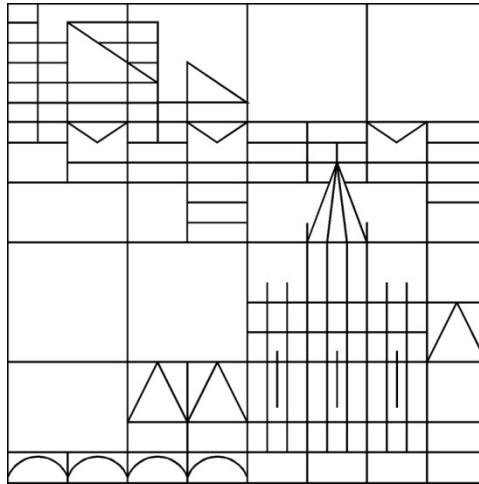


University of Konstanz
Faculty of Sciences
Department of Biology



Module manual

M. Sc. Biological Sciences

June 2018

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QUALIFICATION AIMS OF THE M.SC. “BIOLOGICAL SCIENCES”

General

The course of studies “M.Sc. Biological Sciences” imparts professional qualification in the areas of organismic as well as molecular biology.

The Masters-course provides a natural extension to the studies that builds upon the foundations laid as part of the bachelors-coursework. The theoretical, experimental and analytical abilities that the students acquired in their bachelors studies are to be extended upon and expanded to impart a specialization in one of the specified research foci of the Department of Biology (it should be stated that these research foci are not to be regarded as separate from one-another, but rather as intermeshing parts of the overall research pursued in the department). Aim of the masters-level course is to prepare the students for an academic or non-academic career pursuing basic science (i.e. Doctoral research/ Ph.D.), the pursuit of applied research in a biotechnology or industrial setting as well as the ability to work for service providers (e.g. “consulting firms” or ‘environmental agencies”) requiring a solid expertise in biological topics and the general natural sciences. For each student, the course of studies is individually adapted so as to best match their specific interests while also taking into account advice provided by the lecturers of the Department of Biology. In addition to extending their subject-specific theoretical and experimental knowledge, the students are also expected to expand and refine their abilities in other areas, such as developing additional competences in methods, communication or socially relevant topics. To this effect, the Department of Biology and other departments of the University of Konstanz offer a variety of elective modules the student can select from.

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| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Preference Module | |
| Credits | 8 | Duration | 1 Semester 4 SWS | Part of module of the total rating | 20 % |
| Module grade | | | | In case of a compulsory course the module mark is composed of the arithmetic average of two selected courses within this module unit. In case of an optional course the module is not graded. | |
| Module units | | | | a. Disease Biology I b. Disease Biology II c. Pharmacology and Toxicology II d. Biochemistry III e. Methods in Biology f. Evolutionary Organismal Biology g. Concepts in Ecology | |
| Qualification aims | | | | After successful completion of two of courses offered as alternatives within this module the students will have acquired the following capabilities: <ul style="list-style-type: none"> - To give an account of the specific basics and important concepts of the fields chosen and to explain the current state-of-the art of science by using examples - To explain the relevant methodology and to give a critical evaluation thereof - To identify, collect, evaluate and correctly interpret scientific information relevant for a certain field, and to develop their own process of learning - To come up with further research questions in the field, based on current concepts and research data, and to select appropriate methodology - To find out where their own scientific interest lies and to critically evaluate it; assess if the knowledge and skills they have acquired in the field is going to contribute to their own qualification they aspire to. | |
| Educational objectives | | | | a-d. The objective is to give the students insight, at an advanced level, into major topics in the field of Biomedicine, as a basis for the full understanding of the current literature and for their own future experimental work in the field of Biomedicine. e. Get to know your possibilities: An overview on methods, techniques, and facilities available to you for your future | |

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| | <p>(Master) research work at University of Konstanz.</p> <p>f. A wide overview of research in ecology and evolution at the University of Konstanz.</p> <p>g. The aim of the lecture is to introduce the students to basic conceptual approaches in ecology. Theoretical and modeling issues are presented at the integrative levels of behavioral, population and community ecology.</p> |
| Module unit | a. Disease Biology I |
| Coordinator | Prof. Dr. Bürkle |
| Teaching content | <p>The topics covered deal with the pathology, pathogenesis, clinical picture, therapy and prevention of specific human diseases or disease groups; animal and in vitro models of human disease; and specific microbial pathogens, at the organismal, tissue, cellular and molecular level.</p> <p>Infectious Diseases (INF)/Specific Organs (ORG)/Cancer (CAN)</p> <ul style="list-style-type: none"> • Introduction / Model systems in Disease Biology • INF I: Viral infections • INF II: Fungal infections • INF III: Bacterial infections • INF IV: Protozoan infections • INF V: Inflammation / sepsis • ORG I: Autoimmune diseases and their therapy • ORG II: Pathogenesis of renal disease • ORG III: Chronic obstructive pulmonary disease • CAN I: Molecular pathogenesis of cancer: human colon cancer as an example • CAN II: Mitosis-Aneuploidy-Cancer: how mitotic checkpoints control chromosome segregation • CAN III: Oncogenes and transgenic models • CAN IV: Molecular Targets of current cancer chemotherapy • Epidemiological studies and clinical trials |
| Forms of teaching/Amount of SWS | Lecture/2 SWS |
| Work load | <p>30 h Attendance time</p> <p>60 h Preparation and post-processing</p> <p>30 h Exam preparation</p> |
| Credits for this unit | 4 |
| Examination and unit completion | Written exam (2 h; questions in English, answers in English or German) |

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| Prerequisites | Bachelor degree in Biological Sciences, Life Science or similar study courses |
| Language | English |
| Time slot and frequency of the module | Winter term |
| Module unit | b. Disease Biology II |
| Coordinator | Prof. Dr. Bürkle |
| Teaching content | <p>The topics covered deal with the pathology, pathogenesis, clinical picture, therapy and prevention of specific human diseases or disease groups; animal and in vitro models of human disease; and specific microbial pathogens, at the organismal, tissue, cellular and molecular level.</p> <p>Metabolic and cardiovascular disorders (MCD) / Modern approaches to therapy (MAT) / Nervous system disorders (NSD)</p> <p>MCD-1: Adiposity / neuroendocrinology / diabetes MCD-2: Hereditary diseases and disorders of imprinting MCD-3: Cardiac dysrhythmias MCD-4: Atherosclerosis and ischemic disease MCD-5: Inflammatory bowel disease MCD-6: Gout and rheumatoid arthritis</p> <p>MAT-1: Gene therapy MAT-2: Transplantation medicine MAT-3: Regenerative medicine</p> <p>NSD-1: Dementias NSD-2: Addiction NSD-3: Channelopathies NSD-4: Schizophrenia</p> |
| Forms of teaching/Amount of SWS | Lecture/2 SWS |
| Work load | 30 h Attendance time 60 h Preparation and post-processing 30 h Exam preparation |
| Credits for this unit | 4 |
| Examination and unit completion | Written exam (2 h; questions in English, answers in English or German) |
| Prerequisites | Bachelor degree in Biological Sciences, Life Science or similar study courses |
| Language | English |
| Time slot and frequency of the module | Summer term |

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| Module unit | c. Pharmacology and Toxicology II |
| Coordinator | Prof. Dr. Bürkle |
| Teaching content | <p>The topics covered deal with current methodology in the field, including in vitro Toxicology, major molecular mechanisms involved in the cellular and organismal response to xenobiotics, in-depth discussion of major classes of natural or man-made hazardous substances, the pharmacology of selected disease groups and the interface between Toxicology and legislation (Regulatory Toxicology).</p> <p>The following specific topics are included:</p> <ul style="list-style-type: none"> • Basics of Toxicology / molecular targets of toxic substances/assessment of toxic effects • Pharmacology of hematopoiesis and blood coagulation • In vitro Toxicology • Cell death, necrosis, apoptosis • Neurotoxicology • Toxicokinetics and xenobiotic metabolism • Toxic industrial compounds • Chemical carcinogenesis • Toxic gasses and dusts • Pharmacogenomics and toxicogenomics • Nanotoxicology • Toxins from animals or plants / chemical warfare agents • Regulatory Toxicology • Pharmacology of water and electrolyte disturbances |
| Forms of teaching/Amount of SWS | Lecture/2 SWS |
| Work load | 30 h Attendance time 60 h Preparation and post-processing 30 h Exam preparation |
| Credits for this unit | 4 |
| Examination and unit completion | Written exam (2 h; questions in English, answers in English or German) |
| Prerequisites | Bachelor degree in Biological Sciences, Life Science or similar study courses |
| Language | English |
| Time slot and frequency of the module | Winter term |
| Module unit | d. Biochemistry III |
| Coordinator | Prof. Dr. Bürkle |

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| Teaching content | The topics covered deal with fundamental cellular mechanisms like nucleotide synthesis, oxidative stress, inflammation, cell death, cellular and organismal ageing, cell cycle regulation and post-translational modification. |
| Forms of teaching/Amount of SWS | Lecture/2 SWS |
| Work load | 30 h Attendance time 60 h Preparation and post-processing 30 h Exam preparation |
| Credits for this unit | 4 |
| Examination and unit completion | Written exam (2 h; questions in English, answers in English or German) |
| Prerequisites | Bachelor degree in Biological Sciences, Life Science or similar study courses |
| Language | English |
| Time slot and frequency of the module | Summer term |
| Module unit | e. Methods in Biology |
| Coordinator | Dr. Schleheck |
| Teaching content | A selection of seminars on current methods and techniques in use at the Department of Biology at University of Konstanz, presented by Postdocs of various groups and by members of the particular research facilities (Proteomics, Genomics, Microscopy units). |
| Forms of teaching/Amount of SWS | Lecture/2 SWS |
| Work load | 30 h Attendance time 60 h Preparation and post-processing 30 h Exam preparation |
| Credits for this unit | 4 |
| Examination and unit completion | Exam |
| Prerequisites | n/a |
| Language | English |
| Time slot and frequency of the module | Winter term |
| Module unit | f. Evolutionary Organismal Biology |
| Coordinator | Dr. Robert Kraus |
| Teaching content | "Evolutionary Organismal Biology" is a lecture series that gives a wide overview of research in ecology and evolution at the University of Konstanz. Each lecture presents a general |

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| | theme of one active researcher, with particular focus on ecological and evolutionary context. The lecture series is integrative and includes a wide range of contributions, e.g., from physiologists, limnologists and developmental and behavioural biologists. It is specifically intended for MA students who chose "Ecology and Evolution" as emphasis area but it is also open to other interested persons. |
| Forms of teaching/Amount of SWS | Lecture/2 SWS |
| Work load | 30 h Attendance time 60 h Preparation and post-processing 30 h Exam preparation |
| Credits for this unit | 4 |
| Examination and unit completion | written examination |
| Prerequisites | none |
| Language | English |
| Time slot and frequency of the module | summer term |
| Module unit | g. Concepts in Ecology |
| Coordinator | Prof. Dr. Rothhaupt, Prof. Dr. Peeters |
| Teaching content | optimal foraging, ecological stoichiometry versus essential biochemicals, chemical communication, life histories, population growth and demography, predator-prey models, intra- and interspecific facilitation, theory of food chains and food webs, spatial ecology, biological invasions, patterns and functional aspects of biodiversity |
| Forms of teaching/Amount of SWS | Lecture/2 SWS |
| Work load | 30 h Attendance time 60 h Preparation and post-processing 30 h Exam preparation |
| Credits for this unit | 4 |
| Examination and unit completion | Written exam, 90 minutes. |
| Prerequisites | Basic class/lecture in ecology. |
| Language | English |
| Time slot and frequency of the module | Winter term |

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|---|----|-----------------|---------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: <u>Behavioral Neurobiology</u> |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. |
| Module units | | | | Advanced course of scientific lab work consisting of a lecture, a seminar and an internship with individual projects. |
| Educational objectives | | | | The lecture will cover basic principles of Behavioral Neurobiology with special emphasis on olfaction |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | PD Dr. Kleineidam and others |
| Teaching content | | | | <p>The lecture covers both, contemporary techniques used in Neuroscience and an overview of classic topics in Behavioral Neurobiology. For further reading, we recommend the textbook: 'Behavioral Neurobiology' by Tom Carew. The lecture also includes a number of presentations by invited speakers, which gives the students the opportunity to learn more about different exciting research topics currently investigated.</p> <p>In addition, a paper seminar is held during one of the first weekends (usually the second weekend) where we discuss related publications at a retreat in the Alps. Here, the students present a publication, and the supervisors introduce their own field of research.</p> |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Journal club / seminar |
| Prerequisites | | | | EOB and SIS or comparable background required. In case you did not attend one of the before mentioned classes, please contact Chr. Kleineidam |
| Language | | | | English |
| Time slot and frequency of the course | | | | Summer term, 1. or 2. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | PD Dr. Kleineidam and others |

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| Teaching content | <p>students in this course will join one of our current research projects; either as single individuals or in pairs of two.</p> <p>Our main interest is Olfaction in Insects, Learning and Memory, and the proximate mechanisms for Social Organization in ants, bees and <i>Drosophila</i> flies and larvae.</p> <p>In order to study how insects acquire and process odor information, we use a variety of different physiological techniques such as Calcium Imaging of the first olfactory neuropil, the antennal lobe, and electrophysiological approaches such as Single Neuron Recordings and Electroantennography. The connectivity of the olfactory pathway and modulation of information processing, e.g. during learning is investigated with neuroanatomical techniques such as Immunohistochemistry and subsequent Confocal Microscopy. The neuroanatomy of the insect brain is reconstructed by a detailed visualization based on image stacks using advanced 3D-software (AMIRA). Experimental setups that analyse the naïve responses of insects towards odors or even learning and memory on a behavioral level are used to test, how the insect brain organizes a particular insect behavioral. We address our questions in different insect species ranging from the model organism <i>Drosophila</i>, mosquitoes, bees and various ant species.</p> |
| Forms of teaching/Amount of SWS | 10 |
| Work load | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Summer term, 1. or 2. Half |

