

Spezielle Ordnung für den Master-Studiengang Global Change: Ecosystem Science and Policy Anlage 2: Modulbeschreibungen In der Fassung des 08. Beschlusses vom 16.10.2019	14.04.2020	7.36.08 Nr.4	S. 1
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Overview

UCD	Core modules	Code	Credits
	Data Analysis and Interpretation	ENVB40370	5
	Designing Global Change Research Projects	BIOL40780	5
	Global Change Ecology	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
	Adaptation to Global Change	M-GC-AGC	3
	Political Consulting – Environmental Policy and Development Cooperation	M-GC-PCE	6
	Resource Economics, Sustainability and Environmental Management	M-GC-REM	6
	Biodiversity Informatics	M-GC-BDI	3
	Sustainable Agroecosystems	MK-96	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) Stress Ecology	M-GC-STE	3
	d) Into the Footsteps of a Researcher	M-GC-TEA	3
	e) 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:

ENVB40370	Data Analysis and Interpretation		1.Sem.	5 CP
Title of module	Data Analysis and Interpretation			
Code of module	ENVB40370			
Faculty / study program / Institution	UCD, School of Biology and Environmental Science			
used in StG / Sem.	1 Sem., MSc Global Change			
Person in charge	Dr Jon Yearsley			
Prerequisites	None			
Course aims	<p>This module aims to equip you with the skills to professionally synthesize and communicate technical information in the field of biology and environmental science.</p> <p>Learning Outcomes:</p> <ul style="list-style-type: none"> • Design a biological / environmental experiment, taking due account of independence, allocation of replicates and controls; • Organise and manipulate data on a computer; • Fit and validate a statistical model to biological data; • Test a null-hypothesis using fitted statistical models • Accurately communicate data using graphs, tables and written text; • Answer research questions and draw strong, defensible conclusions using modern statistical data analysis methods 			
Course content	<p>The module blends online lessons, computer practicals and self-test problem sheets. Topics covered include the reporting of data, data management, design and analysis of biological and environmental experiments, hypothesis testing and the use of the R statistical software.</p> <p>For this module, you will require access to a computer that will run the R statistical software (available for Windows, Mac or Linux operating systems at https://www.r-project.org/) and RStudio (freely available at https://www.rstudio.com/products/rstudio/#Desktop).</p>			
Class format	On-line learning			
Workload	125 h		Credit-Points: 5 CP	
containing:	A Course		B Self-study	C examination
	A presence	b preparation/post processing, LN		
	On-line learning			125
	Total			125
Examination format Grading Repetition	<p>Continuous Assessment: Online data analysis test 1 (20 %), Online data analysis test 2 (20 %), R script to accompany online test 1 (5 %), R script to accompany online test 2 (5 %)</p> <p>Examination: End of semester exam (2 h) (50 %)</p>			
Availability Duration	Winter, each year one semester			
Acceptance capacity	None			
Language of instruction	English			
Literature				
Notes				

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BIOL40780	Designing global change research projects	5 CP
	Designing global change research projects	
Core module	UCD/School of Biology & Environmental Science	1 st Sem.
	to be registered for academic session 2019/20	
<p>Learning outcomes:</p> <p>Students will</p> <ul style="list-style-type: none"> • have enhanced critical reading and thinking; • be able to use literature databases and write a publishable scientific literature review; • know the structure of theses and scientific papers; communication writing styles and understanding of the peer review process; • know how to present scientific results at international conferences in the form of poster and oral presentations; • understand the various research approaches and methods that include quantitative, qualitative and mixed methods, as well as social/spatial research (grounded theory etc.); • have learned how to keep systematic records and time-management of the whole research process. 		
<p>Module content:</p> <p>This module will prepare students for work placement in research institutions and for their research theses. The student will be equipped with all the tools necessary to design and produce a robust research proposal that will include a rationale (literature review), management timeline and will be underpinned by sound theoretical and methodological research design. This will be delivered in a workshop and seminars that will be student-led, requiring active participation.</p> <p>Module content:</p> <ul style="list-style-type: none"> • design of a scientific and policy research proposal from initial ideas to a full proposal with adequate robust methodologies; • efficient organisation of scientific literature in databases and use of reference software; • develop greater awareness of narratives used in both scientific and policy publications and writing styles avoiding bias; • enhanced reading, understanding and writing of scientific papers (peer-reviewed); • methods and techniques of communication: poster with short presentation ('elevator pitch') and oral presentations during conference-style seminars. 		
Availability and duration: Winter, each year, one semester		
In charge of the module: School of Biology & Environmental Science *		
Used in: M.Sc. Global Change – Ecosystem Science and Policy		
Prerequisites: none		
Class format and Workload:	Presence:	Preparation / Reading / Exercises:
Seminars and Workshop	24 h	100 h
Total:	124 h	

