



# Universität Bremen

## Master of Ecology Course Catalogue

Master of Ecology board of examiners  
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## THE MASTER OF ECOLOGY PROGRAMME

The Master of Ecology at the University of Bremen is a programme for European and Non-European students with a background in biology, ecology or a related subject. All courses are offered in English. The Master of Ecology is multidisciplinary and contains many innovative elements such as a mentoring programme, integrated skills courses, supporting online material, scientific projects, and individual research training.

## CURRICULUM

The programme consists of 4 semesters (two years) including M.Sc. thesis. Specialisation is offered with individual choice of courses, i.e. in Molecular, Behavioral, Population, Vegetation, and Soil Ecology, as well as Conservation Biology and Risk Assessment. Especially during the 3rd term, students have the possibility to study at one of our partner universities abroad.

## THIS MASTER WILL PREPARE YOU FOR RESEARCH AND MORE

The Master of Ecology will provide you with a broad ecological background and will train you to become a critically thinking scientist. Not only will you get extensive research experience qualifying you for PhD studies and an academic career. The acquired scientific, technical and communication skills also open a wide array of additional opportunities. During the programme, you will become familiar with many techniques and approaches including field experiments, analysis of animal behavior, sustainability research, advanced statistics, and modern genetic methods.

Time scheme of the Master of Ecology at the University of Bremen

| Week<br>1   | 2   | 3   | 4 | 5 | 6 | 7         | 8  | 9 | 10 | 11  | 12 | 13 | 14   | Concurrent courses<br>or semester break |
|---|---|---|---|---|---|-----------|--|---|----|---|----|----|--|---|
| 1st Semester (Winter semester)  |   |   |   |   |   |           |  |   |    |   |    |    |  |   |
| <b>Concepts of Ecology</b><br>(Module 401, 3 CP)*   | <b>Experimental Design and Data Analysis</b> (Module 402, 12 CP)* |   |   |   |   | Exam week | <b>Scientific Writing</b><br>(Module 418, 6 CP)* |   |    | <b>Molecular Ecology</b><br>(Module 404, 9 CP)*   |    |    | <b>Current Topics in Ecology 1 &amp; Mentoring</b> (Module 405, 3 CP)* |   |
| 2nd Semester (Summer semester)  |   |   |   |   |   |           |  |   |    |   |    |    |  |   |
| <b>Population Ecology</b><br>(Module 411, 9 CP)*  |   | <b>Behavioral Ecology</b> (Module 413, 6 CP)<br><b>Vegetation Ecology and Conservation Biology</b> (Module 415, 6 CP)<br><b>Long / Short Ecological Excursion and Field Course</b> (Module 414, 3 CP / 417, 6 CP)<br><b>Soil and Ecosystem Ecology</b> (Module 416, 6 CP) |   |   |   |           |  |   |    |   |    |    |  |   |
|   |   | <b>Research Project</b> (Module 412, 12 CP)*<br>(The project may be started in any of the blocks or after the teaching term)  |   |   |   |           |  |   |    |   |    |    |  |   |
| 3rd Semester (Winter semester)  |   |   |   |   |   |           |  |   |    |   |    |    |  |   |
| <b>Environmental Risks and Ecotoxicology</b> (Module 408, 6 CP)<br><b>Marine Ecology Excursion</b> (Module 511, 6 CP) |   |   |   |   |   |           |  |   |    | <b>Introduction to Behavioral Ecology</b><br>(Module 406, 3 CP)<br><b>Basics in Biodiversity</b> (Module 407, 3 CP)<br><b>Advances in Biodiversity</b> (Module 410, 6 CP)<br><b>Current Topics in Ecology 2 &amp; Mentoring</b> (Module 505, 3 CP)<br><b>Tutorial Module</b> (Module 509, 3 CP)<br><b>Coral Reef Ecology</b> (Module 508, 3 CP) |    |    |  |   |
| 4th Semester (Summer semester)  |   |   |   |   |   |           |  |   |    |   |    |    |  |   |
| <b>Master Thesis and Defense</b> (Module 510, 30 CP)*   |   |   |   |   |   |           |  |   |    |   |    |    |  |   |

\*- compulsory courses (401, 402, 404, 405, 411, 412, 418, 510)

## Table of Contents

|   |    |
|---|----|
| Concepts of Ecology .....                         | 5  |
| Experimental Design and Data Analysis .....       | 6  |
| Molecular Ecology.....                            | 8  |
| Current Topics in Ecology 1 and Mentoring .....   | 10 |
| Introduction to Behavioral Ecology .....          | 11 |
| Basics in biodiversity.....                       | 12 |
| Environmental Risks and Ecotoxicology .....       | 13 |
| Advances in biodiversity .....                    | 15 |
| Population Ecology .....                          | 16 |
| Research Project .....                            | 18 |
| Behavioral Ecology .....                          | 19 |
| Long Ecological Excursion and Field Course .....  | 20 |
| Vegetation Ecology and Conservation Biology ..... | 21 |
| Soil and Ecosystem Ecology.....                   | 23 |
| Short Ecological Excursion and Field Course ..... | 25 |
| Scientific Writing .....                          | 26 |
| Current Topics in Ecology 2 and Mentoring.....    | 28 |
| Coral Reef Ecology .....                          | 29 |
| Tutorial Module .....                             | 30 |
| Master Thesis .....                               | 31 |
| Marine Ecology Excursion .....                    | 32 |

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|---|--|-------------------|
| <b>Module name</b>  | <b>Concepts of Ecology</b>   |                   |
| <b>Module reference code</b>  | 401 (02-M19-401)   |                   |
| <b>Module type</b>  | Compulsory   |                   |
| <b>Contents</b>   | Exemplary work on current concepts and questions in different sub-disciplines of ecology: autecology (life forms, responses of species along resource gradients, distribution), population ecology (population growth and intraspecific competition, interspecific competition, plant-animal interactions), community ecology (biodiversity, energy flow and nutrient cycles), global change ecology (invasions, habitat fragmentation, climate change, nitrogen enrichment of ecosystems) |                   |
| <b>Learning outcomes / targeted competences</b>   | Students have gained a general overview of universal, modern concepts of ecology and their historical developments; knowledge of important hypotheses and methods to test these in different fields of ecology   |                   |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)  | Presence in the course   | 10 hours          |
|   | Preparation for exams  | 60 hours          |
|   | Pre- and post-preparation  | 20 hours          |
|   |  | <b>= 90 hours</b> |
| <b>Responsible for the module</b>   | Prof. Dr. Martin Diekmann  |                   |
| <b>Instructor(s)</b>  | Prof. Dr. Martin Diekmann  |                   |
| <b>Frequency</b>  | Yearly, winter semester  |                   |
| <b>ECTS points</b>  | 3 CP   |                   |
| <b>Appertaining courses and course formats</b>  | Seminar<br>0.7 SWS block course over 1 week, i.e. 10 h of seminar (10 h: 14 weeks = 0.7 SWS)   |                   |
| <b>Type of examination</b>  | Module examination (MP)  |                   |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input type="checkbox"/>   | PL, number:       |
|   | <input checked="" type="checkbox"/>  | SL, number: 1     |
|   | <input type="checkbox"/>   | PVL, reason:      |
| <b>Examination format</b>   | Oral presentation  |                   |
| <b>Literature</b>   | Current scientific papers  |                   |

