

Spezielle Ordnung für den Master-Studiengang Global Change: Ecosystem Science and Policy Anlage 2: Modulbeschreibungen In der Fassung des 6. Beschlusses vom 23.11.2017	19.01.2018	7.36.08 Nr.4	S. 1
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Overview

UCD	Core modules	Code	Credits
	Quantitative Methods for Engineers	STAT40690	5
	Plant-Atmosphere Climate Interaction	BOTN40180	5
	Global Change – Introduction	ENVB40130	5
	Science and Policy	BIOL40140	5
	Environmental Impact Assessment	ENVB40040	5
	Environmental Law and Policy	LAW30440	5
	Optional modules		5
	a) Biodiversity	ZOOL40010	5
	b) Peatland and Environmental Change	ENVB40040	5
	Total CP in UCD for taught modules		35

JLU	Core modules	Code	Credits
	Global Change: Modelling and Advanced Techniques	M-GC-GCM	5
	Designing and Managing Global Research Projects	M-GC-RIE	3
	Political Consulting – Environmental Policy and Development Cooperation	M-GC-PCE	6
	Resource Economics and Environmental Management	M-GC-REM	6
	Biodiversity Informatics	M-GC-BDI	3
	Climate-relevance and Resource Efficiency of Sustainable Farming Systems	MP-155	6
	Optional modules		6
	a) Field Methods in Global Change Research	M-GC-MGC	3
	b) Human Health Impacts of Climate Change: the International Dimension	M-GC-CCH	6
	c) Adaption to Global Change	M-GC-AGC	3
	d) Stress Ecology	M-GC-STE	3
	e) Into the Footsteps of a Researcher	M-GC-TEA	3
	f) Man in Past Climates and Climate Change Impacts	M-GC-MPC	3
	Total CP in JLU for taught modules		35

Module 'Work Placement'	UCD	20
Module 'Research Project/Thesis'	UCD	30

Total Number of CP **120**

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UCD - Core modules:

STAT40690		Quantitative Methods for Engineers	1. Sem.	5 CP
Module title		Quantitative Methods for Engineers		
Module code		STAT40690		
Start semester		winter semester 2017		
Faculty / Subject / Department		UCD, School of Mathematics and Statistics		
Associated with degree course(s) / Semester taken		MSc. Global change: Ecosystem Science and Policy / 1 st semester		
Module coordinator		Dr Damien McParland		
Prerequisites		This module is aimed at all students who are studying for Masters programmes. Students may or may not have prior exposure to Statistics and Research Methods.		
Learning	Students will be able to critically assess studies in the literature and will be able to compute relevant descriptive statistics, conduct hypothesis tests and apply basic regression models to data. They will also be required to conduct a study of their own during the course. The course will also have a lab component where students will become familiar with the use of statistical software. Finally they will gain experience in writing a research report.			
Module contents	<p>The module will introduce students to the fundamental principles of probability and statistics including data collection with an emphasis on Engineering.</p> <p>The main content of the module will be:</p> <ul style="list-style-type: none"> - Descriptive statistics and data collection - Review of Probability Laws and Basic Distributions - Estimation methods - Sampling distributions and assessing uncertainty in estimates - Hypothesis testing - Regression - Design of experiments and analysis of variance - Statistical methods for quality control <p>Weeks 6-12 will be more applied in nature and will provide students with the skills required to complete basic statistical analyses.</p>			
Class format		Lectures/Computer Lab		
Methods of assessment		Final module examination		
Workload	Total workload, credit points	125 h, 5 CP		
	consisting of A Courses	Lectures/Computer Lab		
	Aa Contact hours	24		
	Ab Preparation / revision	101		
	B Autonomous work			
	C Examination with preparation			
Examination	Examination prerequisites			
	Methods of assessment	Continuous Assessment: Experimental design and analysis, Examination: Final examination (2 hour End of Semester Exam)		
	Module retake examination	According to UCD module retake regulations		

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Final module mark	Continuous Assessment: Experimental design and analysis (30 %), Examination: Final examination (70%)		
Frequency, duration in semesters	Each year	1 semester	Winter semester
Intake capacity	16		
Language of instruction	English		
Comments			

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BOTN40180	Plant-Atmosphäre Climate Interaction	Winter	5 CP		
Title of module	Plant-Atmosphäre Climate Interaction				
Code of module	BOTN40180				
Faculty / study program / Institution	UCD, Botany				
used in StG / Sem.	1 Sem., MSc Global Change				
Person in charge	Dr Jennifer McElwain				
Prerequisites	None				
Course aims	<p>We are currently experiencing major changes in our climatic and atmospheric environment. Conservative estimates project that the concentration of greenhouse gas carbon dioxide will double by the end of this century and global temperatures are expected to rise by 1 to 4 °C. A major issue facing the scientific and political community is how these projected changes will influence natural ecosystems, plant and animal ecology and biodiversity. This course will explore examples of plant-atmosphere and plant-climate interactions in the geological past, in the more recent past of Quaternary glacial-interglacial cycles and from experimental studies of the present day. The course will provide a framework for understanding the nature and scale of evolution, adaptation and eco-physiological responses of plants to their atmospheric and climatic environment.</p>				
Course content	<p>The learning objectives of this course are:</p> <ul style="list-style-type: none"> - to understand plant evolution over the past 3700 million years (with specific emphasis on land plant evolution over the past 500 million years). - to understand fossil plant responses to environmental extremes associated with mass extinction events in Earth history. - to understand global, regional, local and individual level responses to past, present and likely future atmospheric CO₂ concentrations. 				
Class format	Lecture and practice				
Workload	106 h	Credit-Points: 5 CP			
containing:	A Course		B Self-study	C examination	total
	a presence	b preparation/post processing, LN			
Lecture	12				
Conversation Class	4				
Specified Learning Activities	40				
Total	56		50		106
Examination format Grading Repetition	Short in class presentation on research paper 30%; end of semester essay style examination (70%)				
Availability Duration	Winter, each year one semester				
Acceptance capacity	None				
Language of instruction	English				
Literature					
Notes					