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|---|----|-----------------|---------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: Biochemical Pharmacology |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark is composed of the individual examination results within this module. |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. |
| Educational objectives | | | | The participants of the course should learn about the various molecular, biochemical and cellular processes underlying cell death induction and regulation and their consequences for health and disease. Furthermore, they should get a deeper insight into molecular mechanisms of immune regulation and immunopathological disorders of the liver, intestine, and lung, and their pharmacological control. Students will also present and discuss a scientific publication in the field. |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Prof. Dr. Brunner |
| Teaching content | | | | Regulation of cell death (apoptosis, necrosis, autophagy), cell biology, immunology, immunopathology, signal transduction, steroid synthesis, general pharmacology, in vitro and in vivo models, method applications |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Colloquium |
| Prerequisites | | | | Successful completion of basic modules |
| Language | | | | English |
| Time slot and frequency of the course | | | | Summer term, 1. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | Prof. Dr. Brunner |
| Teaching content | | | | In the practical lab work participants should get familiar with various methods and techniques while working on current projects and scientific questions in the lab under the supervision of lab members. They will learn to summarize their data in scientific protocols and present their projects in internal seminars |

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| Forms of teaching/Amount of SWS | 10 |
| Work load | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Report |
| Language | English |
| Time slot and frequency of the course | Summer term, 1. Half |

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|---|----|-----------------|---------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: <u>Bioinformatics and X-Ray Structure Analysis</u> |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. |
| Module units | | | | The advanced course consists of a theoretical part with lecture and seminar and an internship with individual projects. |
| Educational objectives | | | | Insight into theory and experimental work of macromolecular structure determination by X-ray crystallography. Understanding the impact of macromolecular structures at atomic resolution for modern molecular biology. |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Prof. Dr. Mayans, Prof. Dr. Diederichs |
| Teaching content | | | | Techniques for protein overexpression, purification, solubilization of membrane proteins, physicochemical analysis of protein solutions, macromolecular crystallization, oral reporting of scientific publications on from macromolecular structures at atomic resolution. |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Seminar |
| Prerequisites | | | | Interest in molecular genetics, biology, wet lab work, some basic mathematics, computer work. |
| Language | | | | English |
| Time slot and frequency of the course | | | | Winter term, 2. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | Prof. Dr. Mayans, Prof. Dr. Diederichs |
| Teaching content | | | | Techniques for protein overexpression, purification, solubilization of membrane proteins, physicochemical analysis of protein solutions, macromolecular crystallization, data collection, experimental phase determination, crystallographic computing, model building, structure refinement, oral reporting of scientific work done during the course and of scientific publications on from macromolecular structures at atomic resolution. |

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| Forms of teaching/Amount of SWS | 10 |
| Work load | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Winter term, 2. Half |

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|---|----|-----------------|---------|---|--|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: Cell Biology - Cell Adhesion and Signal Transduction | |
| Credits | 15 | Duration | 6 weeks | | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. | |
| Module units | | | | The advanced course consists of a theoretical part with lecture and seminar and an internship with individual projects. | |
| Educational objectives | | | | <p>The students will be exposed to current conceptual and methodological approaches in cell biology with a particular emphasis on cell adhesion and signal transduction processes in animal cells. In the theoretical part a) of the module the students learn the current state of the art by focussed lectures. From this detailed theoretical background the students should be able to frame a hypothesis together with their supervisor. Furthermore, in part a) the students present and discuss original publications and seminal contributions to the field in the form of a seminar to understand how to deconstruct published information. Thereby, they will acquire the knowledge to analyse key experiments and to integrate such approaches in their own practical project. In the practical part b) the students experimentally address current research questions with state-of-the-art equipment in a one-to-one interaction with their supervisor. Based on their hypotheses, the students will learn to plan and conduct different experiments including proper experimental controls. They will learn to critically analyse the raw data, summarize results, and present their data to peers. Finally, they will have the opportunity to refine or reformulate their starting hypothesis. The students should understand that this iterative process is key to scientific discovery</p> | |
| Module unit | | | | a. Lecture and Seminar | |
| Coordinator | | | | Prof. Dr. Hauck | |
| Teaching content | | | | <p>The lectures cover the following areas of cell biology : adhesion molecules: integrins, IgCAMs; focal adhesions, protein and lipid phosphorylation: kinases/ phosphatases, adapter proteins/ protein-protein-interaction domains/ SH3- domains/ SH2- domains / ITAMs/ITIMs, endocytosis – autophagocytosis, lipid rafts, vesicle trafficking, dynamics of the actin cytoskeleton, regulation of cell migration, phagocytosis, innate immunity, cellular microbiology. Selected</p> | |

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| | <p>pathogenic bacteria will be presented (e.g. Neisseria, Haemophilus, Staphylococci) and medical aspects and their biology will be discussed.</p> <p>Furthermore, the second part of the lecture series addresses common experimental strategies, and the principles, application and pitfalls of the used methodology will be discussed. In particular we talk about:</p> <p>i) cell biological and genetic methods, e.g. cell culture, hybridoma cells, monoclonal antibodies, manipulation of cells – transfection, transduction, RNA-interference (RNAi), microRNAs, siRNA, shRNA, generation of viral particles, transgenic and knock-out mice, fluorescence labeling and – detection, flow cytometry, next-generation sequencing.</p> <p>ii) microscopy, electron microscopy and advanced light microscopy including confocal microscopy, TIRF, FRAP, FRET, FLIM</p> <p>iii) protein biochemistry, e.g. protein detection, epitope-tagging, affinity purification, Western Blotting, detection of protein-protein-interactions, protein-arrays, and identification of novel protein-protein-interactions</p> <p>The seminar focusses on current publications and breakthrough findings in the above mentioned areas, which will be discussed in detail. Each student presents one original paper.</p> |
| Forms of teaching/Amount of SWS | 5 |
| Work load | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | 5 |
| Examination and unit completion | Seminar |
| Prerequisites | The lectures Cell Biology I and II, Biochemistry II, and Immunology (BA Life Science or BA Biological sciences) or equivalents to these lectures must have been followed and passed. Attending the lecture Disease Biology I (especially the series on infectious diseases) is an asset. A specific introduction into laboratory safety is mandatory and will be given on the first day of the course |
| Language | English |
| Time slot and frequency of the course | Winter term, 2. Half |
| Module unit | b. Internship |

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| Coordinator | Prof. Dr. Hauck |
| Teaching content | <p>Individual projects will be conducted alongside existing lines of investigation in the field of cell adhesion receptors and address the following topics:</p> <p>CEACAMs, Integrins & pathogenic microbes / Regulation of cell adhesion / Advanced Methodology in Microscopy</p> <p>Examples of recent projects: CEACAM3 initiated signalling in granulocytes / The adapter molecule Nck is involved in phagocytosis / CEACAM1 localization to membrane microdomains / The role of Pyk2 in complement-mediated phagocytosis / Role of Vinculin in the Internalization of Staphylococcus aureus / Influence of CD105 on subcellular localization of zyxin / Role of Focal Adhesion Kinase (FAK) in cell migration</p> |
| Forms of teaching/Amount of SWS | 10 |
| Work load | <p>200 h Attendance time</p> <p>100 h Preparation and post-processing</p> |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Winter term, 2. Half |

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| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: <u>Cellular Biochemistry</u> |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. |
| Educational objectives | | | | Introduction to the biochemistry and (patho-)physiology of the ubiquitin-conjugation system to prepare students for a future career in academia or industry |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Prof. Dr. Scheffner |
| Teaching content | | | | (1) Ubiquitin-conjugation system: history, current research concepts and activities, role in human disorders (2) Methods used in ubiquitin research including yeast genetics, mass spectrometry, unnatural amino acids (3) Cancer: "classical" and current concepts, DNA tumor viruses |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Journal club / seminar |
| Prerequisites | | | | B.Sc. degree |
| Language | | | | English |
| Time slot and frequency of the course | | | | Summer term, 2. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | Prof. Dr. Scheffner |
| Teaching content | | | | The students will participate in current research projects and, depending on the individual project, will be acquainted with various biochemical/cell and molecular biological methods including PCR mutagenesis and cloning, protein expression and purification, enzyme assays, yeast and mammalian cell culture, mass spectrometry, etc. |
| Forms of teaching/Amount of SWS | | | | 10 |
| Work load | | | | 200 h Attendance time |

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| | 100 h Preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Summer term, 2. Half |

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|---|----|-----------------|---------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Advanced Courses: <u>Cellular Biochemistry and Mass Spectrometry</u> |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. |
| Educational objectives | | | | Introduction to mass spectrometry and proteomics to prepare students for a future career in academia or industry |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Prof. Dr. Stengel |
| Teaching content | | | | 1. Proteomics (History, Sample Preparation, Basic Concepts, Peptide Identification, Data Analysis, Quantification) 2. Methods in Structural Mass Spectrometry (Cross-Linking MS, Native MS, Ion Mobility, Integrated Modeling) |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Journal club / seminar |
| Prerequisites | | | | B.Sc. degree |
| Language | | | | English |
| Time slot and frequency of the course | | | | Summerterm, 2. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | Prof. Dr. Stengel |
| Teaching content | | | | The students will participate in current research projects and, dependig on the individual project, will be acquainted with various biochemical/cell and molecular biological methods (including cloning, protein expression and purification, enzyme assays, yeast and mammalian cell culture); in addition every project is designed to have a mass spectrometric part (including MS sample preparation, MS measurement and data analysis). |
| Forms of teaching/Amount of SWS | | | | 10 |
| Work load | | | | 200 h Attendance time 100 h preparation and post-processing |

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| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Summer term, 2. Half |

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|---|----|-----------------|---------|---|--|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: Chemical Ecology/Biological Chemistry | |
| Credits | 15 | Duration | 6 weeks | | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. | |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. | |
| Educational objectives | | | | <p>The students should realise that most aspects in Chemical Ecology are mediated by chemical processes. In order to successfully address biological questions it is often crucial to appreciate their (bio)chemical basis.</p> <p>In interdisciplinary research it is necessary to be open minded and to include diverse methodologies in the experimental design. A broad knowledge in different techniques is communicated.</p> <p>The students should learn to design experiments, perform experiments independantly, to critically evaluate obtained experimental data and to present their results in a concise report.</p> | |
| Module unit | | | | a. Lecture and Seminar | |
| Coordinator | | | | Prof. Dr. Spiteller | |
| Teaching content | | | | <p>Chemical ecology, microbial chemical ecology, natural products chemistry and biochemistry, chemistry of microbial symbionts, microbiology, secondary metabolites:</p> <p>Presentation of own research topics and current topics in microbial chemical ecology.</p> <p>Presentation of analytical techniques such as chromatography, HPLC, gas chromatography, mass spectrometry, MS Imaging, and NMR).</p> <p>Discussion of microbiology and molecular biology techniques (isolation, cultivation, bioassays, cloning techniques, analysis of gene clusters, phylogeny).</p> <p>General topics: experimental design, how to write a paper, how to give an oral presentation, bibliography.</p> <p>Short oral presentation of a research topic by each student.</p> | |
| Forms of teaching/Amount of SWS | | | | 5 | |

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| Work load | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | 5 |
| Examination and unit completion | Journal club / seminar |
| Prerequisites | Solid knowledge in organic chemistry, analytical chemistry, biochemistry, and microbiology/molecular biology. Attendance of the lectures Bioorganic Chemistry and the lecture Chemical Ecology as basis for the practical course is expected. |
| Language | English |
| Time slot and frequency of the course | Winter term, 2. Half |
| Module unit | b. Internship |
| Coordinator | Prof. Dr. Spiteller |
| Teaching content | <p>Interdisciplinary course: Depending on the interests of the students the focus of the experiments can be microbiology/molecular biology or biochemistry and analytical chemistry.</p> <p>Microbiology and molecular biology techniques: isolation, cultivation, phylogeny, bioassays, gene cluster analysis, mutagenesis, heterologous expression of enzymes.</p> <p>Chemistry: biosynthetic studies, feeding studies, isolation of bioactive compounds, structure elucidation (mass spectrometry, NMR), functional analysis of secondary metabolite gene clusters, enzymology.</p> <p>Ecology: Bioassays, function of natural products.</p> |
| Forms of teaching/Amount of SWS | 10 |
| Work load | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Winter term, 2. Half |

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|---|----|-----------------|---------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: Collective Animal Behaviour |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. |
| Educational objectives | | | | Develop an understanding of collective animal behaviour, and how theoretical models and empirical studies together can provide new insights about complex systems |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Iain Couzin, Damien Farine, Alex Jordan |
| Teaching content | | | | The lectures for this course will cover theoretical models explaining collective animal behaviour and explain how these lead to predictions about the benefits individuals gain by forming groups. The lectures will focus on modelling studies, but also review the empirical literature that has tested the predictions that models have generated. |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Journal club / seminar |
| Prerequisites | | | | none |
| Language | | | | English |
| Time slot and frequency of the course | | | | WS |
| Module unit | | | | b. Internship |
| Coordinator | | | | Iain Couzin, Damien Farine, Alex Jordan |
| Teaching content | | | | Projects for small groups will be offered in the Couzin, Farine & Jordan labs. These will include opportunities to work with fish, invertebrates, and birds (both captive and wild). Projects can include tracking individuals using video, PIT tag, and QR code technologies, to answer questions about how individuals behave and how individual behaviours scale up to group-level outcomes. Projects on fish will require completing the animal care course, which must be done prior to the module. |