|  |  |                        |          |                       |          |                           |           |  |                    |
|--|--|------------------------|----------|-----------------------|----------|---------------------------|-----------|--|--------------------|
| <b>Module name</b>   | <b>Experimental Design and Data Analysis</b>   |                        |          |                       |          |                           |           |  |                    |
| <b>Module reference code</b>   | 402 (02-M19-402)   |                        |          |                       |          |                           |           |  |                    |
| <b>Module type</b>   | Compulsory   |                        |          |                       |          |                           |           |  |                    |
| <b>Contents</b>  | <ul style="list-style-type: none"> <li>- The consequences of bad experimental design</li> <li>- Formulation of hypotheses</li> <li>- Manipulative experiments and correlative studies</li> <li>- Replication, pseudo-replication and randomization</li> <li>- Controls, factorial and block designs, crossover and split-pot designs</li> <li>- Bias of the measurement</li> <li>- General and generalized linear models (GLMs) with one or more continuous or factorial variables</li> <li>- GLMs with repeated measurements, generalized linear mixed models, nested models, model selection using backward optimization, Akaike information criterion (AIC) and other criteria</li> <li>- Basics of Multivariate Analyses, data transformation</li> <li>- Ordination ([Detrended] correspondence analysis, canonical correspondence analysis, principal component analysis, Non-metric multidimensional scaling (NMDS)</li> <li>- Monte Carlo permutation test</li> <li>- Cluster analysis</li> </ul> |                        |          |                       |          |                           |           |  |                    |
| <b>Learning outcomes / targeted competences</b>  | <p>Knowledge of the basic approaches and possible pitfalls in experimental design; the ability to critically verify the adequateness of a chosen design as well as the capability to develop an adequate experimental design for an ecological research question.</p> <p>Knowledge of current univariate and multivariate statistical models and the competence to apply these to the research question at hand using R. Aptitude to interpret and present results from statistical models.</p>  |                        |          |                       |          |                           |           |  |                    |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010) | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Presence in the course</td> <td style="text-align: right;">98 hours</td> </tr> <tr> <td>Preparation for exams</td> <td style="text-align: right;">98 hours</td> </tr> <tr> <td>Pre- and post-preparation</td> <td style="text-align: right;">164 hours</td> </tr> <tr> <td></td> <td style="text-align: right;"><b>= 360 hours</b></td> </tr> </table>  | Presence in the course | 98 hours | Preparation for exams | 98 hours | Pre- and post-preparation | 164 hours |  | <b>= 360 hours</b> |
| Presence in the course   | 98 hours   |                        |          |                       |          |                           |           |  |                    |
| Preparation for exams  | 98 hours   |                        |          |                       |          |                           |           |  |                    |
| Pre- and post-preparation  | 164 hours  |                        |          |                       |          |                           |           |  |                    |
|  | <b>= 360 hours</b>   |                        |          |                       |          |                           |           |  |                    |
| <b>Responsible for the module</b>  | Prof. Dr. Thomas Hoffmeister   |                        |          |                       |          |                           |           |  |                    |
| <b>Instructor(s)</b>   | Prof. Dr. Thomas Hoffmeister, Prof. Dr. Martin Diekmann  |                        |          |                       |          |                           |           |  |                    |
| <b>Frequency</b>   | Yearly, winter semester  |                        |          |                       |          |                           |           |  |                    |
| <b>ECTS points</b>   | 12 CP  |                        |          |                       |          |                           |           |  |                    |
| <b>Appertaining courses and course formats</b>   | <p>Lecture together with seminar and exercises</p> <p>7 SWS block course over 5 weeks, with 32 hours of lectures (32 h : 14 weeks. = 2.3 SWS), 7 hours of seminars (7 h : 14 weeks = 0.5 SWS) and 59 hours (59 h : 14 weeks = 4.2 SWS) of practical exercises</p>  |                        |          |                       |          |                           |           |  |                    |
| <b>Type of examination</b>   | Combination examination (KP)   |                        |          |                       |          |                           |           |  |                    |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded</b>                      | <input checked="" type="checkbox"/> PL, number: 1<br><br><input checked="" type="checkbox"/> SL, number: 1   |                        |          |                       |          |                           |           |  |                    |

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| <b>component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input type="checkbox"/> PVL, reason:  |
| <b>Examination format</b>  | 100% for written examination in Data Analysis = 1 PL;<br>written presentation in Experimental Design = 1 SL  |
| <b>Literature</b>  | Recommended:<br>Grafen & Hails: Modern Statistics for the Life Sciences, OUP<br>Quinn & Keough: Experimental Design and Data Analysis for Biologists, Cambridge<br>Crawley: An Introduction Using R, Wiley<br>Course scripts |





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| <b>examination</b>                                |  |
| <b>PL = Graded component of the examination</b>   | <input checked="" type="checkbox"/> PL, number: 1 in course 404a (1 written examination), 3 in course 404b (2 assignments and 1 oral seminar presentation)   |
| <b>SL = Ungraded component of the examination</b> | <input type="checkbox"/> SL, number:   |
| <b>PVL = Examination prerequisite</b>             | <input checked="" type="checkbox"/> PVL: 1 ungraded examination prerequisite, reason: In order to carry out the laboratory training in course 404b, students must have participated in safety instructions prior to the course.  |
| <b>Examination format</b>                         | Course 404a: Written exam (100%),<br>Course 404b: Two homework assignments (25% each), oral seminar presentation (50%)   |
| <b>Literature</b>                                 | Recommended:<br>Alberts et al. (2015): Molecular biology of the cell. Garland Science, NY, USA<br>Nicholl (2008): An introduction to genetic engineering. Cambridge University Press, UK<br>Hillis et al. (1996): Molecular Systematics. Sinauer Associates, Sunderland, USA<br>Hall (2011): Phylogenetic trees made easy. Sinauer Associates, Sunderland, USA |



|   |   |                        |          |                       |          |                           |          |  |                   |
|---|---|------------------------|----------|-----------------------|----------|---------------------------|----------|--|-------------------|
| <b>Module name</b>  | <b>Introduction to Behavioral Ecology</b>   |                        |          |                       |          |                           |          |  |                   |
| <b>Module reference code</b>  | 406 (02-M19-406)  |                        |          |                       |          |                           |          |  |                   |
| <b>Module type</b>  | Elective  |                        |          |                       |          |                           |          |  |                   |
| <b>Contents</b>   | 1. Natural selection, ecology and behaviour, 2. Testing hypotheses in behavioral ecology, 3. Economic decisions, 4. Predator prey evolutionary arms races, 5. Competition, 6. Group living, 7. Sexual selection, competition and sexual conflict, 8. Parental Care, 9. Mating systems, 10. Sex allocation, 11. Social behavior, 12. Cooperation, 13. Altruism and conflict in social insects, 14. Communication and signals.  |                        |          |                       |          |                           |          |  |                   |
| <b>Learning outcomes / targeted competences</b>   | Students learn to explain concepts of behavioral ecology; they understand behavior as trait under natural selection and are able put this into context; they gain the competence to derive hypotheses from these concepts and develop research approaches; they understand the evolutionary foundations of different mating systems, the selective forces operating on group living and group size, and on cooperative behavior, they achieve the ability to explain and present the concepts as oral presentation and to defend scientific arguments in group discussions. |                        |          |                       |          |                           |          |  |                   |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)  | <table> <tr> <td>Presence in the course</td> <td>28 hours</td> </tr> <tr> <td>Preparation for exams</td> <td>21 hours</td> </tr> <tr> <td>Pre- and post-preparation</td> <td>41 hours</td> </tr> <tr> <td></td> <td><b>= 90 hours</b></td> </tr> </table>   | Presence in the course | 28 hours | Preparation for exams | 21 hours | Pre- and post-preparation | 41 hours |  | <b>= 90 hours</b> |
| Presence in the course  | 28 hours  |                        |          |                       |          |                           |          |  |                   |
| Preparation for exams   | 21 hours  |                        |          |                       |          |                           |          |  |                   |
| Pre- and post-preparation   | 41 hours  |                        |          |                       |          |                           |          |  |                   |
|   | <b>= 90 hours</b>   |                        |          |                       |          |                           |          |  |                   |
| <b>Responsible for the module</b>   | Prof. Dr. Thomas Hoffmeister  |                        |          |                       |          |                           |          |  |                   |
| <b>Instructor(s)</b>  | Prof. Dr. Marko Rohlf   |                        |          |                       |          |                           |          |  |                   |
| <b>Frequency</b>  | Yearly, winter semester   |                        |          |                       |          |                           |          |  |                   |
| <b>ECTS points</b>  | 3 CP  |                        |          |                       |          |                           |          |  |                   |
| <b>Appertaining courses and course formats</b>  | Seminar<br>2 SWS block course over 1 week, i.e. 10 h of seminar (10 h: 14 weeks = 0.7 SWS)  |                        |          |                       |          |                           |          |  |                   |
| <b>Type of examination</b>  | Module examination (MP)   |                        |          |                       |          |                           |          |  |                   |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input checked="" type="checkbox"/> PL, number: 1<br><br><input type="checkbox"/> SL, number:<br><br><input type="checkbox"/> PVL, reason:  |                        |          |                       |          |                           |          |  |                   |
| <b>Examination format</b>   | Oral presentation   |                        |          |                       |          |                           |          |  |                   |
| <b>Literature</b>   | Davies, NB, Krebs, JR, West, SA, An Introduction to Behavioural Ecology, 4th ed., Wiley-Blackwell   |                        |          |                       |          |                           |          |  |                   |