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ENVB40130	Global Change Ecology – Introduction		Winter	5 CP	
Title of module	Global Change Ecology – Introduction				
Code of module	ENVB40130				
Faculty / study program / Institution	UCD, Environmental Biology				
used in StG / Sem.	1 Sem., MSc Global Change				
Person in charge	Prof. Thomas Bolger				
Prerequisites	None				
Course aims	Introduction to global change as a many-faceted process arising from human and natural activities. Topics covered include elevated concentrations of atmospheric CO ₂ , enhanced levels of nitrogen deposition, changes in land use, biodiversity loss and global warming. The background is set through descriptions of the diversity of terrestrial systems, the differences between terrestrial and aquatic systems and the importance of climate in determining the distribution and functioning of terrestrial systems.				
Course content	<p>What will the student learn?</p> <p>On completion of this module students should:</p> <ul style="list-style-type: none"> - Understand the ecosystem concept; - Appreciate the differences between terrestrial and aquatic ecosystems; - Understand the drivers of global change; - Understand the consequences of global change. 				
Class format	Lecture and practice				
Workload	112 h			Credit-Points: 5 CP	
containing:	A Course		B Self-study	C examination	total
	a presence	b preparation/post-processing, LN			
	Lecture	18			
	Practical	9			
	Field Trip	5			
	Total	32	80		112
Examination format	Essay on aspects of global change (25%); end of course examination (50%) and report from fieldtrip (25%)				
Grading					
Repetition					
Availability	Winter, each year				
Duration	one semester				
Acceptance capacity	None				
Language of instruction	English				
Literature					
Notes					

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BIOL40140	Science and Policy		Winter	5 CP	
Title of module	Science and Policy				
Code of module	BIOL40140				
Faculty / study program / Institution	UCD, Biology				
used in StG / Sem.	1 Sem., MSc Global Change				
Person in charge	Dr Tamara Hochstrasser				
Prerequisites	None				
Course aims	The role of science and scientists in Western societies is rapidly changing. New technologies in particular the World Wide Web make information available in much faster time and to a wider audience than was traditionally the case. In the first half of this course, student participants should become familiar with the history of science in society as well as with the social structure and functioning of the scientific community over time through a series of readings and discussion groups. In the second half of the course, the students will explore the interface with the wider society by running a project where citizens are involved in the scientific process.				
Course content	<p>What will the student learn?</p> <p>On completion of this module students should be able to:</p> <ul style="list-style-type: none"> - give an outline of how the role of science in society evolved over time - clearly explain the difference between scientific knowledge and other kinds of knowledge – priorities, normative and positive claims - be able to lead a citizen group in a discussion of a scientific topic - have a clear understanding and a working knowledge of methods to bridge the gap between scientists and society. 				
Class format	Lecture and practice				
Workload	110 h			Credit-Points: 5 CP	
containing:	A Course		B Self-study	C examination	total
	a presence	b preparation/post processing, LN			
	Lectures	20			
	Small group	10			
	Practical	20			
	Specified Learning Activities	20			
	Total	70	40		110
Examination format	Essay (40%) and oral examination (60%)				
Grading					
Repetition					
Availability	Winter, each year				
Duration	one semester				
Acceptance capacity	20				
Language of instruction	English				
Literature					
Notes					

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ENVB40040	Environmental Impact Assessment		Winter	5 CP	
Title of module	Environmental Impact Assessment				
Code of module	ENVB40040				
Faculty / study program / Institution	UCD, School of Biology and Environmental Science				
used in StG / Sem.	1 Sem., MSc Global Change				
Person in charge	Dr Tasman Crowe				
Prerequisites	None				
Course aims	This module outlines the development and philosophy of the EIA framework in Ireland and Europe. We then focus on the practicalities of preparing an Environmental Impact Statement, including scoping and the collection, synthesis and dissemination of relevant information. Emphasis is placed on biological sampling and coastal examples. We compare EIA processes in a range of countries and discuss the pros and cons of different approaches. The course includes a mock EIA exercise and guest lectures from practising environmental consultants and decision makers.				
Course content	<p>What will the student learn?</p> <p>Describe the philosophy, background and development of the Environmental Impact Assessment (EIA) process in Europe and Ireland and place it in a broader framework of approaches to environmental management;</p> <ul style="list-style-type: none"> - Summarise the general legal framework for EIA in Ireland, including the different categories of impact that must be addressed; - Discuss some of the difficulties of assessing 'significance' of impacts; - Work as part of a team to prepare a scoping report (part of EIA), based on practical experience of doing so; - Take a critical view of the design and interpretation of biological surveys for EIA; - Critically appraise the relative merits and flaws of EIA systems in different countries; - Consider the different careers available in the field of EIA and their spheres of influence. 				
Class format	Lecture and practice				
Workload	102h			Credit-Points: 5 CP	
containing:	A Course		B Self-study	C examination	total
	A presence	b preparation/post processing, LN			
	Lectures	9			
	Specified Learning Activities	30			
	Total	39	63		102
Examination format	Simulation exercise (30 %) and exam (70 %)				
Grading					
Repetition	In-semester assessment				
Availability	Winter, each year				
Duration	one semester				
Acceptance capacity	None				
Language of instruction	English				
Literature					
Notes					