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| Forms of teaching/Amount of SWS | 10 |
| Work load | 200 h Attendance time 100 h preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | WS |

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|---|----|-----------------|---------|--|--|
| Study program/Usability Master Biological Sciences Master Life Science | | | | <u>Module Title: Advanced Courses:</u> <u>Dynamics of Aquatic Ecosystems</u> | |
| Credits | 15 | Duration | 6 weeks | | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. | |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. | |
| Educational objectives | | | | <p>The students learn that the investigation of ecological processes and their interactions in aquatic systems requires an interdisciplinary approach. They will acquire basic knowledge about physical limnology and oceanography, abiotic-biotic interactions, ecological modelling and implications of climate change on aquatic systems.</p> <p>The course communicates theoretical concepts and field methods that enable the students to independently conduct a process oriented research project. The main focus is on the interaction between ecological and physical processes in aquatic systems.</p> <p>The students learn how to design and conduct field experiments for the investigation of ecological processes. They learn how to analyse their data, and to critically evaluate the results of their work with respect to existing knowledge.</p> <p>They learn to communicate scientific results in form of oral presentations and scientific manuscripts.</p> | |
| Module unit | | | | a. Lecture and Seminar | |
| Coordinator | | | | Prof. Dr. Peeters | |
| Teaching content | | | | <p>Basic principles in physical limnology (exchange and transport processes, tracer techniques), relevance and release of methane, utilization of acoustic techniques in aquatic systems, plankton patchiness, waves and their ecological relevance, basic ocean dynamics, climate change, introduction to ecological modelling, case studies from specific lakes. The lectures not only present basic principles but will also show recent results from the current projects of the research group.</p> <p>We will have additional presentations from invited guests addressing specific research topics.</p> <p>Seminar:</p> <p>In the seminar the participants present selected articles</p> | |

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| | relevant for their projects. |
| Forms of teaching/Amount of SWS | 5 |
| Work load | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | 5 |
| Examination and unit completion | Journal club / seminar |
| Prerequisites | none |
| Language | English |
| Time slot and frequency of the course | Summer term, 2. Half |
| Module unit | b. Internship |
| Coordinator | Prof. Dr. Peeters |
| Teaching content | <p>Introduction to field techniques in lake research (water sampling, in-situ techniques from a boat on Lake Constance), water sample analyses (e.g. zooplankton, methane, toxins) and data analysis using MATLAB (hands-on tutorial).</p> <p>Conduction of a research project according to the current focus of the group (e.g. temporal and spatial distribution patterns of plankton or methane). Typically this include 2 weeks of field work at a specific site (e.g. Lake Ammer, Illmensee, Untersee, Obersee). Projects focussing on modelling may also be possible if desired.</p> <p>The students work in groups of two. They develop a work plan for their project, conduct the field work and analyse the data with the support of a project supervisor. All projects are integrated part of our current research. After three weeks intermediate results are presented by the research groups and discussed with the other participants and supervisors of the course to adjust the remaining research program based on the information gained so far. At the end of the course the project results will be presented by the research groups in a poster session. Each group compiles and documents their data to make them available for further use in our research group.</p> <p>After the course the students provide a summary of their project work in the format of a scientific manuscript consisting of an abstract, an introduction providing the motivation of the project, a methods section, a section on the main results and a discussion.</p> |
| Forms of teaching/Amount of SWS | 10 |
| Work load | 200 h Attendance time |

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| | 100 h Preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Summer term, 2. Half |

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|---|----|-----------------|---------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: <u>Fish Ecology</u> |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. |
| Educational objectives | | | | Acquire a deeper understanding of fish ecology theory and analytical approaches. Exercise verbal and written presentation of scientific experiments. |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Dr. Behrmann-Godel |
| Teaching content | | | | Selected aspects of fish ecology |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Journal club / seminar |
| Prerequisites | | | | Einführung in die Limnologie At least one lecture given by the fish ecology group for BSc students. |
| Language | | | | English |
| Time slot and frequency of the course | | | | Summer term, 2. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | Dr. Behrmann-Godel |
| Teaching content | | | | Planning of ecological experiments. Basic techniques of fish ecological studies. Actual topics in basic and applied fish ecological research. |
| Forms of teaching/Amount of SWS | | | | 10 |
| Work load | | | | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | | | | 10 |
| Examination and unit completion | | | | Colloquium and written report |
| Language | | | | English |
| Time slot and frequency of the course | | | | Summer term, 2. Half |

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|---|----|-----------------|---------|---|--|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: <u>Global change ecology and plants</u> (former: “Plant Ecology”) | |
| Credits | 15 | Duration | 6 weeks | | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. | |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. | |
| Educational objectives | | | | <p>The major objectives are that by the end of this course, the students will know:</p> <ul style="list-style-type: none"> • What is plant ecology, and why it is important. • What are big questions in plant ecology. • How to test hypotheses in plant ecology. • What are the major methods and approaches in plant ecology. • How to set-up, run and analyse experiments in plant ecology. • How to present results of plant ecological studies. | |
| Module unit | | | | a. Lecture and Seminar | |
| Coordinator | | | | Prof. Dr. van Kleunen | |
| Teaching content | | | | In the lectures, we teach the major theories in plant ecology. Some examples of topics are plant life-histories, dispersal and pollination, functional diversity and invasion ecology. In seminars, the students present and discuss recent publications. | |
| Forms of teaching/Amount of SWS | | | | 5 | |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing | |
| Credits for this unit | | | | 5 | |
| Examination and unit completion | | | | Journal club / seminar | |
| Prerequisites | | | | Requirement for the course are basic knowledge of ecology (the 3rd semester course “Ökologie”, the book “The Ecology of Plants” by Gurevitch, Scheiner and Fox, particularly Chapter 1 and Chapters 5-13) and basic knowledge of statistical methods. | |
| Language | | | | English | |
| Time slot and frequency of the course | | | | Summer term, 2. Half | |
| Module unit | | | | b. Internship | |
| Coordinator | | | | Prof. Dr. van Kleunen | |

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| Teaching content | In addition to the lectures and seminars, we teach practicals and workshop, and the students have to do a research project. In the practicals and workshops, we teach major skills and methods in plant ecology. In the research projects, the students will have to put the acquired skills and knowledge into practice. Collaborating in groups of 2-4 persons, students will obtain experience in all aspects of scientific research: from design and planning to analysis and presentation of results. The projects will be independent or directly linked to ongoing studies in our group, and are supervised by PhD students and postdocs. |
| Forms of teaching/Amount of SWS | 10 |
| Work load | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Summer term, 2. Half |

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|---|----|-----------------|---------|---|
| Study program/Usability | | | | Module Title: Advanced Courses: Human and Environmental Toxicology |
| Master Biological Sciences Master Life Science | | | | |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. |
| Educational objectives | | | | Interconnective thinking, holistic views of toxicological problems, evaluation of data, detailed understanding of experimental approaches, design and interpretation, extrapolation of datasets for toxicological risk assessment |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Prof. Dr. Dietrich |
| Teaching content | | | | Toxicology of natural toxins (cyanobacteria and mycotoxins), intrinsic mechanisms of acute and chronic toxicity including carcinogenicity |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Journal club / seminar |
| Prerequisites | | | | As a minimum the BS course in Ecotoxicology, preferably the 2 advanced courses in Human and Environmental Toxicology by Prof. Dietrich, or similar Toxicology courses provided by Profs. Bürkle, Leist, Hartung and Brunner |
| Language | | | | English |
| Time slot and frequency of the course | | | | Winter term, 1. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | Prof. Dr. Dietrich |
| Teaching content | | | | Labwork on specific research topics associated or direct part of ongoing research projects in the area of renal toxicology or natural toxins |
| Forms of teaching/Amount of SWS | | | | 10 |
| Work load | | | | 200 h Attendance time 100 h Preparation and post-processing |

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| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Winter term, 1. Half |

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| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: <u>Immunology</u> |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. |
| Educational objectives | | | | Presentation of research publications in the field of immunology. Understanding of how and when immunological techniques are applied in research in immunology. Overview of latest concepts in immunobiology. |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Prof. Dr. Groettrup, PD Dr. Schmidtke |
| Teaching content | | | | Antiviral response, T helper cell differentiation, lineage commitment, thymic T cell selection, antigen processing pathways, ubiquitin-proteasome system, T cell vaccination, tumor immunology. |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Journal club / seminar |
| Prerequisites | | | | Lecture on Immunology in the fourth semester with written exam at Konstanz University or equivalent education at external universities. |
| Language | | | | English |
| Time slot and frequency of the course | | | | Winter term, 1. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | Prof. Dr. Groettrup, PD Dr. Schmidtke |
| Teaching content | | | | Practical application of research methods in immunology like intracellular cytokine staining, ELISA, ELISPOT, proliferation assay, flow cytometry, cell sorting, immunization of mice, virus plaque assays, tumor imaging. |
| Forms of teaching/Amount of SWS | | | | 10 |
| Work load | | | | 200 h Attendance time 100 h Preparation and post-processing |

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| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Winter term, 1. Half |

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|---|----|-----------------|---------|---|--|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: Limnology: Limnology of the Lakes | |
| Credits | 15 | Duration | 6 weeks | | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. | |
| Module units | | | | The advanced course consists of a theoretical part with lecture and seminar and an internship with individual projects | |
| Educational objectives | | | | The course is intended to convey occupational skills in fundamental and applied Limnology. | |
| Module unit | | | | a. Lecture and Seminar | |
| Coordinator | | | | Prof. Dr. Rothhaupt, N.N. | |
| Teaching content | | | | The students get to know basic limnological field and laboratory methods. They are instructed in statistics and experimental design, they learn to present results adequately and to assess their scientific relevance and implications. The students are trained in various forms of the communication of scientific results (oral presentation, poster, written report). | |
| Forms of teaching/Amount of SWS | | | | 5 | |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing | |
| Credits for this unit | | | | 5 | |
| Examination and unit completion | | | | Seminar | |
| Prerequisites | | | | Introductory lecture in Aquatic Ecology and/or Limnology; Basic computer skills. | |
| Language | | | | English | |
| Time slot and frequency of the course | | | | Summer term, 2. Half | |
| Module unit | | | | b. Internship | |
| Coordinator | | | | Prof. Dr. Rothhaupt, N.N. | |
| Teaching content | | | | In a short propaedeutic part, basic laboratory and field methods are taught. After that the students work on projects (usually in teams) under the guidance of a supervising tutor. Usually the projects stem from actual research projects. This parts ends with a poster presentation of project results. Afterwards, a written report has to be prepared. The course includes a one day excursion. | |
| Forms of teaching/Amount of SWS | | | | 10 | |

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| Work load | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Summer term, 2. Half |

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|---|----|-----------------|---------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: <u>Microbial Physiology and Ecology/Limnic</u> <u>Microbiology</u> |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. |
| Educational objectives | | | | Understanding the activities of micro-organisms in aquatic environments, how they influence the transformation of matter and use these processes for covering their energy needs |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Prof. Dr. Schink |
| Teaching content | | | | Cultivation of bacteria. Batch and continuous culture, kinetics of continuous flow systems. Dissimilatory and assimilatory metabolism, aerobic and anaerobic degradation of organic matter (fermentations, sulfate reduction, methanogenesis, syntrophic associations, phototrophic bacteria). Limits and principles of microbial degradation, transformation cycles of C, N, S, P. Starvation and survival. Intra- and interspecific cell-cell interactions, chemical communication, signalling molecules. Microbial communities, biofilms. Microbial ecology of specific environments e.g., sediments, water column, deep sea, soil, digestion tracts of animals, extreme environments (hot springs, saline lakes etc.). |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Journal club / seminar |
| Prerequisites | | | | At least one course in microbiology and experience in basic microbiological lab work. Basic knowledge in chemistry and biochemistry is required. Experience in molecular biology may be useful. |
| Language | | | | English |
| Time slot and frequency of the course | | | | Winter term, 2. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | Prof. Dr. Schink |

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| Teaching content | <p>Novel, metabolically interesting bacterial isolates are being characterized and the underlying biochemistry is studied. This includes overall balances of metabolism, growth in batch or continuous culture, quantification of energy input and of metabolic capacities. In the past, novel pathways of fermentation of organic matter have been studied, including novel enzymes which catalyze unusual reactions with aromatic compounds or hydrocarbons. We also isolated novel aerobic and anaerobic bacteria which transform primary amines or ketones, or phototrophic bacteria which utilize iron(II) compounds, organosulfur compounds, or nitrite. Moreover, the strategy of certain bacteria to form cell aggregates in the presence of detergents has been studied as a means to protect themselves against toxic influences.</p> |
| Forms of teaching/Amount of SWS | 10 |
| Work load | <p>200 h Attendance time 100 h Preparation and post-processing</p> |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Winter term, 2. Half |