|   |  |                        |          |                       |          |                           |          |  |                   |
|---|--|------------------------|----------|-----------------------|----------|---------------------------|----------|--|-------------------|
| <b>Module name</b>  | <b>Basics in biodiversity</b>  |                        |          |                       |          |                           |          |  |                   |
| <b>Module reference code</b>  | 407 (02-M19-407)   |                        |          |                       |          |                           |          |  |                   |
| <b>Module type</b>  | Elective   |                        |          |                       |          |                           |          |  |                   |
| <b>Contents</b>   | <ul style="list-style-type: none"> <li>- Basic definitions of the concept of biodiversity</li> <li>- Changes in biodiversity through time and the history of biodiversity research</li> <li>- Spatial and temporal patterns of biodiversity and their ecological reasons</li> <li>- Biodiversity and ecosystem functions</li> <li>- Biodiversity in the face of global change</li> <li>- Methods of biodiversity research</li> <li>- Biodiversity and society</li> </ul> |                        |          |                       |          |                           |          |  |                   |
| <b>Learning outcomes / targeted competences</b>   | The students gain a basic understanding of the main concepts of biodiversity based on current scientific literature. They learn to identify different biodiversity patterns and understand the high importance of the archiving and documentation of biodiversity information. they also are enabled to reflect on the significance of biodiversity for ecosystem functioning and service provisioning in a societal context.  |                        |          |                       |          |                           |          |  |                   |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)  | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Presence in the course</td> <td style="text-align: right;">28 hours</td> </tr> <tr> <td>Preparation for exams</td> <td style="text-align: right;">42 hours</td> </tr> <tr> <td>Pre- and post-preparation</td> <td style="text-align: right;">20 hours</td> </tr> <tr> <td></td> <td style="text-align: right;"><b>= 90 hours</b></td> </tr> </table>                                | Presence in the course | 28 hours | Preparation for exams | 42 hours | Pre- and post-preparation | 20 hours |  | <b>= 90 hours</b> |
| Presence in the course  | 28 hours   |                        |          |                       |          |                           |          |  |                   |
| Preparation for exams   | 42 hours   |                        |          |                       |          |                           |          |  |                   |
| Pre- and post-preparation   | 20 hours   |                        |          |                       |          |                           |          |  |                   |
|   | <b>= 90 hours</b>  |                        |          |                       |          |                           |          |  |                   |
| <b>Responsible for the module</b>   | Prof. Dr. Juliane Filser   |                        |          |                       |          |                           |          |  |                   |
| <b>Instructor(s)</b>  | Prof. Dr. Juliane Filser, Prof. Dr. Martin Diekmann  |                        |          |                       |          |                           |          |  |                   |
| <b>Frequency</b>  | Yearly, winter semester  |                        |          |                       |          |                           |          |  |                   |
| <b>ECTS points</b>  | 3 CP   |                        |          |                       |          |                           |          |  |                   |
| <b>Appertaining courses and course formats</b>  | 2 SWS; lecture (1 SWS) and seminar (1 SWS)   |                        |          |                       |          |                           |          |  |                   |
| <b>Type of examination</b>  | Combination examination (KP)   |                        |          |                       |          |                           |          |  |                   |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input checked="" type="checkbox"/> PL, number: 2<br><br><input type="checkbox"/> SL, number:<br><br><input type="checkbox"/> PVL, reason:   |                        |          |                       |          |                           |          |  |                   |
| <b>Examination format</b>   | Oral examination (50%) and oral presentation (50%)   |                        |          |                       |          |                           |          |  |                   |
| <b>Literature</b>   | Current scientific papers<br>Recommended: Gaston & Spicer (2004): Biodiversity. An introduction. 2. ed. Blackwell  |                        |          |                       |          |                           |          |  |                   |

|   |   |                        |          |                       |          |                           |          |  |                    |
|---|---|------------------------|----------|-----------------------|----------|---------------------------|----------|--|--------------------|
| <b>Module name</b>  | <b>Environmental Risks and Ecotoxicology</b>  |                        |          |                       |          |                           |          |  |                    |
| <b>Module reference code</b>  | 408 (02-M19-408)  |                        |          |                       |          |                           |          |  |                    |
| <b>Module type</b>  | Elective  |                        |          |                       |          |                           |          |  |                    |
| <b>Contents</b>   | <p>Hazardous substances, emission, environmental behaviour, bioavailability, acute and chronic exposition, biomagnification, principles of ecotoxicological test systems (from molecules to model ecosystems), modes of action and test endpoints, toxicodynamics, biomarkers, thinking in terms of structure-activity relations (T-SAR), persistency, bioaccumulation, biodegradation, data availability and uncertainty, environmental monitoring, chemicals regulation, legal aspects.</p> <p>Laboratories: Two toxic model substances: literature study, occupational safety, analytics, aquatic and terrestrial tests with different organism groups, data evaluation and presentation</p> |                        |          |                       |          |                           |          |  |                    |
| <b>Learning outcomes / targeted competences</b>   | <p>Students obtain an overview about the most relevant environmental hazards and learn to assess modes of action and potential risks (a priori) under varying environmental conditions. They gain competence in analytical methods in chemistry and reflect on their importance in risk assessment. They also obtain a basic understanding of risk assessment and regulation, and learn a critical view on associated potentials and limitations.</p> <p>In the laboratories the students gain practical experience with occupational safety, various ecotoxicological tests and analytical methods, and they learn about data reproducibility and accuracy.</p>                                |                        |          |                       |          |                           |          |  |                    |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)  | <table> <tr> <td>Presence in the course</td> <td>98 hours</td> </tr> <tr> <td>Preparation for exams</td> <td>42 hours</td> </tr> <tr> <td>Pre- and post-preparation</td> <td>40 hours</td> </tr> <tr> <td></td> <td><b>= 180 hours</b></td> </tr> </table>  | Presence in the course | 98 hours | Preparation for exams | 42 hours | Pre- and post-preparation | 40 hours |  | <b>= 180 hours</b> |
| Presence in the course  | 98 hours  |                        |          |                       |          |                           |          |  |                    |
| Preparation for exams   | 42 hours  |                        |          |                       |          |                           |          |  |                    |
| Pre- and post-preparation   | 40 hours  |                        |          |                       |          |                           |          |  |                    |
|   | <b>= 180 hours</b>  |                        |          |                       |          |                           |          |  |                    |
| <b>Responsible for the module</b>   | Prof. Dr. Juliane Filser  |                        |          |                       |          |                           |          |  |                    |
| <b>Instructor(s)</b>  | Prof. Dr. Juliane Filser, Dr. Stefan Stolte   |                        |          |                       |          |                           |          |  |                    |
| <b>Frequency</b>  | Yearly, winter semester   |                        |          |                       |          |                           |          |  |                    |
| <b>ECTS points</b>  | 6 CP  |                        |          |                       |          |                           |          |  |                    |
| <b>Appertaining courses and course formats</b>  | <p>Block course over 3 weeks</p> <p>Lectures, seminar, laboratory exercises</p> <p>7 SWS; 14 hours of lecture (14 h : 14 weeks = 1 SWS), 14 hours of seminar (14 h : 14 weeks = 1 SWS) and 70 hours of laboratory exercises (70 h : 14 weeks = 5 SWS)</p>   |                        |          |                       |          |                           |          |  |                    |
| <b>Type of examination</b>  | Module examination (MP)   |                        |          |                       |          |                           |          |  |                    |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input checked="" type="checkbox"/> PL, number: 1<br><br><input type="checkbox"/> SL, number:<br><br><input type="checkbox"/> PVL, reason:  |                        |          |                       |          |                           |          |  |                    |

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|---------------------------|---|
| <b>Examination format</b> | Oral presentation   |
| <b>Literature</b>         | <p>Walker, Hopkins, Sibly &amp; Peakall (2001): Principles of ecotoxicology. Taylor &amp; Francis</p> <p>Newman (2010): Fundamentals of ecotoxicology. CRC Press</p> <p>Van Leeuwen &amp; Vermeire (2007): Risk assessment of chemicals: An introduction. Springer, Dordrecht</p> <p>Alloway &amp; Ayres (1997): Chemical principles of environmental pollution. Chapman &amp; Hall, London</p> <p>Spiro &amp; Stigliani (1996): Chemistry of the environment. Prentice-Hall, London</p> <p>Bleam (2016): Soil and environmental chemistry. Elsevier Science and Technology</p> <p>Köhler &amp; Triebkorn (2013): Wildlife ecotoxicology of pesticides: can we track effects to the population level and beyond? Science 341 (6147): 759-765.</p> <p>Internet Sources:</p> <p><a href="http://www.eea.europa.eu/publications/environmental_issue_report_2001_22">http://www.eea.europa.eu/publications/environmental_issue_report_2001_22</a></p> <p><a href="http://www.eea.europa.eu/publications/late-lessons-2/late-lessons-2-full-report">http://www.eea.europa.eu/publications/late-lessons-2/late-lessons-2-full-report</a> (EEA Report „Late Lessons from Early Warnings“, 20020 and 2013)</p> <p><a href="https://echa.europa.eu/support">https://echa.europa.eu/support</a><a href="http://www.reach-info.de/">http://www.reach-info.de/</a> (EU chemical legislation)</p> <p><a href="http://www.oecd.org/env/ehs/testing/">http://www.oecd.org/env/ehs/testing/</a></p> <p><a href="http://www.oecd.org/department/0,3355,en_2649_34377_1_1_1_1_1,00.html">http://www.oecd.org/department/0,3355,en_2649_34377_1_1_1_1_1,00.html</a> (Guidelines for the testing of chemicals)</p> <p><a href="http://cfpub.epa.gov/ecotox/">http://cfpub.epa.gov/ecotox/</a> (Ecotoxicology database)</p> <p><a href="http://toxipedia.org/display/toxipedia/Toxipedia">http://toxipedia.org/display/toxipedia/Toxipedia</a></p> |