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LAW30440	Environmental Law and Policy		Winter	5 CP	
Title of module	Environmental Law and Policy				
Code of module	LAW30440				
Faculty / study program / Institution	UCD, School of Law				
used in StG / Sem.	1 Sem., MSc Global Change				
Person in charge	Dr Andrew Jackson				
Prerequisites	None				
Course aims	On completion of this module, diligent students should: (1) have a good grounding in the history and key principles of substantive environmental law; (2) understand how environmental law is enforced and the remedies available for breach of environmental law at national, European and international levels; (3) understand the implications of the level at which environmental law is made - domestic, European and international; (4) have developed an awareness of the challenges that this field of law faces and will face in the future.				
Course content	Environmental law is fundamental to how society interacts with the natural world around it. This module will examine the key principles of environmental law, its underlying philosophies, and how it is applied, at national, European and international levels. It will trace the development of environmental law to date and its sources, and will examine how environmental law has become an integral part of many aspects of community life. Fundamental concepts and principles of environmental law will be illustrated with contemporary international and domestic examples, including from climate change law, nature conservation law, and the law of sustainable development. Remedies and enforcement will be studied in detail. This module will not deal in depth with Planning Law, which is covered in a separate module.				
Class format	Lectures, Specified Learning Activities				
Workload			Credit-Points: 5 CP		
containing:	A Course		B Self-study	C examination	total
	a presence	b preparation/post processing, LN			
	Lectures	24	64		88
	Specified Learning Activities	12			12
	Total				100
Examination format Grading Repetition	Essay (25%), Examination (75%)				
Availability Duration	Winter, each year one semester				
Acceptance capacity	None				
Language of instruction	English				
Literature					
Notes					

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UCD – Optional modules:

The student will choose one module from the following list:

ZOOL40010	Biodiversity	Winter	5 CP		
Title of module	Biodiversity				
Code of module	ZOOL40010				
Faculty / study program / Institution	UCD, Zoology				
used in StG / Sem.	1 Sem., MSc Global Change				
Person in charge	Prof. Thomas Bolger				
Prerequisites	None				
Course aims	Biodiversity loss due to human activities is currently more rapid than at any time in human history. To achieve progress towards biodiversity conservation it is necessary to respond with actions that recognise the conservation and sustainable use of biodiversity. These responses need to recognise the indirect and direct drivers of change as well as mechanisms of coexistence and community assembly. In this course the definition, measurement, maintenance and value of biodiversity are discussed taking into account the constant change which is characteristic of ecological systems. While the value of biodiversity will be discussed primarily on ecological grounds; economic, aesthetic and ethical issues will also be discussed. Issues arising from the Millennium Ecosystem Assessment and the EU Strategy for Sustainable Development will be used to structure discussion.				
Course content	<p>What will the student learn?</p> <p>On completion of this module, students should be able to:</p> <ul style="list-style-type: none"> - evaluate techniques of biodiversity enumeration; - demonstrate knowledge of mechanisms of coexistence and assembly of communities; - examine and determine the functional, aesthetic, ethical and economic values of biodiversity; - understand the difficulties with the identification of keystone species. 				
Class format	Lecture and practice				
Workload	Credit-Points: 5 CP				
containing:	A Course		B Self-study	C examination	total
	a presence	b preparation/post processing, LN			
	Lecture	12			
	Tutorial	8			
	Total	20	80		100
Examination format	Written exam (1 hour) (65%), presentation in class (35%)				
Grading					
Repetition					
Availability	Winter, each year				
Duration	one semester				
Acceptance capacity	None				
Language of instruction	English				
Literature					
Notes					

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ENVB40040	Peatland and Environmental Change		Winter	5 CP	
Title of module	Peatland and Environmental Change				
Code of module	ENVB40040				
Faculty / study program / Institution	UCD, Biology				
used in StG / Sem.	1 Sem., MSc Global Change				
Person in charge	Dr Florence Renou-Wilson				
Prerequisites	None				
Course aims	<p>Aim:</p> <p>This module should provide the students with a comprehensive summary of peatland science. Human activity, climatic variability as well as other natural processes shape peatlands which are dynamic ecosystems, constantly evolving. From microbial diversity to entire landscape, students will develop an understanding peatlands especially Irish ones but also around the world.</p>				
Course content	<p>What will the student learn?</p> <p>On completion of this module, students should be able to:</p> <ul style="list-style-type: none"> - recognise peatland types and understand their natural history (their origin and development and how they got to their current status), - understand processes within these ecosystems (ecology, hydrology and peat accumulation), - understand peatland-environment feedback, especially with regards to global climate - recognise the different ecosystem services they provide and appraise the consequence of these values, - evaluate resource management options. 				
Class format	Lecture and practice				
Workload			Credit-Points: 5 CP		
containing:	A Course		B Self-study	C examination	total
	a presence	b preparation/post processing, LN			
	Lecture	16			
	In class conversation	4			
	Field trip	6			
Total	26		80		106
Examination format Grading Repetition	In class presentation on research paper (30%), written examination (2hours)(70%)				
Availability Duration	Winter, each year one semester				
Acceptance capacity	None				
Language of instruction	English				
Literature					
Notes					

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JLU - Core modules:

M-GC-GCM	Global Change	2. Sem.	5 CP	
Module title	Global Change: Modelling and Advanced Techniques			
Module code	M-GC-GCM			
Start semester	Summer semester 2018 V1			
Faculty / Subject / Department	08/Biology/Institute of Plant Ecology			
Associated with degree course(s) / Semester taken	MSc. Global Change: Ecosystem Science and Policy / 2 nd semester MSc. Biology / 2 nd semester			
Module coordinator	Prof. Christoph Müller, PhD			
Prerequisites	-			
Learning outcomes	<p>Students</p> <ul style="list-style-type: none"> • Have knowledge of current global change issues • Have the ability to plan ecological experiments, to interpret results and evaluate, discuss and present them adequately • Understand scientific problems and know how to structure and analyse them • Are able to construct mathematical models in ecology • Are able to use techniques for programming mathematical models. • Are able to apply models for the analysis of biological systems. • Have the ability to organize their own current scientific literature. 			
Module contents	<p>This module aims to provide students with an understanding of the biogeochemical structure of ecological systems which underpins the current state-of-the-art scientific knowledge in Global Change Science. This module first equips the students with tools to measure and analyse data from ecological experiments, addressing the importance of understanding their associated numerical methods and mathematical/model development. The students will learn in turn to program models and validate and illustrate model results. More specifically, students will participate in current ecosystem research at various experimental field stations. The students will also be introduced to research into the quantification of global nutrient cycles using stable isotope.</p>			
Class format	lecture (25 %), seminar (15 %), practical (60 %)			
Methods of assessment	Final module examination			
Workload	Total workload, credit points	150 h, 5 CP		
	consisting of A Courses	lecture	seminar	practical
	Aa Contact hours	10	7	30
	Ab Preparation / revision	15	8	30
	B Autonomous work	30		
	C Examination with preparation	20		
Examination	Examination prerequisites			
	Methods of assessment	Report, seminar presentation		
	Module retake examination	Report (100 %)		
	Final module mark	Report (60%), seminar presentation (40%)		
Frequency, duration in semesters	Annual	4 weeks	summer semester	
Intake capacity	16			
Language of instruction	English			
Comments				

