

# Friedrich-Schiller-Universität Jena

**Module catalogue Master of Science**  
**664 Evolution Ecology and Systematics**  
Examination regulations: version 2018

As at 16.08.2018

## List of abbreviations

CP	credit point(s)
L	Lecture
S	Seminar
E	Exercise
P	Practical course
EX	Excursion
SS	Summer Semester
WS	Winter Semester
SWS	hours per week per Semester
Mc	Module coordinator

## Module MEES001 C1 – Basics in Evolutionary Research

Module Code	MEES001
Module title (German)	C1 - Grundlagen der Evolutionsforschung
Module title (English)	C1 - Basics in Evolutionary Research
Module coordinator	Fischer MS
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Compulsory module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	2 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 1 SWS S: 3 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The module aims at a common understanding of evolutionary theory and evolutionary ecology and deepens the relevant knowledge. It deals with Darwinian evolution, synthetic evolutionary theory and other evolutionary theories. The social meaning of the theory of evolution is also treated. The seminar in the summer semester deals with current evolutionary biological questions based on original papers from the subject areas of the study program.
Intended learning outcomes	<p>Overview of the theory of evolution; interdisciplinary understanding of evolutionary processes; independent understanding of the basic mechanisms of evolution from the group of organisms; Overview of current questions of evolutionary biology; Ability to critically read and interpret original scientific papers; Scientific discussion skills at a high professional level.</p> <p>In order to achieve the study objectives of the module, regular participation in the seminars is necessary. Further details will be given by the respective teachers at the beginning of these courses.</p>
Requirements for awarding credit points (type of examination)	Seminar contributions (50% each)
Additional information on the module	<i>The module will be held in English. The module should be attended in the first semester.</i>

## Module MEES002 C2 – Ecology and Diversity

Module Code	MEES002
Module title (German)	C2 - Ökologie und Diversität
Module title (English)	C2 - Ecology and Diversity
Module coordinator	Küsel
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Compulsory module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 3 SWS S: 1 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The module provides an overview of the ecology and diversity of habitats and populations and addresses aspects of integrative biodiversity research. The lectures will focus on the emergence and ecology of habitats and their biodiversity, with particular emphasis on land use and climate change. We will address fundamental biogeographic aspects, and the dynamics of populations and the interaction between species in ecological networks. In the seminar, small-scale projects will explore how microorganisms and macroorganisms and their interactions, through chemical signals and complex networks, can contribute to important functions of ecosystems while providing important services to humans. The importance of ecology and the preservation of its diversity for society is also highlighted.
Intended learning outcomes	In-depth overview of the most important vegetation formations; Knowledge of the impact of human activities on natural vegetation and biodiversity; in-depth basics of population ecology; Overview of modern methods of integrative biodiversity research; Use of media techniques, presentation and discussion of scientific papers; improved presentation technique and presentation methodology.
Requirements for awarding credit points (type of examination)	Joint written examination for the lectures (70%), project work for the seminar (30%)
Additional information on the module	<i>The module will be held in English. The module should be attended in the first semester.</i>

## Module MEES003 C3 – Species Identification

Module Code	MEES003
Module title (German)	C3 - Artenkenntnis
Module title (English)	C3 - Species Identification
Module coordinator	Pohl
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Compulsory module
Frequency of offer (how often is the module offered?)	Every second semester (from summer semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	E: 6 SWS P: 2 SWS
ECTS credits	10 CP
Work load:	300 h
- In-class studying	120 h
- Independent studying (incl. preparations for examination)	180 h
Module content	In this interdisciplinary module we teach advanced knowledge and skills for the identification of native plants and animals. Taxonomic methods and background knowledge are deepened in the field and in the laboratory.
Intended learning outcomes	In-depth knowledge of plant and animal species; learning of advanced techniques of identifying taxa; qualification to describe new species according to the taxonomic rules.  In order to achieve the study objectives of the module, regular participation in all module events is necessary. Further details will be provided by the respective lecturers at the beginning of these courses.
Requirements for awarding credit points (type of examination)	Herbarium (30%); taxonomic description (30%); Attestation (40%); proof of performance for the practical work
Additional information on the module	<i>The module will be held in English if required. The module should be attended in the second semester.</i>

