A Begründung

- Integration der bisherigen Module “Ecosystem and Model development” (Theorieteil) und “Global Change: Modelling and Advanced Techniques” (Praxisteil).
- Einführung eines neuen Pflichtmoduls „Research in Ecology” zum wissenschaftlichen Arbeiten.
- neues Optionsmodul zu Global Change-Forschungsmethoden (Feldübung).
- Neue Optionsmodule

B Änderungsbeschluss

Fünfter Beschluss

zur Änderung der Speziellen Ordnung für den Master-Studiengang „Global Change: Ecosystem Science and Policy“ des Fachbereichs 08 – Biologie und Chemie und der School of Biology and Environmental Science des University College Dublin

Aufgrund von § 44 Abs. 1 Nr. 1 des Hessischen Hochschulgesetzes vom 14. Dezember 2009 hat der Fachbereichsrat des Fachbereichs 08 – Biologie und Chemie am 25.01.2017 die nachstehenden Änderungen beschlossen:

Art. 1 Änderungen


I. In der Anlage 2 (Modulbeschreibungen) erhält die Modulübersicht folgende Fassung:

<table>
<thead>
<tr>
<th>UCD</th>
<th>Core modules</th>
<th>Code</th>
<th>Credits</th>
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<tbody>
<tr>
<td></td>
<td>Quantitative Methods for Engineers</td>
<td>STAT40690</td>
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<td>Plant-Atmosphere Climate Interaction</td>
<td>BOTN40180</td>
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<td>Global Change – Introduction</td>
<td>ENVB40130</td>
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<td>Science and Policy</td>
<td>BIO40140</td>
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<td>Environmental Law and Policy</td>
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<td></td>
<td><strong>Optional modules</strong></td>
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<tr>
<td></td>
<td>a) Biodiversity</td>
<td>ZOOL40010</td>
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<td></td>
<td>b) Peatland and Environmental Change</td>
<td>ENVB40040</td>
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<tr>
<td></td>
<td>Global Change: Modelling and Advanced Techniques</td>
<td>M-GC-GCM</td>
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<tr>
<td></td>
<td>Research in Ecology</td>
<td>M-GC-RIE</td>
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<tr>
<td></td>
<td>Policy Consultancy</td>
<td>M-GC-PBR</td>
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<tr>
<td></td>
<td>Resource Economics and Environmental Management</td>
<td>M-GC-REM</td>
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<tr>
<td></td>
<td>Biodiversity Informatics</td>
<td>M-GC-BDI</td>
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<tr>
<td></td>
<td>Man in Past Climates and Climate Change Impacts</td>
<td>M-GC-MPC</td>
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<td><strong>Optional modules</strong></td>
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<tr>
<td>a) Scientific Presentations in Ecology</td>
<td>M-GC-SEM</td>
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<tr>
<td>b) Methods in Global Change Research</td>
<td>M-GC-MGC</td>
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<tr>
<td>c) Human Health Impacts of Climate Change: the International Dimension</td>
<td>M-GC-CCH</td>
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<tr>
<td>d) Adaptation to Global Change</td>
<td>M-GC-AGC</td>
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<td>e) Stress Ecology</td>
<td>M-GC-STE</td>
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<tr>
<td>f) Team Work</td>
<td>M-GC-TEA</td>
<td>3</td>
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<tr>
<td>g) Political Consulting – Environmental Policy and Development Cooperation</td>
<td>M-GC-PCE</td>
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<td><strong>Total CP in JLU for taught modules</strong></td>
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</tbody>
</table>

Module ‘Work Placement’  
UCD  
20

Module ‘Research Project/Thesis’  
UCD  
30

**Total Number of CP**  
120

### II. In der Anlage 2 (Modulbeschreibungen) werden folgende Module neu hinzugefügt:

<table>
<thead>
<tr>
<th>MS-GC-GCM</th>
<th>Global Change</th>
<th>2. Sem.</th>
<th>5 CP</th>
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</thead>
<tbody>
<tr>
<td><strong>Module title</strong></td>
<td><strong>Global Change: Modelling and Advanced Techniques</strong></td>
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<td><strong>Module code</strong></td>
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<td>Summer semester 2018</td>
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<tr>
<td><strong>Faculty / Subject / Department</strong></td>
<td>08/Biology/Institute of Plant Ecology</td>
<td></td>
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</table>
| **Associated with degree course(s) / Semester taken** | MSc. Global Change: Ecosystem Science and Policy / 2nd semester  
MSc. Biology / 2nd semester | | |
| **Module coordinator** | Prof. Christoph Müller, PhD | | |
| **Prerequisites** | - | | |