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Pre-examination exercises: none
Assignments: <ul style="list-style-type: none"> - Written essay based on a literature review (scientific paper): 50 % - Poster and oral presentation (50%) - The student will also participate in the Global Change Caravan whereby the student will make presentations to various student classes in UCD on global change science and policy topics. Resit: essay and revised seminar paper within 4 weeks
Language of instruction: English
Notes: * Co-ordinator: Dr Florence Renou-Wilson

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ENVB40130	Global Change Ecology		Winter	5 CP	
Title of module	Global Change Ecology				
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		1.Sem.	5 CP	
Title of module	Science and Policy				
Code of module	BIOL40140				
Faculty / study program / Institution	UCD, School Of Biology & Environment Science				
used in StG / Sem.	1 Sem., MSc Global Change				
Person in charge	Dr Tamara Hochstrasser & Dr Adam Kane				
Prerequisites	None				
Course aims	<p>On completion of this module students should be able to:</p> <ul style="list-style-type: none"> • Give an outline of how scientific knowledge is acquired • Understand how a multitude of questions can be asked about a complex system reflecting the different perspectives of experts and non-experts on an environmental problem • Identify relevant knowledge and use an integrative approach to show connections between perspectives and to formulate a conceptual framework for deciding on action • Have experienced how a simulation model (in particular agent-based simulation models) implemented in the open source software Netlogo can help to anticipate outcomes once a conceptual framework has been defined. 				
Course content	<p>The complexity of addressing global environmental problems such that more sustainable paths of development can be identified demands that a new approach to learning about our environment is taken. The foundation of this new approach “often called a transdisciplinary approach“ is dialogue between experts and non-experts. However, scientists are not trained to enter such a dialogue and their effective participation in the dialogue is hampered by a lack of reflection on underlying values and disciplinary frameworks within which scientists conduct their work. In this module, we are going to reflect on the work of scientists so as to learn about our own values and disciplinary frameworks. Being able to articulate more clearly what the scientific method involves and how scientific knowledge about the world is gained will help to establish a dialogue with other experts and non-experts who bring a multitude of perspectives to bear on the problem at hand. Through the integration of these different perspectives, the transdisciplinary approach allows everybody involved in the dialogue to develop a shared, more holistic understanding of the problem and anticipate long-term consequences of addressing the problem in a particular way. This should clarify options and ease the decision making. Furthermore, the dialogue can be used to communicate uncertainties about the anticipated outcomes, and develop adaptive capacity through a framework for learning over time.</p> <ul style="list-style-type: none"> • Reflection on communication and values influencing communication • Introduction of the notion of a mental framework (or mental model) and its importance in interdisciplinary communication and stakeholder dialogues • Discussion of the scientific method and scientific facts and disciplinary frameworks • Discussion of the properties of complex systems and how to anticipate dynamics of these systems in the future (f.i. deep uncertainty and its implications for evidence-based decision-making) • Use of the open-source software Netlogo as a modelling tool for knowledge integration at the science-policy interface (modelling exercise) • Implementation of the transdisciplinary approach in practice 				
Class format	Lecture and practice				
Workload	125 h		Credit-Points: 5 CP		
containing:	A Course		B Self-study	C examination	total
	a presence	b preparation/post processing, LN			
conversation class	12		43		55

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	on-line learning			20		20
	Specified Learning Activities	50				50
	Total	62		63		125
Examination format Grading Repetition	Oral examination (25 %), Continuous assessment: 3 short essays and modelling project (65 %), Attendance and engagement (10 %)					
Availability Duration	Winter, each year one semester					
Acceptance capacity	20					
Language of instruction	English					
Literature						
Notes						