## Module MEES004 C4 – Experimental Design and Analysis of Biological Data

Module Code	MEES004
Module title (German)	C4 - Versuchsplanung und Analyse biologischer Daten
Module title (English)	C4 - Experimental Design and Analysis of Biological Data
Module coordinator	Bernhardt-Römermann
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Compulsory module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 1 SWS E: 3 SWS (Block)
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The module introduces the experimental design as well as various univariate and multivariate statistical methods. The lecture teaches the basics of scientific work from finding a worthwhile research question to the publication through manuscripts, lectures, or posters. In the exercises with the statistical program R, the presented statistical methods are learned using sample datasets from botany, zoology, ecology, and biodiversity research. It covers the areas of descriptive statistics including visualizations, simple tests, the basics of statistical modelling (linear models, generalized linear models, mixed models, structural equation models), as well as ordinations and cluster analyses. The focus of this module is on practical exercises with intensive instructions during the classroom hours.
Intended learning outcomes	Planning and conducting a scientific investigation; experimental design; Overview and application of advanced techniques of data analysis and visualization; Knowledge of the various publication media for scientific results; Basics of good scientific practice.
Requirements for awarding credit points (type of examination)	Analyses of data in the form of a commented R-script (100%)
Additional information on the module	<i>The module will be held in English. The module should be attended in the first semester.</i>

## Module MEES005 C5 – Excursion EES

Module Code	MEES005
Module title (German)	C5 - Großexkursion EES
Module title (English)	C5 - Excursion EES
Module coordinator	Head of excursion
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Compulsory module
Frequency of offer (how often is the module offered?)	Every second semester (from winter or summer semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	EX: 4 SWS (Block)
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	Based on the excursion, the students should get to know examples of environmental aspects of an unknown habitat. Depending on the field of the excursion, aspects of biodiversity (zoological and / or botanical), the ecology of the visited ecosystems and their species composition or their evolutionary history may be the focus. Depending on the excursion destination, the excursion will take place in the winter or summer semester.
Intended learning outcomes	Description and analysis of an unknown habitat; Procurement and evaluation of different sources of information; Provision of technical information and preparation for a public presentation.  In order to achieve the study objectives of the module, a regular participation in the preparation and follow-up study as well as the excursion is necessary. The respective teachers will give further details at the beginning of these courses.
Requirements for awarding credit points (type of examination)	Protocol and/or presentation (100%)
Additional information on the module	<i>The module will be held in English. Depending on the purpose of the excursion, the module may be taken in the second or third semester.</i>

## Module MEES006 E1 – Comparative Evolutionary Developmental Biology

Module Code	MEES006
Module title (German)	E1 - Vergleichende evolutionäre Entwicklungsbiologie
Module title (English)	E1 - Comparative Evolutionary Developmental Biology
Module coordinator	Olsson
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	2 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 3 SWS S: 2 SWS P: 2 SWS
ECTS credits	10 CP
Work load:	300 h
- In-class studying	105 h
- Independent studying (incl. preparations for examination)	195 h
Module content	The lectures focus on the regulatory mechanisms of development at the molecular level, gene regulation and gene regulatory networks. In the seminar, selected topics in comparative and evolutionary developmental biology are discussed. The lab course introduces methods commonly used in comparative and evolutionary developmental biology.
Intended learning outcomes	An overview of current research topics in comparative and evolutionary developmental biology. Advanced knowledge of selected topics at the interface between genetics and developmental biology. Insight into research methods used in this area of research.
Requirements for awarding credit points (type of examination)	Joint written final examination for the lectures (60%), seminar contribution (40%), proof of performance for the practical work
Additional information on the module	<i>The module will be held in English. The beginning of this module is recommended for the first semester.</i>