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|---|----|-----------------|---------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: Molecular Evolutionary Biology |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. |
| Module units | | | | The advanced course consists of a theoretical part with lecture and seminar and an internship with individual projects. |
| Educational objectives | | | | We study several fundamental issues in evolutionary and developmental biology, as well as comparative genomics and bioinformatics. The evolution of biodiversity, and specifically the developmental basis and molecular and genomic causes of morphological diversity between species are of interest to us. We would like to better understand the relationship between tempo and mode of evolution both in terms of morphological adaptation and speciation on one hand and genetic differentiation among species and speciation on the other. In trying to understand the origin and maintenance of biodiversity we mostly use molecular approaches, namely the study of mitochondrial and nuclear DNA variation (in protein coding genes and microsatellites), to ask how much genetic divergence accompanies morphological differentiation among populations and separates species. |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Prof. Dr. Meyer |
| Teaching content | | | | We will have daily lectures on topics including developmental-evolutionary biology as well as major themes in evolutionary biology. Other topics will cover some of the theory behind molecular phylogenetics, genomics and bioinformatics. |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Seminar |
| Prerequisites | | | | B.Sc. degree |
| Language | | | | English |
| Time slot and frequency of the course | | | | Summer term, 1. Half |
| Module unit | | | | Compulsory/Optional course |

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| Module unit | b. Internship |
| Coordinator | Prof. Dr. Meyer |
| Teaching content | In order to address the central issues in organismal evolutionary biology we are conducting multidisciplinary, integrative research that ranges from population genetics, molecular evolution, and molecular phylogenetics, to comparative genomics and bioinformatics and also includes work on the connections between developmental and evolutionary biology. Our model organisms include the zebrafish and also the evolutionary highly diverse cichlid fishes. |
| Forms of teaching/Amount of SWS | 10 |
| Work load | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Time slot and frequency of the course | Summer term, 1. Half |

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|---|----|-----------------|---------|--|--|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: <u>Molecular Genetics: Mechanisms of Chromosome segregation</u> | |
| Credits | 15 | Duration | 6 weeks | | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. | |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. | |
| Educational objectives | | | | This course enables students to understand the molecular mechanism underlying mitotic and meiotic divisions in higher eukaryotes. At the end of the course, the students will understand how cell cycle progression is regulated by posttranslational modifications of key cell cycle regulators and how mitotic kinesins facilitate the equal distribution of the genome in mitosis. | |
| Module unit | | | | a. Lecture and Seminar | |
| Coordinator | | | | Prof. Dr. Th. Mayer | |
| Teaching content | | | | Molecular insights into the regulatory mechanisms controlling cell cycle progression in mitosis and meiosis. A particular focus will be on the function and regulation of ubiquitin ligases during the cell cycle. In addition, the molecular mechanisms enabling motor proteins to move along microtubules and the regulation of this process in mitosis will be explained in detail. | |
| Forms of teaching/Amount of SWS | | | | 5 | |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing | |
| Credits for this unit | | | | 5 | |
| Examination and unit completion | | | | Journal club / seminar | |
| Prerequisites | | | | Knowledge of the basic concepts of mitotic and meiotic cell cycle regulation in higher eukaryotes. Insights into the function and regulation of mitotic motor proteins. Knowledge of the respective chapters in the textbook " Cell Cycle" by David Morgan is regarded as prerequisite. | |
| Language | | | | English | |
| Time slot and frequency of the course | | | | Winter term, 1. Half | |
| Module unit | | | | b. Internship | |
| Coordinator | | | | Prof. Dr. Th. Mayer | |

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| Teaching content | Experimental insights into the regulatory mechanisms underlying mitotic and meiotic cell cycle progression. Experimental insights into the function and regulation of motor proteins. The <i>Xenopus</i> egg extract and human tissue culture cells are used as model systems. Biochemical, cell biological approaches are combined with high resolution live-cell microscopy. In addition, small molecules are applied to modulate protein function on a fast time scale. |
| Forms of teaching/Amount of SWS | 10 |
| Work load | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Winter term, 1. Half |

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| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: <u>Molecular Microbiology and Cell Biology: Chaperone functions in health and disease</u> | |
| Credits | 15 | Duration | 6 weeks | | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. | |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. | |
| Educational objectives | | | | Conducting research projects independently, presenting data in seminars | |
| Module unit | | | | a. Lecture and Seminar | |
| Coordinator | | | | Prof. Dr. Deuerling | |
| Teaching content | | | | <p>a) Theoretical part:</p> <p>Protein folding, function and mechanisms of molecular chaperones, protein folding defects, molecular basis of neurodegenerative diseases and aging, E. coli, yeast and C. elegans as genetic model systems; biochemical methods for the analysis of protein-protein interactions: crosslinking techniques and fluorescence spectroscopy; detailed structural and functional insights into ribosomes and translation regulation.</p> <p>b) Practical part</p> <p>The practical part of this advanced course orients itself at our current research projects. Our major goal is to enhance our understanding of protein synthesis and folding in health and disease.</p> <p>We work on</p> <ul style="list-style-type: none"> - principles of molecular chaperones - cotranslational folding pathways of nascent polypeptides - protein processing and quality control mechanisms in the cell - functions of ribosome-associated chaperones in aging and diseases related to protein misfolding <p>c) Model organisms and range of methods</p> <p>We use three different model organisms: the bacterium Escherichia coli, the yeast Saccharomyces cerevisiae and the nematode C. elegans. We combine demanding genetic analyses of chaperone and ribosome mutants in vivo with protein analysis in vitro. This includes RNAi experiments in C. elegans, knockout mutations in E. coli and yeast and fluorescence microscopy analysis with all three model</p> | |

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| | systems. State-of-the-art kinetic and mechanistic investigations of translation and chaperone-assisted protein folding in vitro are performed using translation systems, ribosome profiling, qPCR, fluorescence spectroscopy and crosslinking techniques. |
| Forms of teaching/Amount of SWS | 5 |
| Work load | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | 5 |
| Examination and unit completion | Journal club / seminar |
| Prerequisites | a) Compact course Molecular Microbiology b) Elementary knowledge in microbiology, biochemistry and molecular biology including all the techniques like protein purification methods, PCR, cloning, etc. |
| Language | English |
| Time slot and frequency of the course | Summer term, 2. Half |
| Module unit | b. Internship |
| Coordinator | Prof. Dr. Deuerling |
| Teaching content | Same as above, part b) |
| Forms of teaching/Amount of SWS | 10 |
| Work load | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Summer term, 2. Half |


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|---|----|-----------------|---------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: Molecular Toxicology and Bioimaging |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. |
| Module units | | | | The advanced course consists of a theoretical part with lecture and seminar and an internship with individual projects. |
| Educational objectives | | | | Basic & advanced knowledge in Molecular Toxicology Presentation of a scientific poster, literature seminar |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Prof. Dr. Bürkle, apl. Prof. Dr. May, Dr. Mangerich |
| Teaching content | | | | Molecular Toxicology, Genotoxicology, Mechanisms of Aging & Carcinogenesis |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Poster Production and presentation |
| Prerequisites | | | | Successful participation in modules like "Humanbiologie" and "Pharmakologie & Toxikologie" during Bachelor-Studies |
| Language | | | | English |
| Time slot and frequency of the course | | | | Winter term, 2. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | Prof. Dr. Bürkle, apl. Prof. Dr. May, Dr. Mangerich |
| Teaching content | | | | Design, planning and running of experiments, data evaluation, interpretation & presentation |
| Forms of teaching/Amount of SWS | | | | 10 |
| Work load | | | | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | | | | 10 |
| Examination and unit completion | | | | Colloquium and written report |
| Language | | | | English |
| Time slot and frequency of the course | | | | Winter term, 2. Half |

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| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: <u>Novel in vitro methods in pharmacology & toxicology</u> |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. |
| Educational objectives | | | | Knowledge on in vitro methods for toxicity testing Knowledge on novel approaches in toxicology Knowledge on mechanisms governing neurodegeneration and neurodevelopment |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Prof. Dr. Leist |
| Teaching content | | | | Ethical aspects of animal experimentation, overview of non-animal approaches for toxicity testing, cytotoxicity assays, neurotoxicology, basics of pharmacology and toxicology, pluripotent stem cells and stem cell neuronal differentiation, epigenetic mechanisms in differentiation and toxicity, Parkinson's disease, neural crest function and toxicity, cell migration assays, test method development and validation, transcriptome analysis by PCR and microarray, data mining and statistics of genome-wide expression data, biostatistics. |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Journal club / seminar |
| Prerequisites | | | | Good background in biochemistry (e.g. biochemistry II lecture), cell biology, pharmacology (e.g. pharmacology and toxicology I lecture) and physiology; |
| Language | | | | English |
| Time slot and frequency of the course | | | | Summer term, 2. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | Prof. Dr. Leist |
| Teaching content | | | | Laboratory techniques related to stem cell and neuronal cell cultures, their exposure to toxicants and analysis of transcript, functional, metabolic, epigenetic and other changes. Data |

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| | mining, statistical evaluation and presentation. Critical evaluation of literature. |
| Forms of teaching/Amount of SWS | 10 |
| Work load | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Summer term, 2. Half |

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| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: Organismal Biology: Going Wild |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark is composed of the individual examination results within this module. |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. |
| Educational objectives | | | | Field ecological methods, such as animal marking and behavioural observations. Movement ecology and animal behavior. Design and conducting of field experiments in animal ecology including statistical analysis of the results and scientific communication and presentation. |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Prof. Dr. Wikelski, Dr. Dechmann, Dr. Fiedler |
| Teaching content | | | | Animal ecology, movement ecology, ethology, behavioural ecology, statistics and programming. |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Colloquium |
| Prerequisites | | | | The participants should be willing to spend long hours in the field, including night work. Readings in ecology and organismal biology are suggested. |
| Language | | | | English |
| Time slot and frequency of the course | | | | Summer term, 1. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | Prof. Dr. Wikelski, Dr. Dechmann, Dr. Fiedler |
| Teaching content | | | | Combination of field work and lectures with problem based learning on organismal biology and animal ecology. Statistics and visualization in the R programming language. |
| Forms of teaching/Amount of SWS | | | | 10 |
| Work load | | | | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | | | | 10 |
| Examination and unit completion | | | | Report |

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| Language | English |
| Time slot and frequency of the course | Summer term, 1. Half |

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| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: Physiology and Biochemistry of Plants | |
| Credits | 15 | Duration | 6 weeks | | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. | |
| Module units | | | | The advanced course consists of a theoretical part with lecture and seminar and an internship with individual projects. | |
| Educational objectives  | | | | <p>Lecture: The students will learn to understand the molecular and genetic basis of selected topics in physiology and biochemistry of plants and algae. A special focus is on experimental approaches that allow to gain new information about functional aspects of plant and algae metabolism and its regulation by internal and external factors.</p> <p>Seminar: The students will learn how to read and interpret scientific literature and how to present hypotheses or experimental data to a broader audience.</p> <p>Internship: In close contact with the active researchers in the lab the students will learn how to perceive a scientific problem and how to develop an experimental approach to test a hypothesis or how to extract knowledge from unbiased data acquisition. They will have the opportunity to learn and apply up to date methods in plant and cyanobacteria research. The students will also learn how to summarise and discuss their project work in written form.</p> <p>Colloquium: The students will learn to present their scientific project and the results obtained during the internship. They will also learn how to perceive and analyse a scientific presentation.</p> | |
| Module unit | | | | a. Lecture and Seminar | |
| Coordinator | | | | Prof. E. Isono | |
| Teaching content | | | | <p>Lecture:</p> <p>Based on the current research projects in the Isono and Kroth labs, the lecture will present recent results in the field of physiology and biochemistry of plants and algae. The topics currently include adaptation of plants to environmental stress, especially high light stress and drought/salinity as well as the regulation of cellular functions by proteases.</p> <p>On the algae side, the focus is on compartmentation of metabolism and protein transport in diatoms and other algae</p> | |

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| | <p>with complex plastids. Recent advances in algae genomics are also presented.</p> <p>Seminar: Topics will be chosen by the students in accordance with the topics of their internships.</p> |
| Forms of teaching/Amount of SWS | 5 |
| Work load | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | 5 |
| Examination and unit completion | Seminar |
| Prerequisites | The course is open to all master students. Experience in laboratory work is presumed. Good basic knowledge of botany and plant physiology are expected along with a genuine interest in the special challenges that autotrophic organisms have to face in the environment. |
| Language | English |
| Time slot and frequency of the course | Summer term, 1. Half |
| Module unit | b. Internship |
| Coordinator | Prof. E. Isono |
| Teaching content | <p>Internship: The students will participate in current research projects of the plant physiology and biochemistry lab. 1 or 2 students will be supervised by a PhD student or advanced researcher. The actual content depends on the topics available and the methodological focus of the supervisors.</p> <p>Colloquium: Each student will give an oral presentation of the results obtained during the internship. Special focus is on the comprehensiveness and professionalism of the presentation.</p> |
| Forms of teaching/Amount of SWS | 10 |
| Work load | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Summer term, 1. Half |



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| Study program/Usability Master Biological Sciences Master Life Science | | | | Module Title: Advanced Courses: Physiology, Ecology and Molecular Biology of Algae |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark is composed of the individual examination results within this module. |
| Module units | | | | Advanced course of scientific lab work consisting of lecture, internship and single projects. |
| Educational objectives | | | | Design and performance of scientific experiments Development of approaches to solve scientific questions Drawing conclusions from obtained results Presentation of results in front of an audience Scientific writing |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Prof. Dr. Kroth |
| Teaching content | | | | Molecular biology, biochemistry and physiology of algae Regulation of photosynthesis Algal Biology Algal Genomics |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Journal club / seminar |
| Prerequisites | | | | Experience in laboratory work |
| Language | | | | English |
| Time slot and frequency of the course | | | | Summer term, 1. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | Prof. Dr. Kroth |
| Teaching content | | | | Molecular biology, biochemistry and physiology of algae. Each students will work on a a project during th course and present his/her results in a final seminar |
| Forms of teaching/Amount of SWS | | | | 10 |
| Work load | | | | 200 h Attendance time 100 h Preparation and post-processing |
| Credits for this unit | | | | 10 |