M-GC-RIE	Designing and Managing Global Change Research Projects		2. Sem.	3 CP
Module title	Designing and Managing Global Change Research Projects			
Module code	M-GC-RIE			
Start semester	Summer semester 2018, V1			
Faculty / Subject / Department	<i>08/Biology/Institute of Plant Ecology</i>			
Associated with degree course(s) / Semester taken	<i>MSc. Global Change: Ecosystem Science and Policy / 2nd semester MSc. Biology / 1st-4th semester</i>			
Module coordinator	Prof. Christoph Müller			
Prerequisites	-			
Learning	<p>Students</p> <ul style="list-style-type: none"> • Are able to use literature databases • Have the ability to have a scientific conversation in English • Know the structure of theses and scientific papers • Know how to present scientific results at international conferences in form of a poster/oral presentation 			
Module contents	<p>This module aims to equip students with the skills required for completion of a research project, including: (1) searching and organising scientific literature databases; (2) critical reviewing published articles in the field of global change and (3) being able to deliver a scientific discourse. Instructions will be provided specifically on how to research topics of interests, contact relevant researchers and develop a project proposal which will also include an evidence-based policy component. For that purpose, a broad overview of contemporary global change issues and current research projects being investigated in both UCD and JLU will be presented. Finally students will learn how to communicate data using clear graphs, tables and writing in order to either present scientific results for international audience (poster/oral presentation) or write a thesis.</p>			
Class format	Seminar			
Methods of assessment	Final module examination			
Workload	Total workload, credit points	90 h, 3 CP		
	consisting of A Courses	seminar		
	Aa Contact hours	30		
	Ab Preparation / revision			
	B Autonomous work	40		
	C Examination with preparation	20		
Examination	Examination prerequisites			
	Methods of assessment	Presentation in form of an oral conference presentation Report in form of a scientific paper		
	Module retake examination	Presentation in form of an oral conference presentation (50%) Report in form of a scientific paper (50%)		
	Final module mark	Presentation in form of an oral conference presentation (50%) Report in form of a scientific paper (50%)		
Frequency, duration in semesters	annual	1 semester	Summer semester	
Intake capacity	16			
Language of instruction	English			
Comments				

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M-GC-PCE	Political Consulting – Environmental Policy and Development Cooperation		Summer	6 CP	
Title of module	Political Consulting – Environmental Policy and Development Cooperation				
Code of module	M-GC-PCE				
Faculty / study program / Institution	08/ Biology/ Department of Plant Ecology				
used in StG / Sem.	2 Sem., MSc Global Change				
Person in charge	Chair of examination board MSc Global Change				
Lecturers	N.N.				
Prerequisites	None				
Course aims	<p>Political consulting is of growing importance in nowadays fast changing societies. Current challenges arise in the fields of environmental policy and development cooperation according to climate change, globalisation, migration, poverty, north-south divide etc. On successful completion of this module, students will have a broad understanding of political consulting issues relating to these topics. They gain an insight into practical work of political consultants by experts from academia, public and private organisations, and third sector. Students</p> <ul style="list-style-type: none"> - become aware of political approaches, processes, fields and actors, - understand key concepts in political consulting, - learn about possibilities to influence decision-making processes, - analyse political advisers' ways of professional and methodical performance. 				
Course content	<ul style="list-style-type: none"> - Approaches, processes, fields and actors of political consulting - Lecture series by external experts from nature conservation, development cooperation, fight against poverty, equal rights, energy transition, biodiversity research etc. - Best-practice - practical exercises on political consulting 				
Class format	Lecture, Seminar, practice				
Workload	180 h		Credit-Points: 6		
containing:	A Course		B self-study	C examination	total
	a presence	b preparation /post processing, LN			
	Lecture	30	30		60
	Seminar	20	20	40	100
	Practice	8	12		20
	Total	58	62	40	180
Examination format Grading, Repetition	Written report (65%), oral presentation (35%)				
Availability, Duration	Summer, each year, one semester				
Acceptance capacity	None				
Language of instruction	English				
Literature					
Notes	Information concerning modules and literature: see board of information / Date: see university calendar				

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M-GC-REM	Resource Economics and Environmental Management		Summer	6 CP		
Title of module	Resource Economics and Environmental Management					
Code of module	M-GC-REM					
Faculty / study program / Institution	09/ Agricultural Sciences, Nutritional Sciences and Environmental Management					
used in StG / Sem.	2 Sem., MSc Global Change					
Person in charge	Prof. Dr. Ernst-August Nuppenau					
Lecturers	Prof. Dr. Ernst-August Nuppenau					
Prerequisites	None					
Course aims	<p>Students will</p> <ul style="list-style-type: none"> - have foundational knowledge modelling intertemporal optimization of agricultural resource utilization, - understand the basics of management concepts towards the resolution of resource use conflicts, - be able to simultaneously model ecological and economic material cycles, - be able to depict dynamic processes of resource regeneration, - be able to construct computer simulation models, - be able to derive economically and ecologically justifiable extraction rates from soil, water, and biotic resources, - be able to draw knowledge of such concepts as sustainability, the introduction of save minimum standards, etc. to aid efforts in resource management. 					
Course content	<ul style="list-style-type: none"> - intertemporal optimization and resource usage, - economics of non-renewable resources, - economics of renewable resources, - open access property and extinction of species as biotic resources, - nature conservation as common property management, - introduction to the economics of sustainable cultivation, - mathematical formulation of resource management models, - programming of optimization models, - management of cultivated landscapes, - trade and the environment, - political questions about the implementation of environmental policies, - international questions of resource protection, - resource evaluation, - property rights and institutions 					
Class format	Lecture (67%), seminar (20%), practice (13%)					
Workload	180 h		Credit-Points: 6			
containing:	A Course		B self-study	C examination	total	
	a presence	b preparation/post processing, LN				
	Lecture	40	50			
	Seminar	12				
	Practical	8				
	Total	60	50	30	40	180
Examination format	Oral presentation (30%), written examination (70%)					
Grading Repetition						
Availability	Summer, each year					
Duration	one semester					
Acceptance capacity	None					
Language of instruction	English					
Literature						
Notes	Information: see http://www.uni-giessen.de/cms/fbz/fb09/institute/iam/pau					