## Module MEES007 E2 – Evolution of Insects

Module Code	MEES007
Module title (German)	E2 - Evolution der Insekten
Module title (English)	E2 - Evolution of Insects
Module coordinator	Beutel
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from summer semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 1 SWS S: 2 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	45 h
- Independent studying (incl. preparations for examination)	105 h
Module content	In this module, we teach the morphology, phylogeny and evolution of Hexapoda on a higher level. Recent developments in insect phylogenetics are a main topic but more applied aspects (forensic entomology) are also treated in a seminar (students can choose between two seminars with a different focus). Methods and results of phylogenetic investigations based on morphological or molecular are discussed in the lecture and the phylogenetic seminar.
Intended learning outcomes	Advanced knowledge and understanding of insect morphology, phylogenetic and evolution.
Requirements for awarding credit points (type of examination)	Seminar contribution (30%), oral examination for the lecture (70%)
Additional information on the module	<i>There is a choice between the two seminars. The module will be held in English if required. The attendance of this module is recommended for the second semester.</i>

## Module MEES008 E3 - Morphology

Module Code	MEES008
Module title (German)	E3 - Morphologie
Module title (English)	E3 - Morphology
Module coordinator	Schmidt
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from summer semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	E: 4 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The interdisciplinary module provides basic insights into the current application areas of morphological research on animals and plants in industry and technology (keyword: bionics), medicine, environmental protection, architecture and design. The practical focus is the teaching of modern techniques and methods for the development of the 3rd and 4th dimension (3D reconstruction of forms in motion, digital microscopy, cLSM, creation of 3D models on the basis of histological series and Micro-CT data, Geometric Morphometry). Project work entails selected topics.
Intended learning outcomes	Deepening the knowledge on the functional morphology of animals and plants at selected focal points; Ability to recognize general biological principles of solution and their applicability in industry; Application of modern methods of shape and function analysis; Independent research, deepening and presentation of a selected topic.
Requirements for awarding credit points (type of examination)	Poster, presentation or essay (100%)
Additional information on the module	<i>The module will be held in English if required. The attendance of this module is recommended for the second semester.</i>

## Module MEES009 E4 – Human History

Module Code	MEES009
Module title (German)	E4 - Menschheitsgeschichte
Module title (English)	E4 - Human History
Module coordinator	Fischer MS
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	2 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 2 SWS S: 2 SWS E: 3 SWS
ECTS credits	10 CP
Work load:	300 h
- In-class studying	105 h
- Independent studying (incl. preparations for examination)	195 h
Module content	For anatomically modern humans, the understanding of morphological, molecular and cultural evolution should be deepened and extended. The module is multidisciplinary, from morphology and physiology to molecular and microbiology and socio-cultural science topics.
Intended learning outcomes	Based on current research topics, the lecture conveys various aspects of the Incarnation in the last 300,000 years. Using both classical and new research methods, the specialization exercise addresses adaptations of anatomically modern humans to their environment and attempts to describe human variation. Current research topics in human history are the subject of the seminar.
Requirements for awarding credit points (type of examination)	Written final examination for the overall module (100%); proof of performance for the seminar
Additional information on the module	<i>The module will be held in English if required. The beginning of this module is recommended for the first semester.</i>

## Module MEES010 E5 – Paleobiology of Vertebrates

Module Code	MEES010
Module title (German)	E5 - Paläobiologie der Wirbeltiere
Module title (English)	E5 - Paleobiology of Vertebrates
Module coordinator	Fischer MS
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from summer semester)
Duration of module	2 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 2 SWS P: 2 SWS E: 4 SWS
ECTS credits	10 CP
Work load:	300 h
- In-class studying	120 h
- Independent studying (incl. preparations for examination)	180 h
Module content	The module extends the knowledge of morphology, evolution and paleobiology of vertebrates. Practical and theoretical, the exercises provide in-depth knowledge of key events in the vertebrate evolution (such as shore leave, emergence of flight) and highlight key anagenetic changes in structures and functions at selected focal points. Original fossils of early tetrapods are also used. The Quaternary Paleontology courses give special insights into the research activities of the Senckenberg Research Station for Quaternary Paleontology in Weimar, with a focus on large mammal fauna in key regions of Eurasia and North America.
Intended learning outcomes	Deepening knowledge of the morphology, phylogeny and evolution of vertebrates; Basics of paleontological working methods.
Requirements for awarding credit points (type of examination)	Written final examination for the overall module (100%)
Additional information on the module	<i>Quaternary Paleontology courses are not available in English. The beginning of this module is recommended for the second semester.</i>