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| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | Summer term, 1. Half |

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| Study program/Usability Master Biological Sciences Master Life Science | | | | Advanced Courses: <u>Quantitative methods in marine behavioural ecology</u> |
| Credits | 15 | Duration | 6 weeks | |
| Module grade | | | | The module mark for Life-Science-Students is composed of the individual examination results within this module. |
| Module units | | | | Advanced course of scientific field work consisting of lecture, internship and single projects. |
| Educational objectives | | | | This course aims to develop scientific reasoning, quantitative empirical and analytical proficiency, and project management skills to students, all in a realistic field environment. |
| Module unit | | | | a. Lecture and Seminar |
| Coordinator | | | | Dr. Alex Jordan; Dr Ari Strandburg-Peshkin; Dr. Julian Torres-Dowdall, Dr. Karsten Klein, Dr. Björn Sommer |
| Teaching content | | | | <p>The first week will be held in Konstanz and will be comprised of lectures and workshops in topics of behavioural and marine ecology, as well as planning of potential experimental designs and approaches in groups of 2-3 students per project. These techniques will be presented and discussed by each group, and the experimental approaches workshopped in Lake Konstanz.</p> <p>After the field trip to Corsica, students will participate in lectures and workshops on data analysis, computational ethology, interpretation, manuscript preparation, and science communication. In the final week, students will participate in a mini-conference presenting posters and scientific seminars on the results of their experiments.</p> |
| Forms of teaching/Amount of SWS | | | | 5 |
| Work load | | | | 60 h Attendance time 90 h Preparation and post-processing |
| Credits for this unit | | | | 5 |
| Examination and unit completion | | | | Journal club / seminar |
| Prerequisites | | | | none |
| Language | | | | English |
| Time slot and frequency of the course | | | | summer term 2018, 2. Half |
| Module unit | | | | b. Internship |
| Coordinator | | | | Dr. Alex Jordan; Dr Ari Strandburg-Peshkin; Dr. Julian Torres-Dowdall |

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| Teaching content | Students will travel to Corsica to spend two weeks at the STARESO field station, one of the best equipped and located fields sites in the Mediterranean. There they will design and perform field experiments supervised by Dr Alex Jordan, Dr Ari Strandburg-Peshkin, Dr Julian Torres-Dowdall and Professors Michael and Barbara Taborsky, including lectures on biology and diversity of local fauna and relevant theory. All experiments will be conducted by snorkeling on the local reef. Experiments can include observations and computer tracking of fish behaviour, invertebrate interactions, coral ecology, photogrammetry and modelling of biological structures, or suggestions from students. |
| Forms of teaching/Amount of SWS | 10 |
| Work load | 200 h Attendance time 100 h preparation and post-processing |
| Credits for this unit | 10 |
| Examination and unit completion | Colloquium and written report |
| Language | English |
| Time slot and frequency of the course | summer term 2018, 2. Half |

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| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Advanced Methods in Genetics & Genomics |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | Students will learn state-of-the-art genomics tools and methods and how to implement them in their research projects. |
| Coordinator | | Dr. Paolo Franchini |
| Teaching content | | <p>In the last decade, DNA sequencing technologies have evolved at an unprecedented pace, thus deeply changing the landscape of genomics and bioinformatics. These genome-scale technologies not only allow us to address a large variety of biological questions, but they are also becoming crucial for researchers to remain competitive.</p> <p>What are the latest technologies available and what are their strengths and limitations? What is the best way to design an experiment using the appropriate technology? Which bioinformatics computational resources and tools are required to analyse such large genomic data sets? These are the main questions we will address during the course in order to provide the students with theoretical and practical knowledge of these innovative approaches. This information will ultimately help the students to better integrate and exploit existing genomics tools and methods in their projects and to appropriately design their future research.</p> <p>The class will be focused on different genomics methods and approaches and will consist of lectures by experts (1) presenting an overview of their field of research, (2) describing the best way to design and conduct a project based on cutting-edge technologies and (3) showing the most appropriate workflows for analyzing the data. Additionally, relevant scientific papers will be reviewed and presented by the students, followed by a critical discussion that will involve the whole class.</p> |
| Forms of teaching/Amount of SWS | | Seminar/2 |
| Work load | | Attendance: 15h Reading of material and preparation of presentation: 20-30h Writing of the essay: 10-15h |
| Credits for this unit | | 2 |
| Examination and unit completion | | - |
| Prerequisites | | - |

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| Language | English |
| Time slot and frequency of the course | Summersemester (only SS 18) |
| Recommended Term | |

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| Study program/Usability Master Biological Sciences Master Life Science | | <u>Module: Compulsory/Optional Courses</u> |
| Duration | 1 Term | Title: 'Aliens within' - Ecology and Evolution of Parasite & Host |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | Basics of parasite-host interaction and co-evolution, examples of human pathogens |
| Coordinator | | Dr. Jasminca Behrmann-Godel |
| Teaching content | | Lectures: Introduction into the parasitic groups, immunological and non-immunological defense, host as niche, parasites and behavior, modelling parasite infections, case studies, parasite-host coevolution, parasites in multitrophic food webs |
| Forms of teaching/Amount of SWS | | 1 SWS |
| Work load | | 3 h |
| Credits for this unit | | 1 |
| Examination and unit completion | | Oral examination or colloquium |
| Prerequisites | | - |
| Language | | german/english |
| Time slot and frequency of the course | | WS |
| Recommended Term | | - |

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| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Analytical Methods in Chemical Ecology / Life Science |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | <p>Knowledge of analytical methods and their applications to solve biological questions</p> <p>Design experiments to reveal the chemical basis of biological phenomena</p> <p>Ability to identify unknown small molecules (secondary metabolites)</p> |
| Coordinator | | Prof. Dr. Spiteller |
| Teaching content | | <p>Bioassay–guided isolation, chromatography (e.g. HPLC, UPLC, GC), structure elucidation (mass spectrometry, nuclear magnetic resonance), metabolite profiling – metabolomics, genome mining,</p> <p>Hands-on training with examples</p> |
| Forms of teaching/Amount of SWS | | 2 |
| Work load | | <p>30 h Attendance time</p> <p>30 h Post processing/preparation for examination</p> |
| Credits for this unit | | 2 |
| Examination and unit completion | | Written examination (or oral presentation) |
| Prerequisites | | Sound knowledge in organic chemistry and biochemistry |
| Language | | English or German depending on the audience |
| Time slot and frequency of the course | | Summersemester |
| Recommended Term | | From 1 st master semester |

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| Study program/Usability Master Biological Sciences Master Life Science | | <u>Module: Compulsory/Optional Courses</u> |
| Duration | 1 Term | Title: Applied Environmental Toxicology: From Academic bench to applied law |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives and Teaching content | | Capability of data evaluation within the context of developing a hazard and risk assessment as well as the associated legal limits, e.g. TVV, MAK, MRL, Guidance values; TDI; ADI etc. |
| Coordinator | | Prof. Dr. Daniel Dietrich |
| Forms of teaching/Amount of SWS | | 2 SWS |
| Work load | | 4 h / day |
| Credits for this unit | | 2 |
| Examination and unit completion | | Final exam |
| Prerequisites | | Solid understanding of toxicologic methodologies, anatomy and human physiology |
| Language | | english |
| Time slot and frequency of the course | | WS, daily 2 h in the first six week of the semester |
| Recommended Term | | 5 th semester, minimum bachelor |

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| Study program/Usability Master Biological Sciences Master Life Science | | <u>Module: Compulsory/Optional Courses</u> |
| Duration | 1 Term | Title: Applied fish biology in aquaculture |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | Delineation how fish ecological expertise can benefit and develop the applied context of fish farming – the world’s most dynamic & resource efficient source for animal food for human consumption | |
| Coordinator | Alexander Brinker | |
| Teaching content | Reproduction (including artificial procedures), larval stages, nutrition, selection/genetics, animal welfare, fish diseases, environmental impact, rearing systems, fish as food, organic aquaculture | |
| Forms of teaching/Amount of SWS | Lecture/1 SWS | |
| Work load | 2 hours per week (excluding homework assignment); attendance during the session | |
| Credits for this unit | 1 | |
| Examination and unit completion | performance test (either written or oral examination depending on attendance) | |
| Prerequisites | None (beneficial basic course in immunology, genetic, biostatistic) | |
| Language | English | |
| Time slot and frequency of the course | SS 16, Wednesday, 5pm – 6:30pm | |
| Recommended Term | advanced Bachelor or Master | |

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| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Bioimaging 0 |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | Understanding of basic principles of optics image formation in a microscope. Critical assessment of microscope performance. Critical Evaluation of different microscopy techniques | |
| Coordinator | Prof. Dr. Elisa May | |
| Teaching content | <p>This course covers basic aspects of light microscopy. Focus will be on image formation in the light microscope and contrasting techniques.</p> <p>Three lectures on principles of optics, image formation in the compound microscope, confocal microscopy, advanced techniques of fluorescence imaging. Three practical sessions with hands-on experience</p> | |
| Forms of teaching/Amount of SWS | 1 SWS | |
| Work load | Three full days | |
| Credits for this unit | 1 | |
| Examination and unit completion | Report and discussion of results from each group | |
| Prerequisites | Bachelor degree | |
| Language | english | |
| Time slot and frequency of the course | SS | |
| Recommended Term | starting 1 Semester Master | |

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| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Bioinformatical problem solving with Python |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | The aim of this course is to obtain a detailed understanding of the concepts underlying the programming language Python. Students will learn to analyze basic bioinformatical problems and to devise custom-made solutions using Python scripts. The course is split into two parts. First, students will attend introductory lectures teaching the basics of programming languages in general and Python in particular. These lectures will be accompanied by hands-on exercises. Second, students will work on bioinformatical problems, either from the Rosalind platform or derived from their own research. Students will take turns in presenting the problems and possible solutions to the class. |
| Coordinator | | Dr. Alexander Nater |
| Teaching content | | <p>Due to recent advances in high-throughput techniques, modern biological research is increasingly dominated by the analysis of large data sets. The analysis of such big data poses a serious challenge, since computational tools for efficient processing are often lacking. A good understanding of bioinformatic concepts is therefore a critical skill for an aspiring researcher in many fields of biological research. Python is a modern, powerful, object-oriented programming language that is rapidly gaining popularity in the scientific community. Due to its clear syntax, Python is relatively easy to learn, even for students without prior programming experience. Already with a basic understanding of the fundamentals of the language, students can write powerful custom-made scripts for the processing of large-scale data sets.</p> <p>This course focuses on teaching students the basic concepts common to most programming languages. Using the popular and clearly structured programming language Python, the course will provide students with a basic toolset for data analysis, which they can extend later on and apply to their own research projects. Students will learn to analyze common bioinformatical problems and devise strategies to handle and process data with the tools available to them. Thus, rather</p> |

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| | than focusing on bioinformatical problems specific to a particular field, the course aims to teach general concepts applicable to any kind of problem that involves the efficient handling of large data sets, such as data conversion, summarization, or extraction of specific patterns. |
| Forms of teaching/Amount of SWS | Seminar/2 |
| Work load | Attendance: 28 academic hours Reading of material, hand-on exercises, and preparation of presentations: 20-30 h |
| Credits for this unit | 2 |
| Examination and unit completion | - |
| Prerequisites | - |
| Language | English |
| Time slot and frequency of the course | Winter term |
| Recommended Term | |

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| Study program/Usability Master Biological Sciences Master Life Science | | <u>Module: Compulsory/Optional Courses</u> |
| Duration | 1 Term | Title: Brain and Consciousness II "Mentalizing and decision making" |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | To begin to grasp the interplay of the mind and the brain |
| Coordinator | | Prof. Dr. Dieter Malchow |
| Teaching content | | <ol style="list-style-type: none"> 1. Theory of the mind 2. Brain areas of the self: the default network 3. The self as agent and embodiment 4. Orientation and memory 5. Cerebellum and Autism 6. The roots of Alzheimer disease |
| Forms of teaching/Amount of SWS | | 1 |
| Work load | | Lecture/Seminar |
| Credits for this unit | | 1 |
| Examination and unit completion | | Participate actively in the lecture Prepare the talk to your own satisfaction |
| Prerequisites | | none |
| Language | | english |
| Time slot and frequency of the course | | WS |
| Recommended Term | | 5.-7. |

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| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Brain and Nervous System: structure, development, evolution and repair. |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | Students acquire insights into structure and function of the brain in lectures and report on publications which identify genetic and molecular parameters of neurological/psychological disorders. |
| Coordinator | | Jens Pruessner, Claudia Stuermer |
| Teaching content | | <p>This course consists of lectures (first part) and student seminars (second part).</p> <p>Lectures present basics of nervous system structure and function , molecular and cellular aspects of brain development and evolution, as well as repair after injury. Seminars will focus on molecular and genetic aspects of nervous system malfunctioning (depression, schizophrenia, hydrocephalus, trisomy 21, autism).</p> <p>The lectures explain the structure, function and development of: the neuron, brain, synapses, reflexes, sensory system, topography, parallel processing, visual system and vision, ocular dominance columns, color vision, language, split brain</p> |
| Forms of teaching/Amount of SWS | | 2 SWS |
| Work load | | Lectures and seminars, 2h per week |
| Credits for this unit | | 2 |
| Examination and unit completion | | presentation |
| Prerequisites | | - |
| Language | | English |
| Time slot and frequency of the course | | Winterterm 2017/18 |
| Recommended Term | | |