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M-GC-BDI	Biodiversity Informatics		Summer	3 CP	
Title of module	Biodiversity informatics				
Code of module	M-GC-BDI				
Faculty / study program / Institution	08/ Biology/ Institute of Animal Ecology and Systematics				
used in StG / Sem.	2 Sem., MSc Global Change, MSc Biology				
Person in charge	Prof. Dr. T. Wilke				
Lecturers	Albrecht, Wilke				
Prerequisites	None				
Course aims	<p>Students</p> <ul style="list-style-type: none"> - receive an overview of important methods in biodiversity informatics and can critically judge their individual performances, - are familiar with the digital acquisition, management and processing of biodiversity data, - are able to plan complex field studies, - are familiar with important aspects of biodiversity modeling, - can critically assess changes in biodiversity over time, - understand human impact on biodiversity, - possess a high level of cognitive competence. 				
Course content	<ul style="list-style-type: none"> - acquisition, management and processing of biodiversity data, - biological databases and collections, - geo-referencing/GPS, - biodiversity indices, - visualization of spatially-explicit statistical data, - species range dynamics under global change scenarios, - human impact and invasion biology 				
Class format	Lecture (40%), Seminar (20%), Tutorial (40%)				
Workload	180 h		Credit-Points: 6		
containing:	A Course		B self-study	C examination	total
	a presence	b preparation/post processing, LN			
	Lecture	14	20		
	Seminar	7	7		
	Tutorial	14	28		
	Total	35	55		90
Examination format	Exercises (50%), oral presentation (50%)				
Grading					
Repetition					
Availability	Summer, each year				
Duration	one semester				
Acceptance capacity	None				
Language of instruction	English				
Literature					
Notes	Information concerning modules and literature: see board of information / Date: see university calendar				

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MP 155	Climate-relevance and resource efficiency of sustainable farming systems			2. Sem.	6 CP
Title of module	Climate-relevance and resource efficiency of sustainable farming systems				
Faculty / study program / Institution	Agrarwissenschaften, Ökotropologie und Umweltmanagement / Institut für Pflanzenbau und Pflanzenzüchtung II / Ökologischer Landbau mit dem Schwerpunkt nachhaltige Bodennutzung				
Used in StG / Sem.	Profil, Master (1.-4.), Master Global Change: Ecosystem Science and Policy				
Person in charge	Professur für für Ökologischen Landbau mit dem Schwerpunkt nachhaltige				
Prerequisites	None				
Course aims	<p>The students</p> <ul style="list-style-type: none"> • Get deep insights into the complex of agriculture, greenhouse gas emissions, resource scarcity and climate change • Get an overview of the principles of organic farming in Europe with particular emphasis on climate change and resource utilisation • Learn about the importance of land use, farm structure and soil management regarding climate change impacts and resource efficiency • learn intensively about strategies for organic- and low-input-farming to mitigate and adapt to climate change • deepen their ability to access a topic by means of scientific methodologies 				
Course content	<ul style="list-style-type: none"> • State of the art knowledge on agriculture in particular organic farming and climate change • Particular emphasis on SOLMACC project (Strategies for organic- and low-input-farming to mitigate and adapt to climate change; solmacc.eu) • Writing and presenting own contributions to the given topics • How to access a topic scientifically? Evaluation of various media sources (from brochure to scientific paper) for further successful communication and dissemination of climate change issues. • Excursion to research stations at JLU (Glabbacherhof, Giessen FACE) • Lectures by external scientists 				
Class format	Seminar (83%), Excursion (17%)				
Workload in Stunden	Workload	180 h			
		A Course		B Self-study	C Examination
		a Presence	b preparation/ post processing, LN		Total
	Seminar	50	50		
	Excursion	10			
	Total	60	50	40	30
		180/6 CP			
Examination	Examination format	a) presentation and seminar paper or b) other examinations conducted by the teaching staff (see Spezo § 8)			
	Grading	Presentation and seminar paper (100 %)			
	Repetition	Revision of the seminar paper within 4 weeks or repeat/revision of the examination as described in b)			
Availability	Summer, each year			One semester	
Acceptance capacity	40				
Language of instruction	English				
Homepage	https://www.uni-giessen.de/fbz/fb09/institute/pflbz2/olb				

Siehe auch: http://www.uni-giessen.de/mug/7/pdf/7_36/09/1/7_36_09_1_ANL2b_7ae

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JLU – Optional modules:

The student will choose modules up to 6 CP in total from the following list:

M-GC-MGC		Field Methods in Global Change Research		2. Sem.	3 CP
Module title		Field Methods in Global Change Research			
Module code		M-GC-MGC			
Start semester		Summer semester 2018			
Faculty / Subject / Department		08/Biology/Department of Plant Ecology			
Associated with degree course(s) / Semester taken		MSc. Global change: Ecosystem Science and Policy / 2 nd semester MSc. Biology / 2 nd – 3 rd semester			
Module coordinator		Prof. Christoph Müller, PhD			
Prerequisites		-			
Learning outcomes	Students	<ul style="list-style-type: none"> - have good knowledge of ecophysiology, system ecology and microbial ecology, - know the most important methods in autecology and synecology, - know matter of transformation processes and nutrient cycles on community and ecosystem level, - have the ability to organize on their own current scientific literature, - have the ability to plan ecological experiments, to interpret results and evaluate, discuss and present them adequately. 			
	Module contents	This module will help students deepen their knowledge of specific global change topics related to science of ecosystem ecology. More specifically, the students will learn the most important methods used in investigating terrestrial ecosystem functions with the focus on the flow of water, energy and the cycling of carbon and nutrients. More specifically students will be introduced to scientific methods used in (1) autecology and synecology, (2) transformation processes and nutrient cycles, and (3) in relationship between climatically driven abiotic factors and ecosystem structure and processes (e.g. photosynthesis). Classes will be mainly taught at the state-of-the-art research field station which includes the longest running Free Air Carbon dioxide Enrichment Facility (FACE).			
Class format		Lecture, practical			
Methods of assessment		Final module examination			
Workload	Total workload, credit points	90 h, 3 CP			
	consisting of A Courses	Lecture	Practical		
	Aa Contact hours	10	20		
	Ab Preparation / revision	10	10		
	B Autonomous work	20			
	C Examination with preparation	20			
Examination	Examination prerequisites	-			
	Methods of assessment	Report			
	Module retake examination	Report 100 %			
	Final module mark	100 % report			
Frequency, duration in semesters	Each year	2 weeks	Summer semester		
Intake capacity	16				
Language of instruction	English				
Comments					

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M-GC-CCH	Human Health Impacts of Climate Change: the International Dimension		Summer	6 CP	
Title of module	Human Health Impacts of Climate Change: the International Dimension				
Code of module	M-GC-CCH				
Faculty / study program / Institution	07/ Geography				
used in StG / Sem.	2 Sem., MSc Global Change				
Person in charge	Dr. E. Xoplaki				
Lecturers	Dr. E. Xoplaki				
Prerequisites	Basic knowledge in statistics and familiarity with computer use				
Course aims	<p>The students will</p> <ul style="list-style-type: none"> - learn about the links between climate and health issues - learn how to deal with human health and climate data - learn how statistical methods are applied and results interpreted - study and understand climate variations in different areas of the world, - discuss relevance of human health issues in a climatological context - discuss open issues in climate change and health issues - detect linkages between mortality rate of vector born diseases (west Nile virus, malaria, etc.) and temperature time-series in a selected region and time. 				
Course content	<p>Human beings are exposed to climate change through changing weather patterns (temperature, precipitation, sea-level rise and more frequent extreme events) and indirectly through changes in water, air and food quality and changes in ecosystems, agriculture, industry and settlements and the economy. There are concerns that in the future changes in climate might increase the spread of diseases and threaten human health. However, detecting these changes is challenging because climate is only one of several factors which affect the prevalence of disease at the present day. For instance, changes in frequency and intensity of extreme weather and climate events could pose a serious threat to human health. These threats may either be direct, such as heat waves and flooding, or indirect, for example by the spread of tick-borne diseases. The course also deals with Malaria, Dengue fever, West Nile Fever, Leishmaniasis, and Chikungunya fever and their potential relationship to climate change. The course will also cover the following topics: Climate, a modern health determinant, links between climate change and health, Impact modeling: analysis approaches, Climate Change and Disease Hazards, Extreme temperature impacts on human mortality, Drought and pollution impacts (heat-compounded) detect linkages between mortality rate of vector born diseases (west Nile virus, malaria, etc.) and temperature time-series in a selected region and time.</p>				
Class format	Lectures, Seminar, and Practice				
Workload	180 h		Credit-Points: 6		
containing:	A Course		B self-study	C examination	Total
	a presence	b preparation/post processing, LN			
	Lecture	80	20		
	Seminar	30	24		
	Practice	16	10		
	Total	126	54		180
Examination format	Oral presentation (40%), report (60%)				
Grading					
Repetition					
Availability	summer, each year				
Duration	one semester				
Acceptance capacity	None				
Language of instruction	English				
Literature	Will be distributed and announced				
Notes	Information concerning modules and literature: see board of information / Date: see university calendar				

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M-GC-AGC		Adaptation to Global Change		2. Sem.	3 CP
Module title		Adaptation to Global Change			
Module code		M-GC-AGC			
Start semester		Summer semester 2018			
Faculty / Subject / Department		08/Biologie/Institute of Plant Ecology			
Associated with degree course(s) / Semester taken		MSc. Global Change: Ecosystem Science and Policy / 2 nd semester MSc Biology / 2 nd semester			
Module coordinator		Prof. Christoph Müller, PhD			
Prerequisites		-			
Learning outcomes	<p>The Students</p> <ul style="list-style-type: none"> • Have fundamental understanding of plant environment interactions • Know the influence of global change on plant growth and health in terrestrial ecosystems • Gain insights into the effects of global change on plants, populations and ecosystems • Learn how global change (global warming, elevated CO₂ concentration, land use change) interacts with different stress factors • Are able to design simple experiments to study global change impacts on plants and ecosystems • Acquire skills in the interpretation of scientific literature about global change impacts and plant and ecosystem adaptations • Are able to present and discuss actual scientific research results on the impact of global change and the adaptation of plants and ecosystems 				
	<p>Module contents</p> <p>This module aims to impart the students the latest body of research on the subject global change impacts on various part of the planets and understand the difference between mitigation and adaptation strategies. The focus of this module will be on methods to enable carbon sequestration in soil, i.e. by increasing the stable carbon pool in soil. Methods to evaluate the suitability of carbon rich amendments as well the implications for the environment (e.g. to be in line with the soils directive) are covered in this module. The implications of management and the interactions with changing biotic factors on competition, shift of vegetation, interaction between bio- and functional diversity and vulnerability of plants and ecosystems and conservation aspects are included. Both, laboratory methods but also long-term field studies at the research station, will be covered.</p>				
Class format		Lecture, Practical			
Methods of assessment		Final module examination			
Workload	Total workload, credit points	90 h, 3 CP			
	consisting of A Courses	Lecture	Practical		
	Aa Contact hours	10	14		
	Ab Preparation / revision	20	26		
	B Autonomous work				
	C Examination with preparation	Report 8 h, Seminar presentation 12 h			
Examination	Examination prerequisites	-			
	Methods of assessment	Report, presentation			
	Module retake examination	Report (100%)			
	Final module mark	Report (50%), presentation (50%),			
Frequency, duration in semesters		Annual	2 weeks block	Summer Semester	
Intake capacity		16			
Language of instruction		English			