## Module MEES011 E6 – History of Evolutionary Biology

Module Code	MEES011
Module title (German)	E6 - Geschichte der Evolutionsbiologie
Module title (English)	E6 – History of Evolutionary Biology
Module coordinator	Fischer MS
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	2 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	S: 4 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The seminar "Discovery of Evolution" provides an overview of the history of ideas in evolutionary biology by means of secondary literature. The seminar "Classics of Evolution" critically discusses the most important advances in theory formation in the 19th and 20th century with the help of original papers.
Intended learning outcomes	Detailed overview of the history of ideas of evolutionary biology from antiquity to the present; Ability to critically read and interpret original scientific papers; Scientific discussion skills at a high professional level.
Requirements for awarding credit points (type of examination)	Seminar contributions (50% each)
Additional information on the module	<i>The module will be held in English if required. The beginning of this module is recommended for the first semester.</i>

## Module MEES012 E7 – Collections in Biodiversity Research

Module Code	MEES012
Module title (German)	E7 - Sammlungen in der Biodiversitätsforschung
Module title (English)	E7 - Collections in Biodiversity Research
Module coordinator	Schmidt
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 1 SWS E: 2 SWS EX: 1 SWS (Block)
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The interdisciplinary module teaches the basics of biological collection work. This includes not only the collection itself, but also the long-term preservation and safe storage of objects and the data belonging to them.
Intended learning outcomes	The lecture conveys basic knowledge about the history of biological collections as well as theoretical fundamentals for the processing and collection of objects in collections, for storing object-related data and for the legal basis of collecting. Practical knowledge in the preparation and preservation of biological objects is acquired in the corresponding exercises. It also introduces the work with online databases and creates simple projects with object-related data. As part of the excursion, the natural history collection in Thuringia and Germany will be visited in order to get to know the various implementations and approaches of biological collection retention and work.
Requirements for awarding credit points (type of examination)	Written final examination for the overall module (100%)
Additional information on the module	<i>The module will be held in English if required. The attendance of this module is recommended for the first or third semester.</i>

## Module MEES013 E8 – Plant Microevolution and Population Genetics

Module Code	MEES013
Module title (German)	E8 - Mikroevolution und Populationsgenetik der Pflanzen
Module title (English)	E8 - Plant Microevolution and Population Genetics
Module coordinator	Hellwig
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from summer semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 1 SWS E: 3 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	<p>The module deals with microevolution und population genetics in plants. The lecture focuses on speciation and related population genetic aspects. Hybridization, adaptive radiation and impact of evolutionary processes on populations and species, like e.g. isolation and spread of mutations will be treated in more detail.</p> <p>In the practical part, the most important, predominantly molecular methods applied in micro-evolutionary research will be studied. There will be exercises on calculation and interpretation of population genetic parameters.</p>
Intended learning outcomes	<p>Knowledge about most important processes in speciation and about key processes in evolutionary change in plant populations. Knowledge of terminology in population genetics; Ability to calculate and interpret parameters in population genetics, including specific computer software.</p> <p>In order to achieve these learning outcomes regular active participation in the exercises is required. More detail are presented at the beginning of the lecture and exercise respectively.</p>
Requirements for awarding credit points (type of examination)	Protocol for the exercise (100%)
Additional information on the module	<p><i>The module will be held in English if required.</i></p> <p><i>The attendance of this module is recommended for the second semester.</i></p>

## Module MEES014 E9 – Plant Phylogeny / Phylogenetics

Module Code	MEES014
Module title (German)	E9 - Pflanzenphylogenie der Pflanzen / Phylogenetik
Module title (English)	E9 - Plant Phylogeny / Phylogenetics
Module coordinator	Hellwig
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from summer semester)
Duration of module	2 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 2 SWS E: 2 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The module presents an overview of the phylogeny of plants and an introduction to paleobotany. The exercise offers training in actual analytical methods in plant phylogenetics, e.g. treatment of characters, construction and evaluation of phylogenetic trees.
Intended learning outcomes	Survey of the plant phylogeny from Glaucophyta to Angiosperms including extinct lineages. Ability to identify plants from different climatic zones with German and foreign literature. Knowledge about key methods in phylogenetics including design of analytical pipelines.
Requirements for awarding credit points (type of examination)	Oral final examination for the overall module (100%)
Additional information on the module	<i>The module will be held in English if required. The beginning of this module is recommended for the second semester.</i>