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|---|---|------------------------|----------|-----------------------|----------|---------------------------|----------|--|--------------------|
| <b>Module name</b>  | <b>Advances in biodiversity</b>   |                        |          |                       |          |                           |          |  |                    |
| <b>Module reference code</b>  | 410 (02-M19-410)  |                        |          |                       |          |                           |          |  |                    |
| <b>Module type</b>  | Elective  |                        |          |                       |          |                           |          |  |                    |
| <b>Contents</b>   | <ul style="list-style-type: none"> <li>- Basic definitions of the concept of biodiversity</li> <li>- Changes in biodiversity through time, the history of biodiversity research</li> <li>- Spatial and temporal patterns of biodiversity and their ecological reasons</li> <li>- Biodiversity and ecosystem functions</li> <li>- Biodiversity in the face of global change</li> <li>- Methods of biodiversity research</li> <li>- Biodiversity and society</li> </ul> |                        |          |                       |          |                           |          |  |                    |
| <b>Learning outcomes / targeted competences</b>   | The students gain a basic understanding of the main concepts of biodiversity based on current scientific literature. They learn to identify different biodiversity patterns and understand the high importance of the archiving and documentation of biodiversity information. they also are enabled to reflect on the significance of biodiversity for ecosystem functioning and service provisioning in a societal context.   |                        |          |                       |          |                           |          |  |                    |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)  | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Presence in the course</td> <td style="text-align: right;">28 hours</td> </tr> <tr> <td>Preparation for exams</td> <td style="text-align: right;">84 hours</td> </tr> <tr> <td>Pre- and post-preparation</td> <td style="text-align: right;">68 hours</td> </tr> <tr> <td></td> <td style="text-align: right;"><b>= 180 hours</b></td> </tr> </table>                            | Presence in the course | 28 hours | Preparation for exams | 84 hours | Pre- and post-preparation | 68 hours |  | <b>= 180 hours</b> |
| Presence in the course  | 28 hours  |                        |          |                       |          |                           |          |  |                    |
| Preparation for exams   | 84 hours  |                        |          |                       |          |                           |          |  |                    |
| Pre- and post-preparation   | 68 hours  |                        |          |                       |          |                           |          |  |                    |
|   | <b>= 180 hours</b>  |                        |          |                       |          |                           |          |  |                    |
| <b>Responsible for the module</b>   | Prof. Dr. Juliane Filser  |                        |          |                       |          |                           |          |  |                    |
| <b>Instructor(s)</b>  | Prof. Dr. Juliane Filser, Prof. Dr. Martin Diekmann   |                        |          |                       |          |                           |          |  |                    |
| <b>Frequency</b>  | Yearly, winter semester   |                        |          |                       |          |                           |          |  |                    |
| <b>ECTS points</b>  | 6 CP  |                        |          |                       |          |                           |          |  |                    |
| <b>Appertaining courses and course formats</b>  | 02-M19-410a (Basics in biodiversity): 2 SWS; lecture (1 SWS) and seminar (1 SWS), 02-M19-410b (Advances in biodiversity)  |                        |          |                       |          |                           |          |  |                    |
| <b>Type of examination</b>  | Combination examination (KP)  |                        |          |                       |          |                           |          |  |                    |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input checked="" type="checkbox"/> PL, number: 3<br><br><input type="checkbox"/> SL, number:<br><br><input type="checkbox"/> PVL, reason:  |                        |          |                       |          |                           |          |  |                    |
| <b>Examination format</b>   | 02-M19-410a: Oral presentation (25%), oral examination (25%)<br>02-M19-410b: Written review (50%)<br>The different examination parts can compensate each other.   |                        |          |                       |          |                           |          |  |                    |
| <b>Literature</b>   | Current scientific papers<br>Recommended: Gaston & Spicer (2004): Biodiversity. An introduction. 2. ed. Blackwell   |                        |          |                       |          |                           |          |  |                    |





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| <b>PVL =<br/>Examination<br/>prerequisite</b> |   |
| <b>Examination<br/>format</b>                 | Written Examination   |
| <b>Literature</b>                             | Recommended:<br>Begon, Harper & Townsend: Ecology, Blackwell<br>Silvertown & Charlesworth: Introduction to Plant Population Ecology,<br>Blackwell<br>Townsend, Harper & Begon: Essentials of Ecology, Blackwell |

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|---|--|------------------------|----------|-----------------------|----------|---------------------------|-----------|--|--------------------|
| <b>Module name</b>  | <b>Research Project</b>  |                        |          |                       |          |                           |           |  |                    |
| <b>Module reference code</b>  | 412 (02-M19-412)   |                        |          |                       |          |                           |           |  |                    |
| <b>Module type</b>  | Compulsory   |                        |          |                       |          |                           |           |  |                    |
| <b>Contents</b>   | <p>Project topics of variable content in connection with the research topics of the participating workgroups</p> <ul style="list-style-type: none"> <li>- The theoretical work involves a literature review, interpretation and statistical analysis of the experimental data and finally the process of scientific writing.</li> <li>- The seminar involves the acquirement of topics via discussions and lectures; the planning and arrangement of projects; the analysis and discussion of data; the structuring and formatting of the project report</li> <li>- The laboratories involve the execution of scientific field and laboratory work and project-specific data analysis; arrangements with other projects, if necessary</li> </ul> |                        |          |                       |          |                           |           |  |                    |
| <b>Learning outcomes / targeted competences</b>   | Aptitude to plan and execute a small scientific project independently in single or group work. Students gain the expertise to independently conduct the entire procedure of a scientific work from the stage of planning and testing of methods towards the practical execution. Ideally, students finally demonstrate the ability to submit a manuscript to a peer-reviewed journal.  |                        |          |                       |          |                           |           |  |                    |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)  | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Presence in the course</td> <td style="text-align: right;">56 hours</td> </tr> <tr> <td>Preparation for exams</td> <td style="text-align: right;">56 hours</td> </tr> <tr> <td>Pre- and post-preparation</td> <td style="text-align: right;">248 hours</td> </tr> <tr> <td></td> <td style="text-align: right;"><b>= 360 hours</b></td> </tr> </table>  | Presence in the course | 56 hours | Preparation for exams | 56 hours | Pre- and post-preparation | 248 hours |  | <b>= 360 hours</b> |
| Presence in the course  | 56 hours   |                        |          |                       |          |                           |           |  |                    |
| Preparation for exams   | 56 hours   |                        |          |                       |          |                           |           |  |                    |
| Pre- and post-preparation   | 248 hours  |                        |          |                       |          |                           |           |  |                    |
|   | <b>= 360 hours</b>   |                        |          |                       |          |                           |           |  |                    |
| <b>Responsible for the module</b>   | Prof. Dr. Martin Diekmann  |                        |          |                       |          |                           |           |  |                    |
| <b>Instructor(s)</b>  | All lecturers of the M.Sc. programme of Ecology  |                        |          |                       |          |                           |           |  |                    |
| <b>Frequency</b>  | Yearly, winter or summer semester  |                        |          |                       |          |                           |           |  |                    |
| <b>ECTS points</b>  | 12 CP  |                        |          |                       |          |                           |           |  |                    |
| <b>Appertaining courses and course formats</b>  | 4 SWS with 56 hours of laboratory or field exercises (56 h : 14 weeks = 4 SWS)   |                        |          |                       |          |                           |           |  |                    |
| <b>Type of examination</b>  | Module examination (MP)  |                        |          |                       |          |                           |           |  |                    |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input checked="" type="checkbox"/> PL, number: 1<br><br><input type="checkbox"/> SL, number:<br><br><input type="checkbox"/> PVL, reason:   |                        |          |                       |          |                           |           |  |                    |
| <b>Examination format</b>   | Oral presentation  |                        |          |                       |          |                           |           |  |                    |
| <b>Literature</b>   | Mostly research literature in professional journals, depending on the subject  |                        |          |                       |          |                           |           |  |                    |