#### Students
- 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.

#### Learning outcomes
- Structure of ecological systems and its mathematical development
- Measure and analyse data of ecological experiments
- Programming of models
- Illustration and validation of model results
- Current state-of-the-art scientific knowledge on Global Change Science
- Quantification of global nutrient cycles using stable isotope.
- Numerical methods to describe mathematical models in ecosystem science

#### Module contents
- Lecture (25 %), seminar (15 %), practical (60 %)
- Final module examination

### Workload

<table>
<thead>
<tr>
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<td><strong>Ab Preparation / revision</strong></td>
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### Module Details

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<td></td>
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<tr>
<td>B Autonomous work</td>
<td>40</td>
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<tr>
<td>C Examination with preparation</td>
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</table>

**Examination prerequisites**

- Presentation in form of an oral conference presentation
- Report in form of a scientific paper

**Module contents**

- Efficient organization of scientific literature in literature databases
- Methods to present scientific results (oral and written presentations)
- Typical feature of presentations in English
- Structure of scientific papers (peer-reviewed journals) and theses
- Presentation and practice of scientific results at international scientific conferences (poster and oral presentations)

**Learning Objectives**

- 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

**Class format**

- Seminar

**Methods of assessment**

- Final module examination

**Module title**

- Research in Ecology

**Module code**

- MS-GC-RIE

**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 / 2nd semester
- MSc. Biology / 1st-4th semester

**Module coordinator**

- Prof. Christoph Müller

**Module prerequisites**

- 

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**Examination**

- Examination with preparation, 20 hours

- Autonomous work, 30 hours

**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**

- MS-GC-RIE Research in Ecology 2. Sem. 3 CP

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**Overview**

- Students
  - 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
  - Efficient organization of scientific literature in literature databases
  - Methods to present scientific results (oral and written presentations)
  - Typical feature of presentations in English
  - Structure of scientific papers (peer-reviewed journals) and theses
  - Presentation and practice of scientific results at international scientific conferences (poster and oral presentations)
# Methods in Global Change Research

**Module title:**  
Methods in Global Change Research

**Module code:**  
MS-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 / 2nd semester
- MSc. Biology / 2nd – 3rd semester

**Module coordinator:**  
Prof. Christoph Müller, PhD

## Prerequisites

- Students must have good knowledge of ecophysiology, system ecology and microbial ecology.
- They must know the most important methods in autecology and synchrony.
- They must know matter of transformation processes and nutrient cycles on community and ecosystem level.
- They must have the ability to organize on their own current scientific literature.
- They must have the ability to plan ecological experiments, to interpret results and evaluate, discuss and present them adequately.

## Module contents

- Photosynthesis of plants and communities in relationship to abiotic factors and climate change (e.g. increasing CO2 concentrations and air temperature).
- C and N transformations in terrestial ecosystem (e.g. permanent grassland).
- Energy and matter fluxes in permanent grassland.
- Interactions between vegetation and soil.
- Statistical method in aut- and synecology.

## Class format

Lecture, practical

## Methods of assessment

- **Final module examination**

## Workload

<table>
<thead>
<tr>
<th>Workload</th>
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<td><strong>Practical</strong></td>
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<td><strong>Preparation / revision</strong></td>
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<td><strong>Autonomous work</strong></td>
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<tr>
<td><strong>Examination with preparation</strong></td>
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</table>

## Examination

- **Examination prerequisites:**  
- **Methods of assessment:**  
  Report
- **Module retake examination:**  
  Report 100 %
- **Final module mark:**  
  100 % report

## Frequency, duration in semesters

<table>
<thead>
<tr>
<th>Frequency, duration</th>
<th>Each year</th>
<th>2 weeks</th>
<th>Summer semester</th>
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## Intake capacity

16
<table>
<thead>
<tr>
<th>Language of instruction</th>
<th>English</th>
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<tbody>
<tr>
<td>Comments</td>
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<table>
<thead>
<tr>
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<th>Team Work</th>
<th>2. Sem.</th>
<th>3 CP</th>
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<tbody>
<tr>
<td>Module title</td>
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<tr>
<td>Module code</td>
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<td></td>
<td></td>
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<tr>
<td>Start semester</td>
<td>Summer semester 2018</td>
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<tr>
<td>Faculty / Subject / Department</td>
<td>08/Biology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associated with degree course(s) / Semester taken</td>
<td>MSc. Global change: Ecosystem Science and Policy / 2nd semester MSc Biology / 3rd - 4th semester</td>
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<td>Examination board MSc Global Change</td>
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<tr>
<td>Prerequisites</td>
<td>-</td>
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</tbody>
</table>