## Module MEES015 E10 – Evolution and Diversity of Cryptogams

Module Code	MEES015
Module title (German)	E10 - Evolution und Diversität der Kryptogamen
Module title (English)	E10 - Evolution and Diversity of Cryptogams
Module coordinator	Hellwig
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 1 SWS P: 3 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The lecture presents the systematic groups of cryptogams in detail. Phylogenetic relationships will be treated as well as their life cycles, and morphological characteristics. Furthermore, life and adaptations of algae, lichens, mosses, lycopods, and fern plants to their respective habitats are illuminated. Particular attention is paid to the ecological importance of cryptogams and their role as indicator organisms. During the internship, selected representatives will be determined by the participants on their own and in small excursion typical representatives of different habitats will be presented.
Intended learning outcomes	In-depth knowledge of the systematic classification of algae, lichens, mosses, lycopods and fern plants; Learning how to deal with partly English-language identification literature; Bioindication of cryptogams; Understanding construction and life of cryptogams as adaptation to the respective habitats.
Requirements for awarding credit points (type of examination)	Attestation (100%)
Additional information on the module	<i>The module will be held in English if required. The attendance of this module is recommended for the first semester.</i>

## Module MEES016 E11 – Applied Vegetation Ecology

Module Code	MEES016
Module title (German)	E11 - Angewandte Vegetationsökologie
Module title (English)	E11 - Applied Vegetation Ecology
Module coordinator	Römermann
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from summer semester)
Duration of module	2 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	S: 1 SWS E: 3 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The module focusses on various aspects of applied vegetation ecology. In the seminar we discuss current research approaches in vegetation ecology with special emphasis on the use of functional trait data. During the field course we will collect and analyse data on plant species composition and diversity from important vegetation types varying in their hemeroby levels.
Intended learning outcomes	<p>Overview of the most important vegetation formations of Central Europe; Knowledge of the impact of human activity (land use, global change) on vegetation and flora; Ability to assess the important consequences of different types of land-use; Developing species identification skills and species knowledge, as well as univariate and multivariate statistical analyses of vegetation data.</p> <p>In order to achieve the study objectives, regular participation in all module events is necessary. Further details will be given by the teachers at the beginning of these courses.</p>
Requirements for awarding credit points (type of examination)	Report on the field exercises (100%); proof of performance for the seminar
Additional information on the module	<i>The module will be held in English if required. The beginning of this module is recommended for the second semester.</i>

## Module MEES017 E12 – Crop Plants

Module Code	MEES017
Module title (German)	E12 - Nutzpflanzen
Module title (English)	E12 - Crop Plants
Module coordinator	Hellwig
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	2 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 2 SWS P: 2 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The lecture introduces food crops, stimulating, medicinal, and aromatic plants. In particular, occurrence, cultivation, biology, morphology / anatomy and their relevance are treated. Furthermore, current aspects of the production of plant foods and stimulants are processed. During the practical course, selected plants and their products will be presented. Also planned are excursions to companies that produce or process herbal products.
Intended learning outcomes	Acquisition of knowledge about most important food crops, luxury crops, medicinal and spice plants, the importance of plant raw materials for human nutrition; Providing an insight into production processes; ability to critically assess current global trends in the use, cultivation and processing of relevant crops.
Requirements for awarding credit points (type of examination)	Oral examination for the lecture (30%); final presentation for the practical work (70%)
Additional information on the module	<i>The module will be held in English if required. The beginning of this module is recommended for the first semester.</i>