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|---|--|------------------------|----------|-----------------------|----------|---------------------------|----------|--|--------------------|
| <b>Module name</b>  | <b>Behavioral Ecology</b>  |                        |          |                       |          |                           |          |  |                    |
| <b>Module reference code</b>  | 413 (02-M19-413)   |                        |          |                       |          |                           |          |  |                    |
| <b>Module type</b>  | Elective   |                        |          |                       |          |                           |          |  |                    |
| <b>Contents</b>   | <ul style="list-style-type: none"> <li>- Resource utilization and optimal behavior</li> <li>- Resource competition and the ideal free distribution</li> <li>- Ecology of information use, variability and status dependence of behavioral decisions</li> <li>- Frequency-dependent processes and the social environment</li> <li>- Cooperation and conflict, sexual selection and mate choice</li> </ul>   |                        |          |                       |          |                           |          |  |                    |
| <b>Learning outcomes / targeted competences</b>   | Students have gained profound knowledge of selected, important concepts of behavioral ecology, and can describe and relate data to these concepts. They obtain the ability to derive hypotheses for manipulative experiments regarding these concepts, as well as to plan, conduct, and analyze these experiments. They furthermore gain competence in communicating complex theoretical concepts in seminar and poster presentations in a clear way, much like upcoming scientists often need to present their research at conferences or invited seminars. |                        |          |                       |          |                           |          |  |                    |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)  | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Presence in the course</td> <td style="text-align: right;">70 hours</td> </tr> <tr> <td>Preparation for exams</td> <td style="text-align: right;">40 hours</td> </tr> <tr> <td>Pre- and post-preparation</td> <td style="text-align: right;">70 hours</td> </tr> <tr> <td></td> <td style="text-align: right;"><b>= 180 hours</b></td> </tr> </table>   | Presence in the course | 70 hours | Preparation for exams | 40 hours | Pre- and post-preparation | 70 hours |  | <b>= 180 hours</b> |
| Presence in the course  | 70 hours   |                        |          |                       |          |                           |          |  |                    |
| Preparation for exams   | 40 hours   |                        |          |                       |          |                           |          |  |                    |
| Pre- and post-preparation   | 70 hours   |                        |          |                       |          |                           |          |  |                    |
|   | <b>= 180 hours</b>   |                        |          |                       |          |                           |          |  |                    |
| <b>Responsible for the module</b>   | Prof. Dr. Thomas Hoffmeister   |                        |          |                       |          |                           |          |  |                    |
| <b>Instructor(s)</b>  | Prof. Dr. Marko Rohlf  |                        |          |                       |          |                           |          |  |                    |
| <b>Frequency</b>  | Yearly, summer semester  |                        |          |                       |          |                           |          |  |                    |
| <b>ECTS points</b>  | 6 CP   |                        |          |                       |          |                           |          |  |                    |
| <b>Appertaining courses and course formats</b>  | 5 SWS block course over 3 weeks with 28 hours of seminar (28 h : 14 weeks = 2 SWS) and 42 hours of laboratory exercises (42 h : 14 weeks = 3 SWS)  |                        |          |                       |          |                           |          |  |                    |
| <b>Type of examination</b>  | Combination examination (KP)   |                        |          |                       |          |                           |          |  |                    |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input checked="" type="checkbox"/> PL, number: 2<br><br><input type="checkbox"/> SL, number:<br><br><input type="checkbox"/> PVL, reason:   |                        |          |                       |          |                           |          |  |                    |
| <b>Examination format</b>   | Poster presentation (50%), oral seminar presentation (50%); the two examination parts can compensate each other  |                        |          |                       |          |                           |          |  |                    |
| <b>Literature</b>   | Davies, Krebs & West: An Introduction to Behavioural Ecology, Wiley<br>Krebs & Davies: Behavioural Ecology – An Evolutionary Approach, eds. 1-4, Blackwell<br><br>Danchin, Giraldeau & Cézilly: Behavioural Ecology, OUP<br>Research literature in professional journals   |                        |          |                       |          |                           |          |  |                    |

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|---|---|------------------------|-----------|-----------------------|----------|---------------------------|----------|--|--------------------|
| <b>Module name</b>  | <b>Long Ecological Excursion and Field Course</b>   |                        |           |                       |          |                           |          |  |                    |
| <b>Module reference code</b>  | 414 (02-M19-414)  |                        |           |                       |          |                           |          |  |                    |
| <b>Module type</b>  | Elective  |                        |           |                       |          |                           |          |  |                    |
| <b>Contents</b>   | Excursion and field course with varying duration with an emphasis on botany and zoology, to variable destinations on offer.<br>Regular destinations:<br>- Wadden Sea island, for example Schiermonnikoog, with dunes, heathland and salt marshes;<br>- Krkonoše Mountains with cultural landscapes and tundra vegetation;<br>- Southern Scandinavia or Baltic states with boreo-nemoral and boreal vegetation;<br>Excursions are accompanied by specific preparatory seminars introducing to the geology, geography, climate, culture, vegetation, flora and fauna and cultural history of the target region. |                        |           |                       |          |                           |          |  |                    |
| <b>Learning outcomes / targeted competences</b>   | Students obtain insight into plant and animal communities of different habitats and into the abiotic, biotic and anthropogenic factors driving habitat features and community structure. The students will learn to use a broad spectrum of methods in field ecology and gain the competence to conduct re-research studies under field conditions. They also train species identification skills in plants and animals.  |                        |           |                       |          |                           |          |  |                    |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)  | <table> <tr> <td>Presence in the course</td> <td>105 hours</td> </tr> <tr> <td>Preparation for exams</td> <td>28 hours</td> </tr> <tr> <td>Pre- and post-preparation</td> <td>47 hours</td> </tr> <tr> <td></td> <td><b>= 180 hours</b></td> </tr> </table>   | Presence in the course | 105 hours | Preparation for exams | 28 hours | Pre- and post-preparation | 47 hours |  | <b>= 180 hours</b> |
| Presence in the course  | 105 hours   |                        |           |                       |          |                           |          |  |                    |
| Preparation for exams   | 28 hours  |                        |           |                       |          |                           |          |  |                    |
| Pre- and post-preparation   | 47 hours  |                        |           |                       |          |                           |          |  |                    |
|   | <b>= 180 hours</b>  |                        |           |                       |          |                           |          |  |                    |
| <b>Responsible for the module</b>   | Prof. Dr. Martin Diekmann   |                        |           |                       |          |                           |          |  |                    |
| <b>Instructor(s)</b>  | Lecturers of the M.Sc. Ecology program  |                        |           |                       |          |                           |          |  |                    |
| <b>Frequency</b>  | Yearly, summer semester   |                        |           |                       |          |                           |          |  |                    |
| <b>ECTS points</b>  | 6 CP  |                        |           |                       |          |                           |          |  |                    |
| <b>Appertaining courses and course formats</b>  | Seminar and field exercises<br>7.5 SWS; Seminar with 14 hours (14 h : 14 weeks. = 1 SWS) and practical training / exercises as excursion with 91 hours (91 h : 14 weeks = 6.5 SWS)  |                        |           |                       |          |                           |          |  |                    |
| <b>Type of examination</b>  | Module examination (MP)   |                        |           |                       |          |                           |          |  |                    |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input type="checkbox"/> PL, number:<br><br><input checked="" type="checkbox"/> SL, number: 1<br><br><input type="checkbox"/> PVL, reason:  |                        |           |                       |          |                           |          |  |                    |
| <b>Examination format</b>   | 02-M19-414a (Long Ecological Excursion and Field Course), 02-M19-414b (Seminar to the Excursion): Oral presentation   |                        |           |                       |          |                           |          |  |                    |