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ENVB40040	Environmental Impact Assessment		1.Sem.	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 Florence Renou-Wilson				
Prerequisites	None				
Course aims	<p>Students should gain an intellectual feel for the rationale, legal and procedural approaches to environmental impact assessment procedures and decision-making – plus practically orientated exposure to the ‘real-world’ approaches used in assessing environmental impacts. Specifically, the module was developed for the students to achieve the following learning objectives:</p> <ol style="list-style-type: none"> 1) Background context is provided on the philosophy and development of the Environmental Impact Assessment (EIA) process in North America, Europe and Ireland and place it in a broader framework of approaches to environmental management. 2) The general legal framework for EIA is presented for European countries and Ireland in particular; critically appraising the relative merits and flaws of EIA systems in different countries. 3) The general stages of assessment are identified and explored with reference to appropriate tools and methodologies: screening, scoping, impact identification; mitigation, monitoring, follow-up and process audit. 4) Critical discussions on the difficulties of assessing ‘significance’ of impacts as well as designing appropriate monitoring surveys. 5) The procedures appropriate to each level in the conceptual planning hierarchy are compared and contrasted. At policy assessment level: Strategic Environmental Assessment (SEA) of plans and programmes; At project assessment level: Environmental Impact Assessment (EIA) and Appropriate Assessment (AA); At company level: Environmental Management Systems (EMS); Life Cycle Analysis (LCA); Integrated Pollution Prevention and Control (IPPC). 				
Course content	<p>This module outlines the development and philosophy of Impact Assessment Procedure (IAP) framework as well as legal and planning framework in which EIA, SEA and AA is used in Ireland, UK and European Union in particular. We then focus on the practicalities of preparing an Environmental Impact Statement, including scoping and the collection, synthesis and dissemination of relevant information. We compare IAP processes in a range of countries and discuss the pros and cons of different approaches. The course includes a practical mock scoping EIA exercise where methodologies (especially used for biological disciplines) to assess and monitor environmental changes are reviewed. Throughout the course, we consider the different careers available in the field of impact assessment procedures in general and their spheres of influence. Case studies and simulation exercises will be utilised. One lecture is given by current ecologists from RPS, one of the largest consultancies in Ireland.</p>				
Class format	Lecture and practice				
Workload	125h		Credit-Points: 5 CP		
containing:		A Course	B Self-study	C examination	total
		A presence	b preparation/post processing, LN		

Anlage 2: Modulbeschreibungen

In der Fassung des 08. Beschlusses vom 16.10.2019

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	Lectures	9		86		95
	Seminar	3				3
	Workshop	5				5
	Specified Learning Activities	22				22
	Total	39		86		125
Examination format	Simulation exercise (30 %) and exam (70 %)					
Grading	In-semester assessment					
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		1.Sem.	5 CP																								
Title of module	Environmental Law and Policy																											
Code of module	LAW30440																											
Faculty / study program / Institution	UCD, Sutherland School of Law																											
used in StG / Sem.	1 Sem., MSc Global Change																											
Person in charge	Prof Suzanne Kingston & Dr Andrew Jackson																											
Prerequisites	None																											
Course aims	<p>On completion of this module, diligent students should:</p> <ol style="list-style-type: none"> 1. Have a good overview of the principles, techniques and regulatory framework of environmental law at national, European and international levels; 2. Have an in-depth knowledge of current principal challenges in environmental law and be able to engage in a high level of debate on these challenges; 3. Be able to critically assess potential ways in which environmental law might be changed to improve environmental protection; 4. Have a good understanding of environmental law in practice. 																											
Course content	<p>Environmental law forms a fundamental part of how our society interacts with its natural surroundings. This course comprises a practical, in-depth examination of environmental law, with a focus on European and international perspectives. It will trace the development of EU and international environmental law to date and will analyse the legal principles applied to environmental protection.</p> <p>Students are introduced to various theoretical bases for environmental regulation, including rights-based approaches, justice-based approaches, as well as the 'law and economics' movement.</p> <p>Having taken this module, students have a good grounding in understanding that law frames, constrains, and delivers policy. The rule of law acts as a check on power, whilst fully respecting the separation of powers. Students will understand that much policy is delivered by the law, and will be aware that a good understanding of the law is essential to understanding environmental policy fully in any given area.</p> <p>This module will have a strong emphasis on environmental law in practice</p>																											
Class format	Seminar																											
Workload	120 h		Credit Points: 5 CP																									
containing:	<table border="1"> <thead> <tr> <th></th> <th colspan="2">A Course</th> <th>B Self-study</th> <th>C examination</th> <th>total</th> </tr> <tr> <th></th> <th>a presence</th> <th>b preparation/post processing, LN</th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>Seminar</td> <td>24</td> <td>96</td> <td></td> <td></td> <td>120</td> </tr> <tr> <td>Total</td> <td>24</td> <td>96</td> <td></td> <td></td> <td>120</td> </tr> </tbody> </table>					A Course		B Self-study	C examination	total		a presence	b preparation/post processing, LN				Seminar	24	96			120	Total	24	96			120
	A Course		B Self-study	C examination	total																							
	a presence	b preparation/post processing, LN																										
Seminar	24	96			120																							
Total	24	96			120																							
Examination format Grading Repetition	Essay (60 %), Presentation (30 %), Participation in class during presentation weeks (10 %)																											
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 Grading Repetition	Written exam (1 hour) (65%), presentation in class (35%)				
Availability Duration	Winter, each year 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					
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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	Students	<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	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.			
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					