## Module MEES018 E13 – Functional Biodiversity Research

Module Code	MEES018
Module title (German)	E13 - Funktionelle Biodiversitätsforschung
Module title (English)	E13 - Functional Biodiversity Research
Module coordinator	Römermann
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	2 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	S: 1 SWS E: 3 SWS (Block)
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The students learn (i) to identify an (own) scientific problem in the context of functional biodiversity research, (ii) to plan an experiment using appropriate scientific methods and experimental design, (iii) to carry out the experiment and (iv) to evaluate it with the help of modern statistical methods. The seminar provides the foundations for experimental biodiversity research and introduces the basics of experimental design. Experimental design and evaluation options are discussed using examples from the literature. The acquired knowledge is used in the (supervised) planning of the own mini-projects during the exercise. The project will be carried out in the field along gradients (e.g., elevation gradients in the Alps), including field work, statistical analyses and poster presentation (in groups). During all stages of the course, the collected data will be evaluated and the procedure critically questioned and discussed.
Intended learning outcomes	Knowledge and skills for experimental design (research planning and implementation), statistical evaluation, interpretation and presentation of scientific results.
Requirements for awarding credit points (type of examination)	Poster (100%); proof of performance for the seminar
Additional information on the module	<i>The module will be held in English if required. The beginning of this module is recommended for the first semester.</i>

## Module **MEES019** E14 – Project Module Habitat Description and Nature Conservation

Module Code	MEES019
Module title (German)	E14 - Projektmodul Lebensräume und Naturschutz
Module title (English)	E14 - Project Module Habitat Description and Nature Conservation
Module coordinator	Hellwig
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from summer semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	P: 4 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	<p>Students will screen and analyze the biotic inventory of selected natural habitats in project teams. Different groups of organisms will be included and actual techniques of species inventories will be applied.</p> <p>Local characteristics are to be worked out and contrasted with typical elements of the habitat. The results are scientifically processed and presented in a way that is understandable to the public.</p>
Intended learning outcomes	<p>Acquisition of practical experience with biodiversity detection methods; Ability to recognize specific habitat features; Implementation of scientific results in a form and language suitable for public relations.</p> <p>In order to achieve the study objectives of the module, regular participation in the practical course is necessary. Further details will be given by the respective teachers at the beginning of these courses.</p>
Requirements for awarding credit points (type of examination)	Working out of a nature guide in group work (100%)
Additional information on the module	<p><i>The module will be held in English if required.</i></p> <p><i>The attendance of this module is recommended for the second semester.</i></p>

## Module MEES020 E15 – Ecological Concepts 1: Current Fields of Ecological Research

Module Code	MEES020
Module title (German)	E15 - Konzepte der Ökologie 1: Aktuelle Forschungsfragen der Ökologie
Module title (English)	E15 - Ecological Concepts 1: Current Fields of Ecological Research
Module coordinator	Halle
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 2 SWS S: 2 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The module covers the basic conceptual frameworks of ecology with a focus on critical reading and independent assessment of original literature. In particular, the module emphasises the essential difference between textbook knowledge and original research papers, and rehearses the composition of conclusive scientific argumentation. The mayor work load of the module comprises autonomous information search, self-study of literature and preparation of the seminar presentation. Another focus is on personal presentation skills. The lecture gives an overview over current ecological research in Jena and shall support the choice of a research group for the master's thesis.
Intended learning outcomes	Independent literature search and evaluation of original research papers; critical assessment of original literature; composition of independent scientific argumentation; ability to participate in scientific discussions; strengthening of independent valuation of open questions in ecology; analysis and improvement of personal presentation style.
Requirements for awarding credit points (type of examination)	Seminar contribution (100%)
Additional information on the module	<i>The module will be held in English if required. The beginning of this module is recommended for the first semester.</i>

## Module MEES021 E16 – Ecological Concepts 2: History of Ecological Ideas

Module Code	MEES021
Module title (German)	E16 - Konzepte der Ökologie 2: Ideengeschichte der Ökologie
Module title (English)	E16 - Ecological Concepts 2: History of Ecological Ideas
Module coordinator	Halle
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from summer semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	S: 4 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The module contemplates the historical development of ecology as a discipline of natural sciences and the emergence of its conceptual foundations with a focus on critical reading and independent assessment of original literature. The mayor work load of the module comprises self-study of literature and preparation of the seminar presentations.
Intended learning outcomes	General understanding of the reciprocity between socio-economic and cultural basic conditions of societies and science; overview over the historical development of ecology; overview over essential milestone-publications in ecology; critical assessment of original literature; composition of independent scientific argumentation; ability to participate in scientific discussions.  A regular attendance at the seminars is required to reach the didactic aims of the module. Details are given at the beginning of the courses by the docents.
Requirements for awarding credit points (type of examination)	Seminar contributions (50% each)
Additional information on the module	<i>The module will be held in English if required. The attendance of this module is recommended for the second semester.</i>

