MSc OE - Ecology and Evolution Master’s Study Programme

Courses of the Ecology and Evolution Master’s Study Programme are in general offered in English if international students are enrolled. Three courses are offered in German language only (see below).

The duration of each course is 7 weeks, either in the 1st or 2nd half of the semester.

Each course consists of
- Lecture and seminar: 5 ECTS credits = 150 h (contact study: 3 SWS / 42 h, self-studies: 108 h)
- Practical course: 10 ECTS credits = 300 h (contact study: 10 SWS / 140 h, self-studies 160 h)

Sum of ECTS credits: 15

List of courses

Winter semester, 1st half of semester
- Evo 3 - Mycology
- Evo 5 - Molecular evolution and bioinformatics
- Evo 6 - Evolutionary genomics of vertebrates
- Evo 9 - Climate change and biodiversity adaptations
- Öko 5 - Ecological parasitology and animal physiology

Winter semester, 2nd half of semester
- Öko 3 - Plant evolutionary ecology and global change
- Öko 1 - Ökotoxikologie (German language only)
- Öko 7 - Environmental toxicology and -chemistry
- Evo 7 - Paleobiology and environment

Summer semester, 1st half of semester
- Evo 2 - Diversity and Evolution of plants
- Öko 2 - Gewässerökologie (German language only)
- Evo 8 - Symbioses of the plants
- Öko 6 - Conservation biology

Summer semester, 2nd half of semester
- Öko 4 - Community ecology, movement ecology and macroecology
- Öko 9 - Zoo and wildlife biology
- Evo 11 - Integrative Taxonomie und Systematik (German language only)
- Öko 8 - Evolutionary ecology and environmental analytics

Course descriptions
Mycology, the science of fungi, deals with both true fungi and fungus-like organisms (slime moulds, Oomycota, etc.). The species diversity of fungi is estimated at approx. 3.8 million, although only about 140,000 species are known to date. This means that the group of fungi as a whole has been little investigated and offers great potential for exciting discoveries about diversity, the importance of fungi in ecosystems and concerning possible uses.

The module focuses on fungi of different phylogenetic lineages with their diverse morphological structures and lifestyles. These are presented in the lecture, supplemented by information on ecological topics (destruents, mycorrhizal fungi, parasites on plants or animals), information on natural products and applied aspects. Concerning humans, fungi are discussed as harmful organisms, e.g. poisonous fungi, phytopathogenic and human-pathogenic fungi and moulds in buildings, or as beneficial organisms, e.g. edible fungi, fungi as suppliers of compounds useful in medicine or fungi in food technology. On one-day excursions in the vicinity of Frankfurt, fungi are discovered, observed, discussed and collected in natural ecosystems. In the laboratory, they are examined under light microscopes, key characteristics are drawn, and species are identified with the help of literature. Microfungi are available as cultures. Other topics include taxonomy, cultivation of fungi, scanning electron microscopy and the use of molecular sequence data to determine species and for phylogenetic analyses.

In the seminar, the participants acquire and impart knowledge on selected topics of ecology, systematics, significance and uses of fungi based on scientific literature.

Course responsible: Prof. Dr. Meike Piepenbring
Web page: https://www.goethe-university-frankfurt.de/45908360/Abt__Piepenbring?locale=en
**Evo 5 - Molecular evolution and bioinformatics**, Winter semester, 1st half
Course description will be completed soon.
Web page of the course responsible Prof. Dr. Ingo Ebersberger: [https://www.bio.uni-frankfurt.de/52197639/Research_interests](https://www.bio.uni-frankfurt.de/52197639/Research_interests)

**Evo 6 - Evolutionary genomics of vertebrates**, Winter semester, 1st half
Course description will be completed soon.
Web page of the course responsible Prof. Dr. Axel Janke: [https://www.senckenberg.de/en/institutes/sbik-f/evolutionary-vertebrate-genomics/](https://www.senckenberg.de/en/institutes/sbik-f/evolutionary-vertebrate-genomics/)

**Evo 9 - Climate change and biodiversity adaptations**, Winter semester, 1st half
This course will introduce biology and geography students to current research in the area of climate and biodiversity change. It will overview major global ecosystems (primarily defined by climate) and their vulnerabilities to human-induced climate change. We address how climate change may influence species, species interactions, and communities. We will go on half-day field trips to illustrate some of the lecture topics and collect material for molecular study. The laboratory will provide a hands-on introduction to molecular methods of assessing biodiversity, such as DNA barcoding and metabarcoding, and analyses of metagenomic DNA. A large part of the lab will deal with computer-based analyses of molecular data. This course is supported by several researchers from the Biodiversity and Climate Research Centre (BiK-F), who will introduce students to their field of study in guest lectures. All parts of the course will be taught in English.
Course responsibles: Prof. Dr. Imke Schmitt and members of the Schmitt Lab