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|--|--|------------------------|----------|-----------------------|----------|---------------------------|----------|--|--------------------|
| <b>Module name</b>   | <b>Vegetation Ecology and Conservation Biology</b>   |                        |          |                       |          |                           |          |  |                    |
| <b>Module reference code</b>   | 415 (02-M19-415)   |                        |          |                       |          |                           |          |  |                    |
| <b>Module type</b>   | Elective   |                        |          |                       |          |                           |          |  |                    |
| <b>Contents</b>  | <ul style="list-style-type: none"> <li>- What is a plant community?</li> <li>- Interactions between vegetation and abiotic / biotic factors</li> <li>- Indicator values</li> <li>- Plant species traits, growth forms, life forms, plant strategies</li> <li>- Ecological niches</li> <li>- Human impact on vegetation and management</li> <li>- Applied and conservation aspects of vegetation ecology</li> <li>- Vegetation sampling and analysis of vegetation data</li> <li>- Examples and potential use of ecological databases</li> <li>- Plant identification</li> <li>- Biodiversity at different scales</li> <li>- Strategies for the preservation of biodiversity</li> <li>- Species conservation</li> <li>- Protection of ecological processes</li> <li>- Invasive species</li> <li>- Regional effects of global environmental change</li> </ul>  |                        |          |                       |          |                           |          |  |                    |
| <b>Learning outcomes / targeted competences</b>  | <p>The students will develop a basic understanding of the theoretical concept of a plant community and of real plant communities and their interactions with environmental factors. Key concepts include the importance of plant traits for the relationship between vegetation and environment and the importance of human impact for the differentiation of vegetation types. The students will also learn about the close link between vegetation types and biotope types and the importance of these types for mapping purposes.</p> <p>Based on the understanding of vegetation-environment relationships, the students will get in touch with the concepts of biodiversity and ecosystem services, and will develop an understanding of the main problems of species conservation and environmental protection. Examples of good and bad practice will show the importance of nature management and various approaches of conservation biology on the species level.</p> |                        |          |                       |          |                           |          |  |                    |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010) | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Presence in the course</td> <td style="text-align: right;">84 hours</td> </tr> <tr> <td>Preparation for exams</td> <td style="text-align: right;">56 hours</td> </tr> <tr> <td>Pre- and post-preparation</td> <td style="text-align: right;">40 hours</td> </tr> <tr> <td></td> <td style="text-align: right;"><b>= 180 hours</b></td> </tr> </table>   | Presence in the course | 84 hours | Preparation for exams | 56 hours | Pre- and post-preparation | 40 hours |  | <b>= 180 hours</b> |
| Presence in the course   | 84 hours   |                        |          |                       |          |                           |          |  |                    |
| Preparation for exams  | 56 hours   |                        |          |                       |          |                           |          |  |                    |
| Pre- and post-preparation  | 40 hours   |                        |          |                       |          |                           |          |  |                    |
|  | <b>= 180 hours</b>   |                        |          |                       |          |                           |          |  |                    |
| <b>Responsible for the module</b>  | Prof. Dr. Martin Diekmann  |                        |          |                       |          |                           |          |  |                    |
| <b>Instructor(s)</b>   | Prof. Dr. Martin Diekmann, PD Dr. Maike Isermann   |                        |          |                       |          |                           |          |  |                    |
| <b>Frequency</b>   | Yearly, summer semester  |                        |          |                       |          |                           |          |  |                    |
| <b>ECTS points</b>   | 6 CP   |                        |          |                       |          |                           |          |  |                    |
| <b>Appertaining courses and course formats</b>   | Lecture with seminar and field exercises<br>6 SWS; block course over 3 weeks with 7 hours of lecture (7 h : 14 weeks = 0.5 SWS), 14 hours of seminar (14 h : 14 weeks = 1 SWS), and 63 hours of field exercises (63 h : 14 weeks = 4.5 SWS)  |                        |          |                       |          |                           |          |  |                    |

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| <b>Type of examination</b>  | Combination examination (KP)   |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input checked="" type="checkbox"/> PL, number: 3<br><input type="checkbox"/> SL, number:<br><input type="checkbox"/> PVL, reason:   |
| <b>Examination format</b>   | Oral presentation (25%), Poster (25%) and written report (50%); the different examination parts can compensate each other.   |
| <b>Literature</b>   | Current scientific papers<br>Recommended:<br>Ellenberg (2009): Vegetation ecology of Central Europe. Cambridge University Press<br>Southwood & Henderson (2000): Ecological Methods. Wiley-VCH |

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| <b>Module name</b>   | <b>Soil and Ecosystem Ecology</b>   |  |
| <b>Module reference code</b>   | 416 (02-M19-416)  |  |
| <b>Module type</b>   | Elective  |  |
| <b>Contents</b>  | <p>The lecture deals with the most important groups of organisms living in soil in context of the chemical and physical framework conditions. It focuses on the biology, functions, and services of all groups of organisms in the soil compartment, and gives insight in the multitude of interactions between different soil organisms and their biotic and abiotic environment. In the field course, students will gain first-hand experience in practical ecological field studies. Various kinds of habitats and a multitude of methods will be used for a comparative survey with different methods in soil ecology (pedology, micro-organisms, micro-, meso- and macrofauna, identification and process measurements).</p> <p>The students will additionally design and conduct experiments in the lab. For this, methods will be introduced for basic soil characterisation as well as for the study of soil mesofauna, microbial activities, and microbial ecology.</p> <p>In the seminar, the students will select appropriate methods and design their studies in group work, perform statistical analyses and work out a portfolio consisting of an oral presentation and a written report.</p> |  |
| <b>Learning outcomes / targeted competences</b>  | <p>Students will be able to</p> <ul style="list-style-type: none"> <li>- Name soil conditions, their associated communities and their interactions with environmental factors, mostly in terms of physico-chemical properties, climate and vegetation.</li> <li>- Illustrate life forms and strategies of species as key factors for the establishment of communities.</li> <li>- Discuss the historical development of ecosystems and the influence of management as important causes for community composition and ecosystem services.</li> <li>- Perform basic and advanced soil ecological methods.</li> <li>- Evaluate related methods for studies at different scales and the advantage of combining different viewpoints, descriptive and experimental approaches.</li> <li>- Analyze the interactions between abiotic soil parameters, vegetation, soil fauna and microorganisms.</li> <li>- Outline analyzed data in oral presentations, discuss and interpret results in scientific reports</li> </ul>  |  |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010) | Presence in the course                      77 hours<br>Preparation for exams                        56 hours<br>Pre- and post-preparation                    47 hours<br><div style="text-align: right;"><b>= 180 hours</b></div>  |  |
| <b>Responsible for the module</b>  | Prof. Dr. Juliane Filser  |  |
| <b>Instructor(s)</b>   | Prof. Dr. Juliane Filser, Prof. Dr. Jürgen Warrelmann   |  |
| <b>Frequency</b>   | Yearly, summer semester   |  |
| <b>ECTS points</b>   | 6 CP  |  |
| <b>Appertaining courses and course formats</b>   | Lecture with seminar, laboratory and field exercises<br>5.5 SWS ; block course over 3 weeks with 16 hours of lecture (16 h : 14 weeks = 1.2 SWS), 10 hours of seminar (10 h : 14 weeks = 0.7 SWS), and  |  |

|   |  |
|---|--|
|   | 51 hours of laboratory and field exercises (51 h : 14 weeks = 3.6 SWS)   |
| <b>Type of examination</b>  | Combination examination (KP)   |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input checked="" type="checkbox"/> PL, number: 2<br><input type="checkbox"/> SL, number:<br><input type="checkbox"/> PVL, reason:   |
| <b>Examination format</b>   | Oral presentation (30%) and written report (70%); the two examination parts can compensate each other  |
| <b>Literature</b>   | Recommended:<br>Bardgett (2005): The biology of soil: A community and ecosystem approach. Oxford University Press<br>Coleman, Crossley & Hendrix (2004): Fundamentals of soil ecology. Elsevier Academic Press<br>Paul (2007): Soil microbiology, ecology, and biochemistry. Academic Press<br>Sylvia, Fuhrmann, Hartel & Zuberer (2004): Principles and Applications of Soil Microbiology. Pearson – Prentice Hall<br>Recent research literature in professional journals |