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|---|--|---|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Chemistry und Biology of lipids, oxylipins, polyketides and non ribosomal peptides - signals, aging and antibiotics |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | Understanding of key biosynthetic pathways Suggestion of biosynthetic pathways of unknown compounds Retrobiosynthetic approach Function and reactivity of secondary metabolites | |
| Coordinator | Prof. Dr. Spitteller | |
| Teaching content | Natural products and their biosynthesis: lipids, oxylipins, polyketides, non-ribosomal peptides, peptides, antibiotics, antibiotic resistance, toxins biosynthesis, retro-biosynthesis, enzyme mechanisms, mode of action secondary metabolite gene clusters | |
| Forms of teaching/Amount of SWS | 2 | |
| Work load | 30 h Attendance time 30 h Post processing/preparation for examination | |
| Credits for this unit | 2 | |
| Examination and unit completion | Written examination (or oral presentation) | |
| Prerequisites | Sound knowledge in organic chemistry and biochemistry | |
| Language | English or German depending on the audience | |
| Time slot and frequency of the course | Summersemester | |
| Recommended Term | From 1 st master semester | |

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|---|--------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Community Ecology – Theory and Computer Lab in R |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | Understand the basics concepts of community ecology and biodiversity research, learn to use R to analyse community data |
| Coordinator | | PD. Dr. Dietmar Straile, dietmar.straile@uni-konstanz.de, |
| Teaching content | | Biodiversity – methods and empirical patterns Modern coexistence theory Trait-based ecology Food web ecology |
| Forms of teaching/Amount of SWS | | Lectures and Computer Lab / 2 SWS |
| Work load | | 30 hours lectures and computer lab 30 hours for study of lecture topics and seminar preparation |
| Credits for this unit | | 2 |
| Examination and unit completion | | Seminar |
| Prerequisites | | Bring your own Laptop for computer labs |
| Language | | English |
| Time slot and frequency of the course | | Once per week, Wednesday 17:15-18:45, 1st lecture: 25 Oct. 2017 |
| Recommended Term | | |

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|---|--------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Controversial and critical views on global environmental issues |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | To provide a critical and scientific approach to current environmental issues and to achieve a thorough understanding of climate change and other environmental problems and possible solutions. |
| Coordinator | | Transdepartmental collaborative teaching Dr. Ioanna Salvarina (Biology), Dr. Dennis Pinggen (Chemistry) |
| Teaching content | | Keywords: Climate Change, Ecology, Human Impact on Environment, Invasive Species, Green Chemistry, Alternative Sustainable Technology, Sociological Aspects of Anthropogenic Climate Change, Climate policies |
| Forms of teaching/Amount of SWS | | The course includes lectures from the organizers, experiments (plant and aquatic ecology, chemistry), one day excursion to the climate trail in Switzerland. |
| Work load | | 84 hours. Participation in the lecture series, excursion, experiment (conduct the experiment, analyse data, present the results) |
| Credits for this unit | | 3 |
| Examination and unit completion | | No examination. Active participation in the lectures and student presentations (of the results of the experiment or a related topic) |
| Prerequisites | | English language skills Suitable for MSc students but all other students from any department are welcome. |
| Language | | English |
| Time slot and frequency of the course | | Weekly, Thursdays 17.00-18.30 |
| Recommended Term | | Winter Semester 2017-2018, Summersemester 2018 |

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|---|---|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Documentaries about ecology |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | Learn to develop questions, to discuss questions/problems and to lead discussions | |
| Coordinator | Prof. Mark van Kleunen | |
| Teaching content | <p>In each seminar, we will first watch a documentary about ecology, and follow this with a discussion of the contents. Documentaries such as the Private Life of Plants by David Attenborough provide unique video footage that explains and visualizes ecological interactions and processes better than any book or lecturer can do. Such documentaries thus can bring us closer to and increase our understanding of what is happening out there in nature. Some of these documentaries will also give insights about how ecological research is done. Note that it will not be a seminar in which you can just lean back and watch, you will have to actively participate in the discussions that follow on the documentaries. These discussions will be in English, and will be led by one of the students.</p> | |
| Forms of teaching/Amount of SWS | 2 SWS | |
| Work load | about 30 hours | |
| Credits for this unit | 1 | |
| Examination and unit completion | No exam. Active participation in all seminars is required. | |
| Prerequisites | An interest in ecology | |
| Language | English | |
| Time slot and frequency of the course | WS | |
| Recommended Term | semester 5 and higher | |

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|---|--------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Eco-evolutionary dynamics |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | This course will teach students a better understanding of the interplay between ecology and evolutionary processes. Every week, students will read and discuss a chapter of the book "Eco-evolutionary dynamics". Students will be required to prepare and provide a formal presentation of at least one of the book chapters to the entire class. |
| Coordinator | | Dr. Andreas Kautt, Dr. Julián Torres-Dowdall |
| Teaching content | | Traditionally, ecological and evolutionary processes have been thought to play out on different time scales. This paradigm has shifted in the last decades and it is now more and more appreciated that organismal adaptations and speciation can happen rapidly. Consequently, evolutionary change in one population can alter the ecological environment of the population itself and, moreover, other organisms living in the same environment. In other words, evolution is not only affected by ecology, but can feed back into ecology. This is the main tenet underlying the term eco-evolutionary dynamics. This course will center on the suitably titled and timely book "Eco-evolutionary dynamics", published in 2016. Through reading and discussing, students are expected to learn some basic and very important ecological and evolutionary concepts, including: selection, adaptation, gene flow, ecological speciation, population dynamics, community structure, ecosystem function, plasticity, as well as ecological genetics and genomics. |
| Forms of teaching/Amount of SWS | | Seminar/2 |
| Work load | | Attendance: 28 academic hours Reading of material and preparation of presentation: 20-30h |
| Credits for this unit | | 2 |
| Examination and unit completion | | - |
| Prerequisites | | - |
| Language | | English |
| Time slot and frequency of the course | | Winter term, once a week |
| Recommended Term | | - |

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|---|--------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Ecological and evolutionary physiology |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | This course aims at providing MA students with an insight into the concepts and techniques of the field of ecological and evolutionary physiology. Students will actively participate in the process of scientific research by taking part in original research projects. Students will be embedded in a lively scientific community and can interact with an international set of Ph.D. students and staff scientists. |
| Coordinator | | Prof. Dr. Michaela Hau (for information and enrollment and please contact me at mhau@orn.mpg.de) |
| Teaching content | | We will be provide formal teaching (lectures) on topics in ecological and evolutionary physiology, endocrinology, and natural history of birds. We will teach students techniques of behavioral observations, data collection and management, and techniques of field endocrinology in birds. We will discuss conceptual approaches, study design and experimental techniques. Students will learn hormone assays (enzyme immuno assays), data analysis, data presentation and hone their writing skills. We will browse the primary literature and have regular discussions of seminal papers (,journal club'). |
| Forms of teaching/Amount of SWS | | 5 SWS, lectures plus practical work. |
| Work load | | 3 weeks, full-time. |
| Credits for this unit | | 5 credits |
| Examination and unit completion | | Student evaluation will be based on active participation in the course (lectures and practical components), on journal club presentations as well as the final report. |
| Prerequisites | | This field course will be taught at the Max Planck Institute for Ornithology, Seewiesen, Bavaria. Housing will be provided. Early morning and mid evening work hour field work (always in teams) may be required for a few days. Driver's licence advantageous. Maximal number of student participants: 3. |
| Language | | English |
| Time slot and frequency of the course | | Winter term (2 years in a row) |
| Recommended Term | | Master students |

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|---|--------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Ecology Project with R |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | <p>Acquire knowledge of the R language for statistical computing and graphics in order to</p> <ul style="list-style-type: none"> - perform quality checks for large data sets - provide an overview of the data structures (meta data) - investigate diversity patterns in species data sets - detect patterns in multivariate data using unconstrained and constrained ordination methods. |
| Coordinator | | PD Dr. Dietmar Straile, dietmar.straile@uni-konstanz.de , |
| Teaching content | | In this course we will analyse a large ecological data set starting from a description of the data (providing the meta-data) , to analyses of alpha and beta diversities, multidimensional analyses (NMDS, PCA) and finally (if we get interesting results) writing a paper. |
| Forms of teaching/Amount of SWS | | Lectures and Computer Lab / 2 SWS |
| Work load | | 30 hours lectures and computer lab 30 hours for study of lecture topics and seminar preparation |
| Credits for this unit | | 2 |
| Examination and unit completion | | Seminar |
| Prerequisites | | You will need your own laptop and install R-studio. |
| Language | | English |
| Time slot and frequency of the course | | Summerterm |
| Recommended Term | | |

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|---|---|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Electron Microscopy |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | This course will teach students the basics how to work on SEM and TEM with different sampling techniques. | |
| Coordinator | Dr. Michael Laumann | |
| Teaching content | These two day courses will introduce techniques used in electron microscopy by lectures, demonstrations, and practical sessions. Using different biological samples the following topics will be covered: Scanning electron microscopy (SEM), transmission electron microscopy (TEM), energy-dispersive x-ray spectroscopy (EDX), focused ion beam (FIB) and various sample preparation techniques. | |
| Forms of teaching/Amount of SWS | 1 SWS | |
| Work load | 16h attending time | |
| Credits for this unit | 1 | |
| Examination and unit completion | No examinations | |
| Prerequisites | None | |
| Language | english | |
| Time slot and frequency of the course | WS | |
| Recommended Term | Master and PhD students at any level | |

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|---|---|---|
| Study program/Usability Master Biological Sciences Master Life Science | | <u>Module: Compulsory/Optional Courses</u> |
| Duration | 1 Term | Title: Endocrinology of Mammals I |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | Solid learning of endocrine regulations; understanding about environmental influences on endocrine regulations. | |
| Coordinator | PD Dr. Schopper | |
| Teaching content | short history of endocrinology; definitions; short survey on biochemistry and metabolism of hormones (hormone synthesis, secretion, transport, metabolism and excretion); general principles of endocrine regulation and hormone action; environmental influences on hormonal regulation; examples of physiological hormonal regulation | |
| Forms of teaching/Amount of SWS | lecture / 2 | |
| Work load | about 60 hours | |
| Credits for this unit | 2 | |
| Examination and unit completion | written exam | |
| Prerequisites | none | |
| Language | English | |
| Time slot and frequency of the course | WS | |
| Recommended Term | from semester one | |

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|---|--------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Environmental Catastrophies: Hazardous substances released accidentally, their acute, mid- and long term human and environmental impacts, risk perception, risk communication and their management |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives / Teaching content | | Assessment of hazardous situations |
| Coordinator | | Prof. Dr. Daniel Dietrich |
| Teaching content | | How to find factual data for immediate hazard assessment, weight hazard evidence and potential acute, subchronic or chronic exposure and thus develop a risk assessment, risk mitigation and a risk management plan. How to communicate risk. |
| Forms of teaching/Amount of SWS | | 2 |
| Work load | | 4h/day |
| Credits for this unit | | 2 |
| Examination and unit completion | | Final exam |
| Prerequisites | | Solid understanding of biology, some toxicology and physiology |
| Language | | english |
| Time slot and frequency of the course | | WS, daily 2 h in the first six weeks of the semester |
| Recommended Term | | as of 5 th semester, minimum bachelor |

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|---|------------------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term 2 days | Title: EU-ToxRisk Workshop on Data Handling |
| Module grade | | not graded |
| Educational objectives | | Introduction in biomedical data formats, harmonization of data presentation of data from different sources and data banking |
| Coordinator | | Dr. Mardas Daneshian |
| Teaching content | | <ul style="list-style-type: none"> - Data formats - Endpoint-specific data in toxicology - Minimum criteria of raw data for computational analysis - Calculation of summary parameters - Data curation - Data base handling - Data banking |
| Forms of teaching/Amount of SWS | | Interactive preparation and face-to-face course |
| Work load | | 50 hours preparation, 20 hours course, 20 hours follow-up work |
| Credits for this unit | | 2 |
| Examination and unit completion | | Preparation of a report |
| Prerequisites | | Laptop and internet access |
| Language | | English |
| Time slot and frequency of the course | | 27.04.2017 – 28.04.2017, Konzil Konstanz, Germany |
| Recommended Term | | - |

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|---|--------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration: 1 Week | 1 Term | Title: Evaluation of Pharmacological and Toxicological Data sets |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | Independent and critical evaluation of data Work with large data sets Independent interpretation of data |
| Coordinator | | PD Dr. Stefan Schildknecht (Uni Konstanz), Dr. Stefan Röpcke (Takeda, Zürich) |
| Teaching content | | In the first part of the course, participants will perform toxicity experiments with neuronal cells in the laboratory. Different readouts such as viability, neurite mass etc. will be determined. In the first part, basic principles and concepts of toxicology are taught in parallel. In the second part of the course, participants will evaluate their own data with a particular focus on the application of appropriate statistical evaluations, and other relevant parameters. Then, participants will continue with the evaluation of large data sets (array data). Focus is on the question of how to get qualitative, biologically relevant information out of large data sets and how these data are interpreted in a critical way. |
| Forms of teaching/Amount of SWS | | 2 SWS |
| Work load | | The course will last the whole day for the entire week. A few weeks before the course, material is handed out to the participants for preparation (mandatory!) |
| Credits for this unit | | 2 |
| Examination and unit completion | | protocol |
| Prerequisites | | Preparation of hand-out material before the course absolutely mandatory; no examination; preparation of a protocol after the course |
| Language | | Optional english/german |
| Time slot and frequency of the course | | winterterm |
| Recommended Term | | Master-students |