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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	The Students				
	<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 				
Module contents	<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			

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M-GC-PCE	Political Consulting – Environmental Policy and Development Cooperation	2.Sem.	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	Prof. Dr. Christoph Müller		
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	<p>The module includes a series of lectures given by guest speakers with background in political science, biodiversity and climate research, conflict research etc., a seminar and a workshop.</p> <p>In the framework of the lecture series speakers from development cooperation and environmental policy present where they do "political consulting" at the interface between science and politics. The invited scientists, consultants, administrative staff etc. present their field of working or single projects and bring up their specific experience. They reflect on their consulting processes and on how they communicate their messages to different target groups and balance different roles and interests.</p> <p>The seminar aims at dealing with policy consulting issues systematically. In presentations and written papers students work on following topics:</p> <ul style="list-style-type: none"> – Policy consulting as a field of work: conceptual definition, history, actors and institutions; – Governance ; context and structures of political processes; – Forms and actors: policy advise by science, think tanks, lobbying, citizens, media, NGOs/bottom-up initiatives; – Fields of policy consulting; examples from Climate Change, Development Cooperation, Food Security, Sustainability Research, Energy Transition, Sustainable Mobility, Technology Assessment etc. <p>The 1-day workshop is organised in form of a role-play: a practical task/problem in development cooperation in a given context is simulated. The students have to support and manage a process that involves different political and administrative actors as well as citizens. Several instructions for consulting and project management are provided, tested "in the field", and jointly evaluated.</p>		

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	20	40
	Practice	8	12		20
Total	58	62	20	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	<p>The module combines a lecture and a seminar where students work on issues of resource use, its optimisation of consumption as well as on political intervention and planning tools:</p> <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 / Duration	Summer, each year / one semester					
Acceptance capacity	None					
Language of instruction	English					
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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MK 96	Sustainable Agroecosystems		2.Sem.	6 CP		
Title of module	Sustainable Agroecosystems					
Code of module	MK 96					
Faculty / study program / Institution	UCD, School of Biology and Environmental Science					
used in StG / Sem.	2 Sem., MSc Global Change					
Person in charge	Prof. Dr. Andreas Gattinger					
Prerequisites	None					
Course aims	<p>The students</p> <ul style="list-style-type: none"> • Get insight knowledge in to the complexity of temperate and tropical agroecosystems under integrated, organic and agro-ecological production • Learn and understand the biophysical factors, processes and interactions that control the functioning of agroecosystems. • Are guided to critically examine agricultural practices and management strategies to increase/stabilize productivity and resource use efficiency, while minimizing negative impacts on the environment and ensuring socio-economic viability. • Practice scientific observation in the field • Practically apply agroecologic principles • broaden their understanding of environmental and socio-economic challenges of farming enterprises • deepen their ability to access a topic by means of scientific methodologies 					
Course content	<ul style="list-style-type: none"> • Agriculture from a systems perspective • Principles of agricultural sustainability • Principles of integrated production, organic farming and agroecology • Sustainability impacts of temperate and tropical agroecosystems covering the main crop commodities and land use systems (Arable, grassland, horticulture) • Farming system innovations (e.g. agroforestry, relay cropping, push-pull systems) • Introduction to action research • Practical work in an experimental garden • 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. • Excursions to research and private farms 					
Class format	Seminar, field trip					
Workload	180 h		Credit-Points: 6 CP			
containing:	A Course		B Self-study	C examination	total	
	A presence	b preparation/post processing, LN				
	seminar	50	50		100	
	Field trip	10			10	
	Total	60	50	40	30	180
Examination format Grading Repetition	a) Seminar work (Presentations, exercises, discussions; assessment scheme can be requested from module coordinator) and oral examination and or b) other examinations conducted by the teaching staff Seminar work (50%), oral examination (50%)					
Availability Duration	Winter, each year one semester					
Acceptance capacity	None					

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Language of instruction	English
Literature	
Notes	

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	<i>08/Biology/Department of Plant Ecology</i>		
Associated with degree course(s) / Semester taken	<i>MSc. Global change: Ecosystem Science and Policy / 2nd semester MSc. Biology / 2nd – 3rd semester</i>		
Module coordinator	Prof. Christoph Müller, PhD		
Prerequisites	-		
Learning outcomes	<p>Students</p> <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	<p>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).</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	20
	Ab Preparation / revision	10	10
	B Autonomous work	20	
Examination	C Examination with preparation	20	
	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				

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	The students				
	<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 				
Module contents	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.				
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				
C Examination with preparation	20				
Examination	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	20	30	
	Practice	10			
	Total	40	20	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>		

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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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Gültig ab SoSe 2020

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					