|   |   |                        |          |                       |          |                           |         |  |                   |
|---|---|------------------------|----------|-----------------------|----------|---------------------------|---------|--|-------------------|
| <b>Module name</b>  | <b>Short Ecological Excursion and Field Course</b>  |                        |          |                       |          |                           |         |  |                   |
| <b>Module reference code</b>  | 417 (02-M19-417)  |                        |          |                       |          |                           |         |  |                   |
| <b>Module type</b>  | Elective  |                        |          |                       |          |                           |         |  |                   |
| <b>Contents</b>   | Excursion and field course with varying duration with an emphasis on botany and zoology, to variable destinations on offer.<br>Regular destinations:<br>- Wadden Sea island, for example Schiermonnikoog, with dunes, heathland and salt marshes;<br>- Krkonoše Mountains with cultural landscapes and tundra vegetation;<br>- Southern Scandinavia or Baltic states with boreo-nemoral and boreal vegetation;<br>Excursions are accompanied by specific preparatory seminars introducing to the geology, geography, climate, culture, vegetation, flora and fauna and cultural history of the target region. |                        |          |                       |          |                           |         |  |                   |
| <b>Learning outcomes / targeted competences</b>   | Students obtain insight into plant and animal communities of different habitats and into the abiotic, biotic and anthropogenic factors driving habitat features and community structure. The students will learn to use a broad spectrum of methods in field ecology and gain the competence to conduct re-research studies under field conditions. They also train species identification skills in plants and animals.  |                        |          |                       |          |                           |         |  |                   |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)  | <table> <tr> <td>Presence in the course</td> <td>63 hours</td> </tr> <tr> <td>Preparation for exams</td> <td>21 hours</td> </tr> <tr> <td>Pre- and post-preparation</td> <td>6 hours</td> </tr> <tr> <td></td> <td><b>= 90 hours</b></td> </tr> </table>  | Presence in the course | 63 hours | Preparation for exams | 21 hours | Pre- and post-preparation | 6 hours |  | <b>= 90 hours</b> |
| Presence in the course  | 63 hours  |                        |          |                       |          |                           |         |  |                   |
| Preparation for exams   | 21 hours  |                        |          |                       |          |                           |         |  |                   |
| Pre- and post-preparation   | 6 hours   |                        |          |                       |          |                           |         |  |                   |
|   | <b>= 90 hours</b>   |                        |          |                       |          |                           |         |  |                   |
| <b>Responsible for the module</b>   | Prof. Dr. Martin Diekmann   |                        |          |                       |          |                           |         |  |                   |
| <b>Instructor(s)</b>  | Lecturers of the M. Sc. programme   |                        |          |                       |          |                           |         |  |                   |
| <b>Frequency</b>  | Yearly, summer semester   |                        |          |                       |          |                           |         |  |                   |
| <b>ECTS points</b>  | 3 CP  |                        |          |                       |          |                           |         |  |                   |
| <b>Appertaining courses and course formats</b>  | Seminar and field exercises<br>4.5 SWS ; Seminar with 10 hours (10 h : 14 weeks. = 0.7 SWS) and practical training excursion with 53 hours (53 h : 14 weeks = 3.8 SWS)  |                        |          |                       |          |                           |         |  |                   |
| <b>Type of examination</b>  | Module examination (MP)   |                        |          |                       |          |                           |         |  |                   |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input type="checkbox"/> PL, number:<br><br><input checked="" type="checkbox"/> SL, number: 1<br><br><input type="checkbox"/> PVL, reason:  |                        |          |                       |          |                           |         |  |                   |
| <b>Examination format</b>   | 02-M19-417a (Short Ecological Excursion and Field Course), 02-M19-417b (Seminar to the Excursion): Oral presentation  |                        |          |                       |          |                           |         |  |                   |
| <b>Literature</b>   | Current scientific papers   |                        |          |                       |          |                           |         |  |                   |

|  |  |                        |          |                       |          |                           |          |  |                    |
|--|--|------------------------|----------|-----------------------|----------|---------------------------|----------|--|--------------------|
| <b>Module name</b>   | <b>Scientific Writing</b>  |                        |          |                       |          |                           |          |  |                    |
| <b>Module reference code</b>   | 418 (02-M19-418)   |                        |          |                       |          |                           |          |  |                    |
| <b>Module type</b>   | Compulsory   |                        |          |                       |          |                           |          |  |                    |
| <b>Contents</b>  | <ul style="list-style-type: none"> <li>- Why must scientists write?</li> <li>- How to structure a research paper?</li> <li>- Contents of a research paper (Abstract, Introduction, Research questions, Hypotheses, Material and Methods, Results, Tables and Figures, Discussion and Conclusions, References, Appendices)</li> <li>- Process of writing, time management, best strategy</li> <li>- Scientific English and writing style (choice of words, constructing sentences, punctuation and spelling)</li> <li>- Journal types, impact factor, scope, selection</li> <li>- Co-authorships, author order, DFG guidelines, rights and duties of authors</li> <li>- Preparation of final draft, submission; decision letters</li> <li>- Revisions and point-to-point replies, checking proofs</li> <li>- Other types of publications (books, review papers, short notes, forum contributions, proceedings, perspectives)</li> </ul> |                        |          |                       |          |                           |          |  |                    |
| <b>Learning outcomes / targeted competences</b>  | Students learn about the various types and techniques of written presentations in basic, applied, and popular ecological science. They also learn that scientific papers and presentations have a clear structure and a style different from poetry. They will understand that the process and product of writing depend on many factors, including the field of ecological research, the targeted audience, the quality and quantity of the data, the significance of the results, and the stage of the career.   |                        |          |                       |          |                           |          |  |                    |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)                         | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Presence in the course</td> <td style="text-align: right;">28 hours</td> </tr> <tr> <td>Preparation for exams</td> <td style="text-align: right;">70 hours</td> </tr> <tr> <td>Pre- and post-preparation</td> <td style="text-align: right;">82 hours</td> </tr> <tr> <td></td> <td style="text-align: right;"><b>= 180 hours</b></td> </tr> </table>   | Presence in the course | 28 hours | Preparation for exams | 70 hours | Pre- and post-preparation | 82 hours |  | <b>= 180 hours</b> |
| Presence in the course   | 28 hours   |                        |          |                       |          |                           |          |  |                    |
| Preparation for exams  | 70 hours   |                        |          |                       |          |                           |          |  |                    |
| Pre- and post-preparation  | 82 hours   |                        |          |                       |          |                           |          |  |                    |
|  | <b>= 180 hours</b>   |                        |          |                       |          |                           |          |  |                    |
| <b>Responsible for the module</b>  | Prof. Dr. Martin Diekmann  |                        |          |                       |          |                           |          |  |                    |
| <b>Instructor(s)</b>   | Prof. Dr. Martin Diekmann, Prof. Dr. Christian Wild  |                        |          |                       |          |                           |          |  |                    |
| <b>Frequency</b>   | Yearly, winter semester  |                        |          |                       |          |                           |          |  |                    |
| <b>ECTS points</b>   | 6 CP   |                        |          |                       |          |                           |          |  |                    |
| <b>Appertaining courses and course formats</b>   | Lecture and seminar<br>2 SWS block course over 3 weeks, i.e. with 14 hours of lectures (14 h : 14 weeks. = 1 SWS) and 14 hours of seminars (14 h : 14 weeks = 1 SWS)   |                        |          |                       |          |                           |          |  |                    |
| <b>Type of examination</b>   | Module examination (MP)  |                        |          |                       |          |                           |          |  |                    |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL =</b> | <input checked="" type="checkbox"/> PL, number: 1<br><br><input type="checkbox"/> SL, number:<br><br><input type="checkbox"/> PVL, reason:   |                        |          |                       |          |                           |          |  |                    |

|                                 |                           |
|---------------------------------|---------------------------|
| <b>Examination prerequisite</b> |                           |
| <b>Examination format</b>       | Written paper             |
| <b>Literature</b>               | Current scientific papers |



|   |   |                   |
|---|---|-------------------|
| <b>Module name</b>  | <b>Coral Reef Ecology</b>   |                   |
| <b>Module reference code</b>  | 508 (02-M19-508)  |                   |
| <b>Module type</b>  | Elective  |                   |
| <b>Contents</b>   | Block course with introductory lectures by the course leader during first 2-3 days. Students then select appropriate topics and prepare presentations in individual study with advice by the course leader. The seminar finishes with a student mini-symposium on the last day of the seminar where each student gives a 20 min presentation followed by 10 min group discussions for each topic. |                   |
| <b>Learning outcomes / targeted competences</b>   | Students obtain insights in classical and novel topics related to coral reef ecology. They are also trained in good preparation of scientific presentations and subsequent presentation techniques.   |                   |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)  | Presence in the course  | 35 hours          |
|   | Preparation for exams   | 42 hours          |
|   | Pre- and post-preparation   | 12 hours          |
|   |   | <b>= 90 hours</b> |
| <b>Responsible for the module</b>   | Prof. Dr. Christian Wild  |                   |
| <b>Instructor(s)</b>  | Prof. Dr. Christian Wild  |                   |
| <b>Frequency</b>  | Yearly, winter semester   |                   |
| <b>ECTS points</b>  | 3 CP  |                   |
| <b>Appertaining courses and course formats</b>  | Seminar<br>2.5 SWS block course over 2 weeks  |                   |
| <b>Type of examination</b>  | Module examination (MP)   |                   |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input checked="" type="checkbox"/>   | PL, number: 1     |
|   | <input type="checkbox"/>  | SL, number:       |
|   | <input type="checkbox"/>  | PVL, reason:      |
| <b>Examination format</b>   | Oral presentation   |                   |
| <b>Literature</b>   | Current scientific papers   |                   |