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|---|--------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Evolutionary Organismal Biology |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | The students will get an overview over the diverse topics of the research group involved in the MSc program Ecology and Evolution. They will gain a broad theoretical and up-to-date background in the represented disciplines. |
| Coordinator | | Dr. Robert Kraus |
| Teaching content | | "Evolutionary Organismal Biology" is a lecture series that gives a wide overview of research in ecology and evolution at the University of Konstanz. Each lecture presents a general theme of one active researcher, with particular focus on ecological and evolutionary context. The lecture series is integrative and includes a wide range of contributions, e.g., from physiologists, limnologists and developmental and behavioural biologists. It is specifically intended for MA students who chose "Ecology and Evolution" as emphasis area but it is also open to other interested persons. |
| Forms of teaching/Amount of SWS | | Lecture course / 2 |
| Work load | | 30 h Attendance time 60 h Preparation and post-processing 30 h Exam preparation |
| Credits for this unit | | 4 |
| Examination and unit completion | | written examination |
| Prerequisites | | none |
| Language | | English |
| Time slot and frequency of the course | | Summer term |
| Recommended Term | | Master students |

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|---|--------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Experimental Design & Statistical Analysis |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | Skills development in the formulation of sound biological hypotheses, design of powerful and effective experiments and successful statistical evaluation of data |
| Coordinator | | Alexander Brinker |
| Teaching content | | Hypothesis development, experimental design, power analysis, handling of biological data, data treatment (transformation, normalization), analyses of regression, analysis of variance/ covariance, non-parametric alternatives |
| Forms of teaching/Amount of SWS | | 1 SWS |
| Work load | | Lecture and practical exercise with JMP |
| Credits for this unit | | 1 |
| Examination and unit completion | | Performance test (by written or oral examination depending on attendance) |
| Prerequisites | | none required; basic course or prior knowledge of statistics will be beneficial |
| Language | | English |
| Time slot and frequency of the course | | summerterm, weekly |
| Recommended Term | | BA 4 to 6 |

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|---|--------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Frontiers in Bioimaging - Super resolution and light sheet microscopy |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | Understanding the principles, advantages and drawbacks of super resolution techniques. Critical assessment of image quality and artefacts in super resolution microscopy. Understanding the principles of light sheet microscopy. |
| Coordinator | | Prof. Elisa May, Dr. Martin Stöckl |
| Teaching content | | This course will cover super resolution microscopy techniques (structured illumination, localization microscopy) and light sheet microscopy by lectures, demonstrations, and hands on, Introductory lectures for the different topics are followed by demonstration and hands on sessions at the instruments. |
| Forms of teaching/Amount of SWS | | 1 SWS |
| Work load | | Three days |
| Credits for this unit | | 1 |
| Examination and unit completion | | Report and discussion of results from each group |
| Prerequisites | | participation in Bioimaging O or Bioimaging I |
| Language | | deutsch |
| Time slot and frequency of the course | | Winter term |
| Recommended Term | | Master students, PhD students |

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|---|--------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | <u>Module: Compulsory/Optional Courses</u> |
| Duration | 1 Term | Title: Further Education - Current topics in Laboratory Animal Sciences |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | Achievement of current information in Laboratory Animal Sciences. |
| Coordinator | | Margarethe Köberle |
| Teaching content | | Belastungsbeurteilung, Antragstellung Tierversuch, Meerwasseraquaristik, Analgesie + Anästhesie; Severity Assessment, Ethical Approval, Seawater fish keeping, Analgesia + Anesthesia |
| Forms of teaching/Amount of SWS | | Lecture |
| Work load | | 8 hours per semester |
| Credits for this unit | | 0 |
| Examination and unit completion | | None. |
| Prerequisites | | Basic Knowledge in Laboratory Animal Sciences / Animal Experiments |
| Language | | German and English |
| Time slot and frequency of the course | | summerterm |
| Recommended Term | | |

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|---|--|---|
| Study program/Usability Master Biological Sciences Master Life Science | | <u>Module: Compulsory/Optional Courses</u> |
| Duration | 1 Term | Title: How to write a thesis in biology: a practical guide |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | This weekly course will give a practical guide how to work on independent project and write a thesis. | |
| Coordinator | Dr. E. Yohannes | |
| Teaching content | This weekly course will give a practical guide to how students need to choose their own topic and select the right adviser, how to work steadily for some time on their research, write, and manage an independent project. The course is designed as a mentor to offer step-by-step advice on how to turn an unclear idea into a clearly defined research project (proposal), then into a rough-draft paper, and finally a thesis. The course will use real-time examples and easy-to-use tips, time schedules that show when to begin various tasks, which steps need special attention and how much time to spend on each. Additionally, issues beyond the research such as good work habits and as how to coping personal problems that interfere with research and writing will be discussed. | |
| Amount of SWS | Lecture and exercise combined, 2 SWS | |
| Work load | 2 hours per week (including homework assignment) | |
| Credits for this unit | 2 | |
| Examination and unit completion | No examinations | |
| Prerequisites | None | |
| Language | English | |
| Time slot and frequency | WS, weekly | |
| Recommended term | All master terms | |

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|---|--|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Human evolutionary genetics |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | Students will learn an integrative view of human evolutionary genetics. | |
| Coordinator | Dr. Claudius Kratochwil, Dr. C. Darrin Hulseley | |
| Teaching content | <p>The seminar will focus on molecular genomics and show how data from the post-genomic era can be used to examine human origins and the human colonisation of the planet. We will discuss how genetic data and the understanding of our origins, which emerges, can be applied to contemporary population analyses, including genealogies, forensics and medicine.</p> <p>The class will center on discussion of the book „Human Evolutionary Genetics“ by Jobling et al. and students will be required to read and discuss this material. We will distribute topics to the students and they will also make a presentation of one of the chapters/topics as well as write an essay about it.</p> | |
| Forms of teaching/Amount of SWS | Seminar / 2 SWS | |
| Work load | Attendance: 15h Reading of material and Preparation of presentation: 20-30h Writing of the essay: 10-15h | |
| Credits for this unit | 2 | |
| Examination and unit completion | - | |
| Prerequisites | - | |
| Language | english | |
| Time slot and frequency of the course | summerterm | |
| Recommended Term | Master students | |

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|---|--|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: ImageJ Workshop |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | Understanding of basic principles of image analysis. Practical use of open source software. Critical evaluation of image parameters. | |
| Coordinator | Prof. Dr. E. May | |
| Teaching content | One day course on the freeware Image analysis platform Image J. General introduction into the analysis of digital images (quantization of images, pixels, filters, contrast, segmentation, registration etc.) Guided exercises using Image J. Application of learned skills to the analysis of own images. | |
| Forms of teaching/Amount of SWS | 1 SWS | |
| Work load | One full day | |
| Credits for this unit | 0,5 | |
| Examination and unit completion | no examination required | |
| Prerequisites | Bachelor's degree | |
| Language | English | |
| Time slot and frequency of the course | 1 x /Semester, 8.30 - 16.00 h | |
| Recommended Term | Starting 1 Semester Master | |

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|---|--------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Introduction in behavioural ecology from an evolutionary point of view |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | Basics of behaviour science, introduction into hypothesis testing, measuring behaviour |
| Coordinator | | Dr. Jasminca Behrmann-Godel |
| Teaching content | | Lectures: Diversity of behavior, ecology of behavior, ecology of social behavior, partner choice and sexual selection, Genetics of behavior, methods in behavioral science |
| Forms of teaching/Amount of SWS | | 1 SWS |
| Work load | | 3h |
| Credits for this unit | | 1 |
| Examination and unit completion | | Colloquium or written exam |
| Prerequisites | | - |
| Language | | german/english |
| Time slot and frequency of the course | | WS |
| Recommended Term | | - |

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|---|--------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Introduction to the C++-programming |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | This course teaches the basics of C++, an universal programming language with many fields of application. The aim of the course will be to make participants able to solve their own problems by making use of self-written software. Target audience includes interested Bachelor, Master and PhD students of experimental sciences (Biology, Life Science, Chemistry and MolMat). |
| Coordinator | | Benedikt Häusele |
| Teaching content | | Digital data processing has become an essential part of scientific research. While small data sets can be handled easily with intuitive tools like spreadsheet software, advanced methods, however, require specialized solutions. In addition, there is always a high demand for development of hardware control software, for example for prototypes of new measurement devices. |
| Forms of teaching/Amount of SWS | | 2 SWS |
| Work load | | One week full-time |
| Credits for this unit | | 2 |
| Examination and unit completion | | Programming exercises |
| Prerequisites | | none |
| Language | | german/english if required |
| Time slot and frequency of the course | | WS and SS |
| Recommended Term | | 1.-4. |

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|---|--------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Methods and approaches for animal social network analysis |
| Module grade | | The optional course is not graded. |
| Educational objectives | | To develop an understanding of fundamental methods for animal social network analysis. Unlike analyses of human or structural networks, the study of animal social networks has to account for a range of factors, such as how data are collected (often observations) and the research question being addressed. As a result, a number of specialised methods and approaches have been developed. These will be explained in detail, and demonstrated in practice using R. |
| Coordinator | | Dr. Damien Farine |
| Teaching content | | The course will cover the following topics: <ol style="list-style-type: none"> 1. Introduction to social network theory 2. Methods of data collection 3. Inferring associations from social data 4. General social network approaches 5. General considerations for animal social network analysis 6. Hypothesis testing with social network analysis 7. Further methods and applications 8. Data formats in <i>R</i> 9. Interfacing with <i>R</i> packages 10. Presenting results 11. Experimental approaches using social network analysis |
| Forms of teaching/Amount of SWS | | Course/Blockdate/2SWS |
| Work load | | 24 hours attendance time (3x8 hours days) |
| Credits for this unit | | 2 |
| Examination and unit completion | | None |
| Prerequisites | | None |
| Language | | English |
| Time slot and frequency of the course | | Wintersemester |
| Recommended Term | | |

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|---|---|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Molecular Ecology |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | In this course students learn about the application of molecular biology to ecological questions. The objective is to understand the history, reasoning and benefits behind using molecular technology in ecology, and to get acquainted with real-life examples from this field. | |
| Coordinator | Dr. Robert Kraus | |
| Teaching content | We will learn several application possibilities of molecular ecology, as well as to apply this knowledge in selected case studies. | |
| Forms of teaching/Amount of SWS | 2 | |
| Work load | 1 week of intense course from 09:15 – 17:00 followed by a week of independent data analysis to prepare a case study in smaller groups. The course consists of lectures, computer demonstrations, and computer exercises. Students are then divided into small groups and given real-life data sets for independent analysis: the case studies. On the last day of the second week students present their studies. | |
| Credits for this unit | 3 | |
| Examination and unit completion | No examination. Successful course participation is conditional on the presentation of the case study analyses. | |
| Prerequisites | None | |
| Language | English | |
| Time slot and frequency of the course | Winter term | |
| Recommended Term | Master students | |

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|---|--|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Parasitology |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | The lecture will give an overview of the most popular human parasites and their interplay with the immune system. | |
| Coordinator | Dr. Annette Aichem | |
| Teaching content | The lecture will cover the most popular human parasites, highlight their survival strategies and discuss how the immune system fights against such infections. | |
| Forms of teaching/Amount of SWS | Lecture / 2 SWS | |
| Work load | 30 h Attendance time 60 h Preparation and post-processing 30 h Exam preparation | |
| Credits for this unit | | |
| Examination and unit completion | Written exam, (2h; questions in English, answers in English or German) | |
| Prerequisites | Basic knowledge in Immunology | |
| Language | English | |
| Time slot and frequency of the course | Weekly, 17-18:30 | |
| Recommended Term | Summer term | |

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|---|--|---|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Pharmacology and Toxicology III |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | Deepened background concerning the nervous system und human development with respect to central controlling processes and their modification by drugs and toxicants. Understanding of methodological basis of experimental approaches | |
| Coordinator | Prof. Dr. Marcel Leist | |
| Teaching content | Neurotoxicity, Stem cell development, Signalling in developmental processes (Wnt, BMP, Notch, Shh, G-proteins, Tyr-kinase receptors, Nuclear receptors). Modulation of these processes by diseases and drugs. Methods to study signaling, nervous system functioning and differentiation processes. Formats of scientific presentations and discussions. | |
| Forms of teaching/Amount of SWS | Lectures, student seminars and seminar discussion | |
| Work load | 60 h (16 h Präsenz, 20 h Seminarvorbereitung, 24 h Vor- und Nachbereitung der Vorlesungen) | |
| Credits for this unit | 2 ECTS | |
| Examination and unit completion | Seminar presentation, oral questions on lecture topics | |
| Prerequisites | Pharmacology and Toxicology I, Cell Biology I+II, Biochemistry II | |
| Language | English | |
| Time slot and frequency of the course | Tuesdays 17:00 – 18:30, pre-registration by email (brigitte.schanze@uni-konstanz.de) | |
| Recommended Term | WS | |

| | | |
|---|---|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Photoshop Workshop |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | Understanding basic principles of image processing. Practical use of Photoshop. | |
| Coordinator | Prof. Dr. E. May | |
| Teaching content | One day course on the image processing program Photoshop. General introduction into the principles of image processing with the help of Photoshop (Histogram , layers, objects, channels, masks, filters etc.) Application of learned skills to example images. | |
| Forms of teaching/Amount of SWS | 1 SWS | |
| Work load | One full day | |
| Credits for this unit | 0,5 | |
| Examination and unit completion | no examination required | |
| Prerequisites | Bachelor's degree | |
| Language | English | |
| Time slot and frequency of the course | 1 x /Semester, 8.30 - 16.00 | |
| Recommended Term | starting 1 Semester Master | |