**Öko 5 - Ecological parasitology and animal physiology**, Winter semester, 1st half
Course description will be completed soon.
Web page of the course responsible Prof. Dr. Sven Klimpel: [https://www.bio.uni-frankfurt.de/43925886/Abt__Klimpel](https://www.bio.uni-frankfurt.de/43925886/Abt__Klimpel)
Öko 3 - Plant Evolutionary Ecology and Global Change, Winter semester, 2nd half

Compared to most animals, plants have low mobility and therefore cannot easily escape adverse environmental conditions. Within the context of global change (climate change, land-use change, etc.), plants need to either adjust their spatial distribution or adapt plastically or evolutionarily to new environmental conditions. Are they able to do so?

In the lectures, we teach theoretical knowledge from the fields of plant evolutionary ecology extended with ecophysiology to understand how plants can adapt physiologically and evolutionarily to different stress factors. Variation among and within plant species in ecologically relevant traits play a central role in such adaptations. Furthermore, we focus on methodological approaches in experimental plant ecology, ecophysiology, quantitative genetics, and population genetics in lectures and seminars. In seminar meetings, participants will read scientific articles, which will subsequently be critically discussed within the group.

In the practicals, participants will be split into two groups. One group will design evolutionary ecological experiments (two students per experiment), which will be conducted in the greenhouse or climate chambers, and the results will be presented orally. In addition, participants will learn the basics of the statistical software package R to analyze and visualize the acquired data. The other group will organize a symposium on the theme of Global Change and Plants. Topics of the oral presentations concern the physical basis of climate change and its consequences for the Earth, for its main ecosystems and most important plant groups, and plant populations. Results of the experiments from the first group will also be presented during the symposium.

Course responsible: Prof. Dr. Wolfgang Brüggemann, Prof. Dr. Niek Scheepens, The staff of the working groups Plant Ecophysiology and Plant Evolutionary Ecology

Webpages of the working groups: https://www.goethe-university-frankfurt.de/45904491/Abt__Scheepens?locale=en, https://www.bio.uni-frankfurt.de/43925726/Abt__Br%C3%BCggemann
Öko 1 - Ökotoxikologie (German language only), Winter Semester, zweite Hälfte

Kursbeschreibung folgt in Kürze.

Homepage des Kursverantwortlichen Prof. Dr. Jörg Oehlmann: https://www.bio.uni-frankfurt.de/45735703/Aquatische_%C3%96kotoxikologie

Öko 7 - Environmental toxicology and –chemistry, Winter semester, 2nd half of semester

Course description will be completed soon.

Web page of the course responsible Prof. Dr. Henner Hollert, PD. Dr. Werner Brack: https://www.bio.uni-frankfurt.de/43970666/Abt__Hollert

Evo 7 - Paleobiology and the environment, Winter semester, 2nd half

Course description will be completed soon.

Web page of the course responsible Prof. Dr. Friedemann Schrenk: https://www.bio.uni-frankfurt.de/43925994/Abt__Schrenk

Evo 2 - Diversity and Evolution of plants, Summer semester, 1st half

Course description will be completed soon.

Web page of the course responsible Prof. Dr. Georg Zizka: https://www.goethe-university-frankfurt.de/47087476/Diversity_and_Evolution_of_Higher_Plants__Botanical_and_Molecular_Evolution_Research

Öko 2 - Gewässerökologie (German language only), Sommer Semester, erste Hälfte

Kursbeschreibung: https://www.bio.uni-frankfurt.de/45434706/Oeko-2-Oehlmann_Gewaess_oeko

Homepage des Kursverantwortlichen Prof. Dr. Jörg Oehlmann: https://www.bio.uni-frankfurt.de/43971064/ak-oehlmann

Evo 8 - Symbioses of the plants, Summer semester, 1st half

Course description in English will be completed soon. Course description in German: https://www.bio.uni-frankfurt.de/45434829/Symbiose_der_Pflanzen