M-GC-STE		Stress Ecology		2. Sem.	3 CP
Module title		Stress Ecology			
Module code		M-GC-STE			
Start semester		Summer semester 2018			
Faculty / Subject / Department		08/Biologie/Institute of Plant Ecology			
Associated with degree course(s) / Semester taken		MSc. Global Change: Ecosystem Science and Policy / 2 nd semester MSc Biology / 2 nd semester			
Module coordinator		Prof. Christoph Müller			
Learning outcomes	<p>The students</p> <ul style="list-style-type: none"> - have basic understanding for the relations of plant with its environment - know the influence of abiotic and biotic stress factors on the biocoenosis and biotope - understand the intermezzo between biotic und abiotic factors during the adjustment of plants to stressful conditions - learn the strategies of plants to adjust at stressful conditions: Escape and Resistance (Avoidance and Tolerance) - are able to design simple experiments to validate the impact of abiotic and biotic stress factors on single plants populations, communities and ecosystems - acquire skills in the autonomous dealing with actual research literature about Soil-Plant-Atmosphere Continuum (SPAC) - are able to present and discuss results of modern academic research on the impact of stress on single plants, populations, communities and ecosystems 				
	<p>Module contents</p> <p>This module will bring students the latest knowledge and research methods regarding environmental stressors (biotic and abiotic) and their impact on single individuals, populations, communities and ecosystems. Students will discover the latest research on various stress factors including radiation, temperature, pollution (salinity, heavy metals or noxious gas) but also competition, and how they affect the biological communities living in various biotopes. Strategies of plants to adjust to stressful conditions will be reviewed at different levels of organization: Escape (ephemerals), Avoidance (homeostasis) and Tolerance (truly resistant). Students will also be introduced to the Phenological Garden Linden at the JLU Environmental Monitoring and Climate Impact Research Station and which is part of the national, European and global monitoring networks.</p>				
Class format		Lecture, practical			
Methods of assessment		Final module examination			
Workload	Total workload, credit points	90 h / 3 CP			
	consisting of A Courses	A lecture	B practical		
	Aa Contact hours	10	14		
	Ab Preparation / revision	20	26		
	B Autonomous work				
	C Examination with preparation	report 8 h, presentation 12 h			
Examination	Examination prerequisites	-			
	Methods of assessment	Report and presentation			
	Module retake examination	Report (100%)			
	Final module mark	Report (50%) and presentation (50%)			
Frequency, duration in semesters	Annual	Two weeks block	Summer semester		
Intake capacity	16				
Language of instruction	English				

M-GC-TEA		Into the Footsteps of a Researcher		2. Sem.	3 CP
Module title		Into the Footsteps of a Researcher			
Module code		M-GC-TEA			
Start semester		Summer semester 2018			
Faculty / Subject / Department		08/Biology			
Associated with degree course(s) / Semester taken		MSc. Global change: Ecosystem Science and Policy / 2 nd semester MSc Biology / 3 rd -4 th semester			
Module coordinator		Examination board MSc Global Change			
Prerequisites		-			
Learning	<p>Students will</p> <ul style="list-style-type: none"> - be able to handle questions in the team - be able present a question properly and credibly in the team - be able to integrate results from different disciplines in the team - acquire social skills. 				
Module contents	<p>This module will see the students being immersed in a research team of their choice. The students will be part of the discussion group within the research team which typically includes several professors, post-docs and PhD and MSc students. They should be presented with an overview of the type of data which is collected and how it is analysed. They will learn how about division of labour within the team, training in modern techniques and at the end the students should be able to demonstrate to a third party.</p>				
Class format		Practical work in small groups (50%), seminars (50%)			
Methods of assessment		Final module examination			
Workload	Total workload, credit points	90 h, 3 CP			
	consisting of A Courses	Practical	Seminars		
	Aa Contact hours	45	5		
	Ab Preparation / revision		20		
	B Autonomous work				
Examination	C Examination with preparation	20			
	Examination prerequisites	-			
	Methods of assessment	Presentation			
	Module retake examination	Presentation 100 %			
	Final module mark	100 % Presentation			
Frequency, duration in semesters		Each year	2 weeks	Summer semester	
Intake capacity		16			
Language of instruction		English			
Comments					

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M-GC-MPC	Man in Past Climates and Climate Change Impacts		Summer	3 CP	
Title of module	Man in Past Climates and Climate Change Impacts				
Code of module	M-GC-MPC				
Faculty / study program / Institution	07/ Geography				
used in StG / Sem.	2 Sem., MSc Global Change				
Person in charge	Professur für Klimatologie, Klimadynamik und Klimawandel				
Prerequisites	None				
Course aims	<p>The students will</p> <ul style="list-style-type: none"> – learn about climate proxies (including from biological archives) from different areas of the world covering the past 2000 years and their suitability for estimating past climate, – learn how statistical reconstructions are performed using different proxies and estimate uncertainties of past climate, – study and understand past climate variations in different cultures and cultural contexts, – study and understand the role of different forcings (anthropogenic, sun, volcanoes) responsible for past climate variations, – discuss relevance of palaeoclimatology in the context of current and future climate, – discuss open issues in palaeoclimatology and impacts on ecology and society. 				
Course content	<ul style="list-style-type: none"> – Paleoclimatology as a study of climate and environmental processes in the geologically recent past prior to the existence of instrumental records – Studies and methods of past climates with an understanding of the types of proxy data available – Modelling of past scenarios to understand past Earth System variability and the underlying processes – 1 day lab course at the University of Mainz where information from tree rings is analysed to derive paleo temperature and precipitation 				
Class format	Seminar, Practical				
Workload	90 h		Credit-Points: 3		
containing:	A Course		B self-study	C examination	Total
	a presence	b preparation/post processing, LN			
	Seminar	30		30	
	Practice	10			
	Total	40		30	90
Examination format Grading Repetition	Examination: written report (60 %), oral presentation (40 %)				
Availability Duration	Summer, each year one semester				
Acceptance capacity	None				
Language of instruction	English				
Literature	Will be distributed and announced				
Notes	Information concerning modules and literature: see board of information / Date: see university calendar				