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|---|--------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: R for Biologists I: Introduction course in R programming language |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | This course gives an introduction in programming using the R programming language, a widely used open source statistical programming language. The objective is to get started in using R to solve a variety of problems that biologists may encounter during their daily business. |
| Coordinator | | Dr. Kamran Safi |
| Teaching content | | R programming language. This course is not a statistic course! It is about learning a programming language. |
| Forms of teaching/Amount of SWS | | The days are split in half, where in the morning lectures are held and in the afternoon a guided hands-on programming is conducted. |
| Work load | | 1 Week of intense course from 09:15 – 17:00 followed by a week of “Nacharbeit” to conclude the course reader. |
| Credits for this unit | | 2 |
| Examination and unit completion | | No examination. A successful course participation is conditional on the delivery of a course reader after the second week. |
| Prerequisites | | None. |
| Language | | English |
| Time slot and frequency of the course | | 1 week depending on availability of computer teaching rooms. 09:15–17:00 daily |
| Recommended Term | | WS |

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|---|--------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | <u>Module: Compulsory/Optional Courses</u> |
| Duration | 1 Term | Title: R for Biologists II: Visualisation and analysis of spatial information |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | This course is intended for the attendants of R for Biologists I or scholar familiar with R programming who want to go in depth in particular areas. The course will have a changing topic from a series of recurrent fields such as GIS in R, analysis and visualization of animal movement, comparative phylogenetic methods etc. |
| Coordinator | | Dr. Kamran Safi |
| Teaching content | | R programming language, scientific communication, visualisations, statistics. |
| Forms of teaching/Amount of SWS | | Half day of teaching / lecturing followed by half day of tutorial and problem based teaching. |
| Work load | | 1 week of intense course from 09:15-17:00 followed by a week of "Nacharbeit" to conclude the course reader |
| Credits for this unit | | 2 |
| Examination and unit completion | | No examination. Successful course participation is conditional on the delivery of a course reader after the second week. |
| Prerequisites | | R programming skills. |
| Language | | English |
| Time slot and frequency of the course | | Varying depending on the availability of the teaching facility. 09:15-17:00 daily for 1 week. |
| Recommended Term | | SS |

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|---|--|---|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Scientific Writing for Biologists |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | <p>Research projects are only finished once they are communicated to the scientific community in a scientific journal.</p> <p>This scientific writing course will enable you to write in clearer and more correct English, increase the chance of getting your papers published and enable you to give others credible and useful feedback on their writing. You should master techniques that will enhance your writing in a measurable fashion. Ideally, you will discover that writing in academic English can be a source of great personal and professional satisfaction.</p> | |
| Coordinator | Dr. Dina Dechmann, Michael O'Mara | |
| Teaching content | <p>Meeting journal requirements – getting published</p> <p>Creating relevance for readers</p> <p>Creating clarity through efficient paragraph and sentence structure</p> <p>Sequencing information and argumentation - which information to present first</p> <p>Creating cohesion in writing - ensuring a common thread for the reader</p> <p>Expanding vocabulary and using correct grammar</p> <p>Avoiding the pitfalls of scientific writing</p> | |
| Forms of teaching/Amount of SWS | 2 SWS | |
| Work load | Five days in a venue outside Konstanz and an additional week of post-course writing. | |
| Credits for this unit | 2 | |
| Examination and unit completion | Written scientific communication of own results. | |
| Prerequisites | The participants should already be in the phase of writing their MSc thesis. Further, they need to be willing to stay these days full-time at a venue outside Konstanz. | |
| Language | English | |
| Time slot and frequency of the course | winterterm | |
| Recommended Term | Last term of the MSc | |

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|---|--------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Self-Organization in Social Insects and other Communities |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | An integrative perspective on group dynamics, its proximate mechanisms and ultimate consequences |
| Coordinator | | PD Dr. Ch. Kleineidam |
| Teaching content | | We will discuss recent publications on self-organization and emergent properties of large communities. Starting with social insects, we will then expand our view on other groups, e. g. fish schools, traffic in humans and emergent properties of structures. Participants from other disciplines e.g. psychology or informatics are welcome to join |
| Forms of teaching/Amount of SWS | | 2 SWS |
| Work load | | 26 h + preparation |
| Credits for this unit | | 1 |
| Examination and unit completion | | Presentation of recent publication |
| Prerequisites | | none |
| Language | | English |
| Time slot and frequency of the course | | summer term |
| Recommended Term | | > 3. Semester |

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|---|--------|---|
| Study program/Usability Master Biological Sciences Master Life Science | | <u>Module: Compulsory/Optional Courses</u> |
| Duration | 1 Term | Title: Species, speciation and extinction |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | Students will learn mechanisms for how species diversify and what could conduct their extinction. |
| Coordinator | | Dr. Melisa Olave, Dr. Paolo Franchini |
| Teaching content | | <p>The complex idea of "species" has evolved over time, as well as the understanding of mechanisms that promote speciation. This class focus in exploring the genetic basis of speciation, as well as what ecological conditions could promote (or prevent) species divergence. Finally, environmental changes that could lead to the extinction of the species are explored as well.</p> <p>What is a species? How do new species arise and how long the speciation process takes? Why do some species go extinct and some others do not? How does the current global warming phenomenon affect the survival of the species? These are some of the questions we will address during the course by reviewing the most recent scientific advances in the field. This is a discussion seminar that will require the active participation of the students during the class. The class includes one practical workshop to put hands on the species diagnosis, using novel model-based methods for species delimitation.</p> <p>The class will be focused on different selected chapters of the books "Evolution" by Futuyma and "Evolution" by Bergstrom and Dugatkin, as well as on a set of relevant scientific articles.</p> |
| Forms of teaching/Amount of SWS | | Seminar/2 |
| Work load | | Attendance:15h Reading of material and Preparation of presentation: 20-30h Writing of the essay: 10-15h |
| Credits for this unit | | 2 |
| Examination and unit completion | | - |
| Prerequisites | | - |
| Language | | English |
| Time slot and frequency of the course | | Winter term (only WS 17/18) |
| Recommended Term | | |

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|---|--------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Stable isotope ecology / Journal Club |
| Module grade | | Das Wahlpflichtmodul ist unbenotet. The compulsory/optional course is not graded. |
| Educational objectives | | This weekly journal club will discuss current and upcoming topics on stable isotope technique in aquatic and terrestrial ecology |
| Coordinator | | Dr. E. Yohannes |
| Teaching content | | This weekly journal club discusses new papers, ideas and concept as well as published reports on stable isotope ecology. |
| Forms of teaching/Amount of SWS | | Lecture and exercise combined, 2 SWS |
| Work load | | 1 hours per week (including homework assignment) |
| Credits for this unit | | 1 |
| Examination and unit completion | | No examinations |
| Prerequisites | | None |
| Language | | English |
| Time slot and frequency of the course | | WS, weekly |
| Recommended Term | | All bachelor terms All master terms |

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|---|--------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Stem Cells in Biomedical Sciences (adult stem cells) |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | Introduction to the biology, function and applications of stem cells. The students learn the differences between the different stem cell types and their applicability to the diverse requirements of regenerative medicine, cell biology and in vitro modeling. |
| Coordinator | | Prof. Dr. Suzanne Kadereit |
| Teaching content | | Basics in stem cell biology, the different stem cell types, adult stem cells (hematopoietic, mesenchymal and neural stem cells), umbilical cord blood transplantation, cancer stem cells. |
| Forms of teaching/Amount of SWS | | 2 SWS |
| Work load | | 30 hours of presence, 10 hours of preparation for test/presentation |
| Credits for this unit | | 2 |
| Examination and unit completion | | Written test |
| Prerequisites | | Basics in cell biology, molecular biology, immunology |
| Language | | English |
| Time slot and frequency of the course | | Summer semester, once a week 2 hours |
| Recommended Term | | |

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|---|--------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Stem Cells in Biomedical Sciences (pluripotent stem cells) |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | Introduction to the biology, function and applications of stem cells. The students learn the differences between the different stem cell types and their applicability to the diverse requirements of regenerative medicine, cell biology and in vitro modeling. |
| Coordinator | | Prof. Dr. Suzanne Kadereit |
| Teaching content | | Basics in stem cell biology, the different stem cell types, embryonic stem cells, cloning and nuclear transfer, induced pluripotency, regenerative medicine, disease modeling with stem cells, stem cells in drug development and screening |
| Forms of teaching/Amount of SWS | | 2 SWS |
| Work load | | 30 hours of presence, 10 hours of preparation for test/presentation |
| Credits for this unit | | 2 |
| Examination and unit completion | | Written test |
| Prerequisites | | Basics in cell biology, molecular biology, immunology |
| Language | | English |
| Time slot and frequency of the course | | Winter semester, once a week 2 hours |
| Recommended Term | | |

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|---|--------|--|
| Study program/Usability Master Biological Sciences Master Life Science | | <u>Module: Compulsory/Optional Courses</u> |
| Duration | 1 Term | Title: Topics and questions of current biological research |
| Module grade | | The compulsory/optional course is not graded. |
| Educational objectives | | Presentation and discussion of actual research problems |
| Coordinator | | Head of the research group |
| Teaching content | | Actual research on the field of biology will be presented and discussed that are within the focus of the respective lab. |
| Forms of teaching/Amount of SWS | | Seminar |
| Work load | | 2 |
| Credits for this unit | | 2 |
| Examination and unit completion | | Presentation |
| Prerequisites | | Course participants have to started their master thesis |
| Language | | German / English |
| Time slot and frequency of the course | | Weekly (2 h) |
| Recommended Term | | WS/SS |

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|---|---|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: Virology |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | Introduction into virology and diseases caused by viruses | |
| Coordinator | Dr. Jérémie Rossy | |
| Teaching content | The goal of this lecture is to give an introduction in Virology. First we will discuss general aspects of virology and then we go into the different classes of viruses and briefly illustrate what kind of diseases they cause. The lecture will be held in english. | |
| Forms of teaching/Amount of SWS | 1 SWS | |
| Work load | 7.5 h Präsenzstudium, 1 h Klausur | |
| Credits for this unit | 1 | |
| Examination and unit completion | written exam | |
| Prerequisites | Advanced BA student | |
| Language | English | |
| Time slot and frequency of the course | Sommersemester | |
| Recommended Term | BA Biological Sciences from 3. Semester | |

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|---|---|--|
| Study program/Usability Master Biological Sciences Master Life Science | | Module: Compulsory/Optional Courses |
| Duration | 1 Term | Title: X-Ray Structure Analysis of Proteins |
| Module grade | The compulsory/optional course is not graded. | |
| Educational objectives | Students should learn the basic principles and procedures of X-ray structure analysis. | |
| Coordinator | Prof. Dr. Diederichs | |
| Teaching content | Crystallization, diffraction, lattice spacegroups, data collection, molecular replacement, experimental phasing, refinement, validation | |
| Forms of teaching/Amount of SWS | Lecture / 1 SWS | |
| Work load | 15 h | |
| Credits for this unit | 1 | |
| Examination and unit completion | Oral exam | |
| Prerequisites | If possible, advanced course „Bioinformatics and X-ray structure analysis of proteins“. Interest for Mathematics | |
| Language | English | |
| Time slot and frequency of the course | winter term, weekly | |
| Recommended Term | advanced Bachelorstudents and Masterstudents | |

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|--|--|-----------------|---------|---------------------------------------|------|
| Study program/Usability | | | | Module TITLE | |
| Master Biological Sciences | | | | Masters project | |
| Master Life Science | | | | | |
| Credits | 30 | Duration | 6 Month | Part of module of total rating | 33 % |
| Module grade | The grade of the Masters project is calculated as the average of the grades provided by the two referees. | | | | |
| Coordinator | Lecturers of the Department of Biology | | | | |
| Educational objectives | The students are expected to pursue a scientific project in the area of biology, within a given time frame, in an independent manner, and to document their achievements in form of a written thesis. | | | | |
| Teaching content | Aim is to impart the ability to independently establish a work-plan suited to complete the proposed masters-project within the prescribed time-frame, independently acquire knowledge corresponding to the current state of the scientific literature, gaining expertise in the methods and approaches required to perform the experimental work, independently examine, analyze, rate and discuss the achieved results, and collate all of the above in form of a written masters-thesis. | | | | |
| Forms of teaching/ Amount of SWS | full-day tutoring in how to work scientifically as part of a team | | | | |
| Work load | 900 hours | | | | |
| Examination and unit completion | Preparation of the written masters thesis | | | | |
| Prerequisites | Successful completion of all exams specified in the rules and regulations governing the "Masters Biological Sciences" or "Masters Life Science" course of studies Immatriculation at the University of Konstanz | | | | |
| Language | German, English | | | | |
| Time slot and frequency of the course | Winter- and Summer-semester | | | | |
| Recommended Term | 4. Semester | | | | |
| Compulsory/ Optional course | Compulsory course | | | | |