Web page of the course responsible Prof. Dr. Marco Thines: https://www.senckenberg.de/en/institutes/sbik-f/evolutionary-analyses-and-biological-archives/
Biodiversity on Earth is under considerable threat due to land use and climate change. We are in the midst of the 6th global mass extinction, and the epoch we live in is therefore called the Anthropocene. One of the most significant challenges of our time is to use resources while preserving biodiversity. A central aim of conservation biology is to develop concepts and find solutions to achieve this goal. The module “Conservation Biology” includes lectures and seminars to transfer factual knowledge about conservation biology. This module includes the topics of introduction to conservation biology as a scientific discipline, basics of biodiversity research, the value of and threats to biodiversity, instruments for the conservation of biodiversity, national and international legal bases for nature conservation and methods for nature conservation assessment. As a supplement to the lecture and seminar, the module also consists of exercises as an integrative combination of theoretical transfer of factual knowledge and practical testing and consolidation. The focus of the courses is on applying and implementing theoretical knowledge to answer nature conservation questions. This knowledge includes formulating nature conservation questions, developing a suitable study concept, collecting relevant data, evaluating and interpretation. The results are discussed in nature conservation management for biodiversity conservation and with relevant stakeholders (e.g. land users).

Deadwood is a highly diverse habitat and plays a crucial role in maintaining diversity in forest ecosystems (Foto: Alfred Schiener).

Course responsibles: Prof. Dr. Claus Bässler and Staff of the Conservation Biology Working Group:
Webpage: https://www.bio.uni-frankfurt.de/87456670/Abt_Baessler
The module addresses key questions in ecology, especially how species coexist in ecosystems, determine animal movements, and how biodiversity is distributed across the Earth. Community ecology is concerned with interactions between species in ecosystems. Movement ecology studies drivers and consequences of animal movements. Macroeoclogy investigates large-scale patterns of biodiversity. Knowledge gained in these fields is relevant for conservation biology, e.g. to maintain ecosystem services such as seed dispersal through animal movements and protect biodiversity hotspots globally. The introductory lecture to the module gives an overview of basic ecological concepts and their applications in conservation biology. Study design and analysis of ecological data are taught in a two-week statistics practical (with the programming language R). Participants will use their new statistical knowledge in a practice of movement ecology and macroecology, e.g. in models of animal movements and projections of species distributions under climate change. During fieldwork, participants record interactions between birds and fruiting plants and use these data for statistical comparisons along a land-use gradient. The results of the individual student projects are put into the context of current debates in conservation biology. Participants will also gain insights into ongoing projects of our research groups at the Senckenberg Biodiversity and Climate Research Centre (SBiK-F).

A field work part of one week will be taught outside Frankfurt (usually in early July).

Course responsible: PD Dr. Matthias Schleuning, Prof. Dr. Thomas Müller

Web pages: Matthias Schleuning (community ecology), Eike Lena Neuschulz (plant-animal interactions), Thomas Müller (movement ecology), Susanne Fritz (macroecology), Katrin Böhning-Gaese (biodiversity and conservation)
Öko 9 - Zoo and wildlife biology, Summer semester, 2nd half

Course description in German: [https://www.bio.uni-frankfurt.de/45434853/Zoo_und_Wildtierbiologie](https://www.bio.uni-frankfurt.de/45434853/Zoo_und_Wildtierbiologie)

Course description in English will be completed soon.

Web page of the course responsibles Prof. Dr. Paul Dierkes [https://www.bio.uni-frankfurt.de/54790859/Zootierbiologie](https://www.bio.uni-frankfurt.de/54790859/Zootierbiologie), Prof. Dr. Lisa Schulte [https://www.bio.uni-frankfurt.de/43970254/ak-schulte](https://www.bio.uni-frankfurt.de/43970254/ak-schulte), Prof. Dr. Thomas Müller [https://www.senckenberg.de/en/institutes/sbik-f/movement-ecology/](https://www.senckenberg.de/en/institutes/sbik-f/movement-ecology/)

Evo 11 - Integrative Taxonomie und Systematik (German language only), Sommer Semester, zweite Hälfte

Kursbeschreibung: [https://www.bio.uni-frankfurt.de/45434976/Integrative_Taxonomie_und_Systematik__Tiere](https://www.bio.uni-frankfurt.de/45434976/Integrative_Taxonomie_und_Systematik__Tiere)

Kursverantwortliche: Prof. Dr. Angelika Brand, Prof. Dr. Gunther Köhler, PD Dr. Sebastian Klaus, Dr. Torben Riehl

Öko 8 - Evolutionary ecology and environmental analytics, Summer semester, 2nd half

Course description will be completed soon.

Web page of the course responsibles Prof. Dr. Henner Hollert, PD Dr. Werner Brack: [https://www.bio.uni-frankfurt.de/43970666/Abt__Hollert](https://www.bio.uni-frankfurt.de/43970666/Abt__Hollert)