**Learning**

- 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**

- Handling of integrative question in the team
- Combination of results from individual disciplines
- Division of labour within the team
- Training in modern media techniques
- Demonstration of training to a third party

**Class format**

Practical work in small groups (50%), seminars (50%)

**Methods of assessment**

Final module examination

<table>
<thead>
<tr>
<th>Workload</th>
<th>Total workload, credit points</th>
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<td>5</td>
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<tr>
<td>Ab Preparation / revision</td>
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**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**

<table>
<thead>
<tr>
<th>MS-GC-AGC</th>
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<th>3 CP</th>
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### 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 / 2nd semester
- MSc Biology / 2nd semester

### Module coordinator
Prof. Christoph Müller, PhD

### Prerequisites

- The Students
  - 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

### Learning outcomes

- Insemination of the actual state of research on the subject ecological global change impact, mitigation and adaptation
- Change of stress factors related to global change: i) abiotic factors: water availability, temperature, frequency of extreme events, shift of climate zones; ii) biotic factors: competition, shift of vegetation zones,
- Adaptation potions to global change for plants and ecosystems: Interaction of bio- and functional diversity and vulnerability of plants and ecosystems (stress escape, tolerance and avoidance, e.g. species shift), conservation aspects

### Module contents

- Insemination of the actual state of research on the subject ecological global change impact, mitigation and adaptation
- Change of stress factors related to global change: i) abiotic factors: water availability, temperature, frequency of extreme events, shift of climate zones; ii) biotic factors: competition, shift of vegetation zones,
- Adaptation potions to global change for plants and ecosystems: Interaction of bio- and functional diversity and vulnerability of plants and ecosystems (stress escape, tolerance and avoidance, e.g. species shift), conservation aspects

### Class format
Lecture, Practical

### Methods of assessment
Final module examination

### Total workload, credit points
90 h, 3 CP

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<tr>
<th>B Autonomous work</th>
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<tbody>
<tr>
<td>C Examination with preparation</td>
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<tr>
<td>Report 8 h, Seminar presentation 12 h</td>
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</table>

### Examination prerequisites

- 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
36

### Language of instruction
English

### MS-GC-STE

#### Module title
Stress Ecology

#### Module code
MS-GC-STE

#### Start semester
Summer semester 2018

#### Faculty / Subject / Department
08/Biologie/Institute of Plant Ecology
The students
- 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
insemination of the actual state of research on the subject stress ecology
Stressors in the environment: biotic and abiotic stressors
radiation, temperature, water, pollution (salinity, heavy metals, gaseous noxa), competition
Strategies of plants to adjust on different levels of organization: Escape (ephemerals), Avoidance (homeostasis) and Tolerance (truly resistant)

Class format
Lecture, practical

Methods of assessment
Final module examination

Workload
<table>
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<th>Total workload, credit points</th>
<th>90 h / 3 CP</th>
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<td>B Autonomous work</td>
<td></td>
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<tr>
<td>C Examination with preparation</td>
<td>report 8 h, presentation 12 h</td>
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</table>

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

Language of instruction English

Comments

STAT40690 Quantitative Methods for Engineers
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 / 1st 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**  
The module will introduce students to the fundamental principles of probability and statistics including data collection with an emphasis on Engineering. The main content of the module will be:
- 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

Weeks 6-12 will be more applied in nature and will provide students with the skills required to complete basic statistical analyses.

**Class format**  
Lectures/Computer Lab

**Methods of assessment**  
Final module examination

**Workload**  
**Total workload, credit points**  
125 h, 5 CP

- **A Courses**  
  - Lectures/Computer Lab
  - 24

- **Ab Preparation / revision**  
  - 101

- **B Autonomous work**  
  - Examination with preparation

**Examination**  
**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

**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**

IV. § 32 wird wie folgt neu gefasst:

„§ 32 (zu § 40 AllB) Inkrafttreten und Übergangsbestimmungen

Diese Ordnung in der Fassung des 5. Änderungsbeschlusses vom 25.01.2017 gilt für alle Studierenden, die den Studiengang ab dem Wintersemester 2017/18 beginnen.“

Art. 2
Inkrafttreten

Dieser Beschluss tritt am Tage nach seiner Verkündung in Kraft. Der neue Wortlaut der geänderten Ordnung wird in den Mitteilungen der Universität Gießen bekannt gemacht.