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BIOL40120	Work Placement	Summer	20 CP
Title of module	Work Placement		
Code of module	BIOL40120		
Faculty / study program / Institution	UCD, Biology		
used in StG / Sem.	1 Sem., MSc Global Change		
Person in charge	Dr Florence Renou-Wilson		
Prerequisites	None		
Course aims	<p>This Masters programme offers students the opportunity to spend 6 weeks in a real-life employment. The student will work in a setting that reflects his/her interests as an Environmental professional. Placements may vary considerably but in general terms the students will be placed in industrial, government, non-government or research environment where they will obtain a breadth of practical experience to complement their degree programme. Employers welcome 'transferable skills' acquired during a work placement such as communication, numeracy, use of IT, group work and time management to name but a few. The students will experience workplace culture making them more effective employee following graduation. The work experience is defined as a learning experience incorporating mentoring, professional supervision in which work is viewed from critical and evaluative perspectives much in contrast to the notion of routine or regular work.</p>		
Course content	<p>What will the student learn?</p> <p>In terms of broad learning outcome, at the end of this module, the students will:</p> <ul style="list-style-type: none"> -have increased their ability to relate academic theory to the work environment -have developed identified work related skills -be able to critically evaluate their learning from the placement -have enhanced their career knowledge -have planned, carried out, evaluated and reported on a project. <p>In particular they should have acquired skills to be able to:</p> <ul style="list-style-type: none"> -Evaluate the interaction between policies and the quality of the environment in its multiple biotic, abiotic and cultural-economic dimensions. -Describe some aspect of the environment which is impacted by global change and understand the implications and possible mitigation and adaptation measures. -Demonstrate an understanding of professional practice in some of the following areas: scientific analyst, policy adviser, researcher, environmental management industries. <p>How will the student learn?</p> <p>Pre placement submission: This involves 1) writing a CV and covering letters; 2) reflection on each application in terms of academic knowledge and related work skills; 3) analysis of skills to be gained while on placement (general knowledge and understanding; cognitive skills, subject specific skills, transferable skills)</p> <p>On placement: A 6 weeks contact time with employers is required. This involves 1) a log book or diary to be sent to the module co-ordinator weekly and should be based on activities and what the student has learnt from the activities (most important focus); 2) a short report on the profile of the host (to get to know an employer).</p> <p>Post placement: This involves 1) a final portfolio/report (whereby students should show how they have met the aforementioned learning outcomes) and 2) an oral presentation (15min with 5 min questions).</p> <p>The format of the final portfolio/report will be flexible depending on the skills a student may wish to develop but should incorporate observations, critical thinking, evaluation and research. It could be a typical report on a particular issue or on an aspect of the placement host (theme) or a draft paper (for publication).</p>		

Anlage 2: Modulbeschreibungen

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Class format	Work placement				
Workload	400 h / 6 weeks <u>contact time with employer</u>			Credit-Points: 20	
containing:	A Course		B self-study	C examination	total
	a presence	b preparation/post processing, LN			
	work placement	270			
	Report			90	
	Total	270	40	90	400
Examination format Grading, Repetition	Log book (10%), Report/final portfolio (50%), seminar/presentation (40%) no grade: fail or pass				
Availability Duration	6 weeks contact time with employer				
Acceptance capacity	20				
Language of instruction	English				
Notes					

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BIOL40130	Research Project Thesis			Summer	30 CP
Title of module	Research Project Thesis				
Code of module	BIOL40130				
Faculty / study program / Institution	UCD, Biology				
used in StG / Sem.	3 Sem., MSc Global Change				
Person in charge	Dr Florence Renou-Wilson				
Prerequisites	None				
Course aims	The research project is an important element of the Masters in Global Change as it involves the planning, execution and communication of a research question that the student wishes to investigate in depth. Students select individual projects from a list provided by the module co-ordinator, following consultation with the selected supervisor. During the third semester, a period of 16 weeks will be devoted entirely to the project work. Students will maintain regular contact with their supervisor, who will assist by guiding the project, reading and commenting on written work, and providing advice as necessary.				
Course content	<p>What will the student learn?</p> <p>During the course of the research project, the student will:</p> <ul style="list-style-type: none"> - develop independent research and organisational skills; - develop technical competence in the specific research area and learn to synthesise information and write a scientific report. 				
Class format	Research thesis				
Workload	600 h			Credit-Points: 30	
containing:	A Course		B self-study	C examination	Total
	a presence	b preparation/post processing, LN			
Autonomous student learning		600			
Total		600			600
Examination format Grading Repetition	<p>On completion of the research project the student will produce a mini-thesis in the format of a scientific paper, which will be graded by a supervisor and a second assessor. The format for grading will be as follows:</p> <p>Statement of problem & literature review (20%) Statement of aims and objectives (10%) Methodology (20%) Treatment of results (15%) Discussion (15%) Referencing/Bibliography (10%) Other (layout/formatting/proof-reading) (10%)</p>				
Availability Duration	each year				
Acceptance capacity					
Language of instruction	English				
Literature					
Notes					