|   |  |                        |          |                       |          |                           |          |  |                   |
|---|--|------------------------|----------|-----------------------|----------|---------------------------|----------|--|-------------------|
| <b>Module name</b>  | <b>Tutorial Module</b>   |                        |          |                       |          |                           |          |  |                   |
| <b>Module reference code</b>  | 509 (02-M19-509)   |                        |          |                       |          |                           |          |  |                   |
| <b>Module type</b>  | Elective   |                        |          |                       |          |                           |          |  |                   |
| <b>Contents</b>   | <p>The student assists in preparing and conducting a practical course, seminar or excursion. The work may include :</p> <ul style="list-style-type: none"> <li>- Practical arrangements (administrative planning of the course, purchase of course materials, booking of travels and accommodation, organisation of guidings, etc.)</li> <li>- Compilation of course material and equipment (scripts, devices for laboratory and field work)</li> </ul> <p>with an emphasis on :</p> <ul style="list-style-type: none"> <li>- Tutoring of students in both laboratory / field exercises and computational exercises</li> </ul> |                        |          |                       |          |                           |          |  |                   |
| <b>Learning outcomes / targeted competences</b>   | <p>By helping with all kinds of work related to the organization and implementation of a course, the students learn about the complexity of university teaching. They train to teach scientific contents and skills in different research fields in the framework of modules that they have passed before . This enables them to consolidate their knowledge about specific subjects of ecology under the guidance of experienced academic teachers. For example, they help the students with applying methods in field exercises or with the identification of species, by this bridging teaching and research.</p>           |                        |          |                       |          |                           |          |  |                   |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)  | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Presence in the course</td> <td style="text-align: right;">66 hours</td> </tr> <tr> <td>Preparation for exams</td> <td style="text-align: right;">10 hours</td> </tr> <tr> <td>Pre- and post-preparation</td> <td style="text-align: right;">14 hours</td> </tr> <tr> <td></td> <td style="text-align: right;"><b>= 90 hours</b></td> </tr> </table>  | Presence in the course | 66 hours | Preparation for exams | 10 hours | Pre- and post-preparation | 14 hours |  | <b>= 90 hours</b> |
| Presence in the course  | 66 hours   |                        |          |                       |          |                           |          |  |                   |
| Preparation for exams   | 10 hours   |                        |          |                       |          |                           |          |  |                   |
| Pre- and post-preparation   | 14 hours   |                        |          |                       |          |                           |          |  |                   |
|   | <b>= 90 hours</b>  |                        |          |                       |          |                           |          |  |                   |
| <b>Responsible for the module</b>   | Prof. Dr. Martin Diekmann  |                        |          |                       |          |                           |          |  |                   |
| <b>Instructor(s)</b>  | All lecturers of the M.Sc. programme   |                        |          |                       |          |                           |          |  |                   |
| <b>Frequency</b>  | Yearly, winter or summer semester  |                        |          |                       |          |                           |          |  |                   |
| <b>ECTS points</b>  | 3 CP   |                        |          |                       |          |                           |          |  |                   |
| <b>Appertaining courses and course formats</b>  | <p>Seminar</p> <p>Regular meetings between instructor / academic teacher and student tutor, 0 SWS</p>  |                        |          |                       |          |                           |          |  |                   |
| <b>Type of examination</b>  | Module examination (MP)  |                        |          |                       |          |                           |          |  |                   |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input type="checkbox"/> PL, number:<br><br><input checked="" type="checkbox"/> SL, number: 1<br><br><input type="checkbox"/> PVL, reason:   |                        |          |                       |          |                           |          |  |                   |
| <b>Examination format</b>   | Short written review   |                        |          |                       |          |                           |          |  |                   |

|   |   |                        |          |                       |          |                           |           |  |                    |
|---|---|------------------------|----------|-----------------------|----------|---------------------------|-----------|--|--------------------|
| <b>Module name</b>  | <b>Master Thesis</b>  |                        |          |                       |          |                           |           |  |                    |
| <b>Module reference code</b>  | 510 (02-M19-510)  |                        |          |                       |          |                           |           |  |                    |
| <b>Module type</b>  | Compulsory  |                        |          |                       |          |                           |           |  |                    |
| <b>Contents</b>   | Definition of an independent research theme, planning and discussion of the contents and the time frame of the research work in lab meetings; introduction to research subject-related methods; realization of the research project; analysis and discussion of the data; structuring and writing of the thesis with the guidance of a university lecturer. |                        |          |                       |          |                           |           |  |                    |
| <b>Learning outcomes / targeted competences</b>   | Implementing the scientific competence and knowledge in the field of ecological concepts and research in independent research. Competence in planning, designing, and conducting a scientific research project. Proficiency to analyze the results and report on the research project in a written thesis.  |                        |          |                       |          |                           |           |  |                    |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)  | <table> <tr> <td>Presence in the course</td> <td>14 hours</td> </tr> <tr> <td>Preparation for exams</td> <td>56 hours</td> </tr> <tr> <td>Pre- and post-preparation</td> <td>830 hours</td> </tr> <tr> <td></td> <td><b>= 900 hours</b></td> </tr> </table>   | Presence in the course | 14 hours | Preparation for exams | 56 hours | Pre- and post-preparation | 830 hours |  | <b>= 900 hours</b> |
| Presence in the course  | 14 hours  |                        |          |                       |          |                           |           |  |                    |
| Preparation for exams   | 56 hours  |                        |          |                       |          |                           |           |  |                    |
| Pre- and post-preparation   | 830 hours   |                        |          |                       |          |                           |           |  |                    |
|   | <b>= 900 hours</b>  |                        |          |                       |          |                           |           |  |                    |
| <b>Responsible for the module</b>   | Prof. Dr. Martin Diekmann   |                        |          |                       |          |                           |           |  |                    |
| <b>Instructor(s)</b>  | All lecturers of the M. Sc. programme   |                        |          |                       |          |                           |           |  |                    |
| <b>Frequency</b>  | Yearly, winter and / or summer semester   |                        |          |                       |          |                           |           |  |                    |
| <b>ECTS points</b>  | 30 CP   |                        |          |                       |          |                           |           |  |                    |
| <b>Appertaining courses and course formats</b>  | Seminar, 1 SWS  |                        |          |                       |          |                           |           |  |                    |
| <b>Type of examination</b>  | Module examination (MP)   |                        |          |                       |          |                           |           |  |                    |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input checked="" type="checkbox"/> PL, number: 1<br><br><input type="checkbox"/> SL, number:<br><br><input type="checkbox"/> PVL, reason:  |                        |          |                       |          |                           |           |  |                    |
| <b>Examination format</b>   | Master thesis (75%) and defence (Colloquium, 25 %)  |                        |          |                       |          |                           |           |  |                    |
| <b>Literature</b>   | Subject-specific research articles and books  |                        |          |                       |          |                           |           |  |                    |

|   |   |                    |
|---|---|--------------------|
| <b>Module name</b>  | <b>Marine Ecology Excursion</b>   |                    |
| <b>Module reference code</b>  | 511 (02-M19-511)  |                    |
| <b>Module type</b>  | Elective  |                    |
| <b>Contents</b>   | 10- to 14-day late summer excursion to the Mediterranean Sea (Tyrrhenian Sea; Tuscany) with an emphasis on the taxonomic identification of major benthic and pelagic marine taxa and understanding of major features of key marine ecosystems (e.g. pelagial with plankton communities, hard versus soft bottom habitats, seagrass meadows and other phytal habitats). Introduction into key methods and tools of marine ecology is provided. Students also pursue field projects in the second half of the course. |                    |
| <b>Learning outcomes / targeted competences</b>   | Students obtain insight into marine ecology and fundamental techniques and instruments for marine research. They develop the competence to study benthic and pelagic marine communities in a taxonomic, ecological, and quantitative way.   |                    |
| <b>Workload calculation</b><br>(1 CP = 30 hours, see Art. 5 Section 6 AT BPO resp. MPO 2010)  | Presence in the course  | 98 hours           |
|   | Preparation for exams   | 42 hours           |
|   | Pre- and post-preparation   | 40 hours           |
|   |   | <b>= 180 hours</b> |
| <b>Responsible for the module</b>   | Prof. Dr. Christian Wild  |                    |
| <b>Instructor(s)</b>  | Prof. Dr. Christian Wild  |                    |
| <b>Frequency</b>  | Yearly, winter or summer semester   |                    |
| <b>ECTS points</b>  | 6 CP  |                    |
| <b>Appertaining courses and course formats</b>  | Block course of 2 weeks with 7 SWS; 98 hours of field and laboratory exercises (98 h : 14 weeks = 7 SWS)  |                    |
| <b>Type of examination</b>  | Combination examination (KP)  |                    |
| <b>PL = Graded component of the examination</b><br><b>SL = Ungraded component of the examination</b><br><b>PVL = Examination prerequisite</b> | <input type="checkbox"/>  | PL, number:        |
|   | <input checked="" type="checkbox"/>   | SL, number: 2      |
|   | <input type="checkbox"/>  | PVL, reason:       |
| <b>Examination format</b>   | Oral seminar group presentation and excursion report  |                    |
| <b>Literature</b>   | Current scientific papers, filed guides   |                    |