## Module MEES022 E17 – Evolutionary and Population Genetics

Module Code	MEES022
Module title (German)	E17 - Evolutions- und Populationsgenetik
Module title (English)	E17 - Evolutionary and Population Genetics
Module coordinator	Schielzeth
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 2 SWS E: 2 SWS (Block)
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	Evolution is based on changes in heritable traits either by natural selection or by genetic drift. The module covers the mechanisms of the evolutionary changes in populations over time. This includes an introduction to quantitative genetics, basis principles of population genetics and modern genomic tools for studying evolution. The array of topics ranges from the quantification of natural selection and heritabilities in natural populations via the genetic basis of local adaptation and maintenance of genetic diversity to speciation genetics and genomics.
Intended learning outcomes	Basic knowledge in population and quantitative genetics; Understanding of the genotype-phenotype association studies; Familiarization with methodological basics for studying evolutionary adaptation; Familiarization with software for population genetic and population genomic analyses; Broadening of general statistical knowledge
Requirements for awarding credit points (type of examination)	Written Examination for the lecture (100%); proof of performance for the exercise
Additional information on the module	<i>The module will be held in English. The attendance of this module is recommended for the first semester.</i>



## Module MEES023 E18 – Behavioural Ecology

Module Code	MEES023
Module title (German)	E18 - Verhaltensökologie
Module title (English)	E18 - Behavioural Ecology
Module coordinator	Halle
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from summer semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 1 SWS S: 1 SWS E: 2 SWS (Block)
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The module engrosses the scientific branch of behavioural ecology and its strong link to evolutionary ecology. The focus is on methodological aspects and the application of theoretical modelling for ESS analyses. Evolutionary mechanisms of selected topics are elaborated in the seminar. The exercise provides a practical insight into game theory modelling.
Intended learning outcomes	Advanced knowledge in the field of behavioural ecology; evolutionary mechanisms for the establishment of behavioural strategies; basics of game theory and modelling.
Requirements for awarding credit points (type of examination)	Thesis (80%); short presentation for the seminar (20%)
Additional information on the module	<i>The module will be held in English. The attendance of this module is recommended for the second semester.</i>

## Module MEES024 E19 – Theoretical Ecology

Module Code	MEES024
Module title (German)	E19 - Theoretische Ökologie
Module title (English)	E19 - Theoretical Ecology
Module coordinator	Brose
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 2 SWS (Block) E: 2 SWS (Block)
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	This module provides the theoretical foundations in the field of ecology by introducing the most important models. In the practical training, the theoretical concepts are studied in more detail in numerical simulations and simple analytical solutions of models.
Intended learning outcomes	Understanding the use of ecological modelling; Converting ecological questions into simulation models; interpretation of simulation results.
Requirements for awarding credit points (type of examination)	Paper to be written at home for the exercise (100%)
Additional information on the module	<i>The module will be held in English. The attendance of this module is recommended for the first or third semester.</i>

## Module MEES025 E20 – Ecological Networks

Module Code	MEES025
Module title (German)	E20 - Ökologische Netzwerke
Module title (English)	E20 - Ecological Networks
Module coordinator	Brose
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	E: 4 SWS (Block)
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	This module provides the theoretical foundations of the modelling of complex ecological networks. In the practical training, the theoretical concepts are studied in computer simulations of simple examples.
Intended learning outcomes	Understanding the use of ecological modelling; Converting ecological questions into simulation models; Interpretation of simulation results.
Requirements for awarding credit points (type of examination)	Paper to be written at home for the exercise (100%)
Additional information on the module	<i>The module will be held in English. The attendance of this module is recommended for the third semester.</i>

## Module MEES026 E21 – Biodiversity Metastudies

Module Code	MEES026
Module title (German)	E21 - Biodiversitäts Metastudien
Module title (English)	E21 - Biodiversity Metastudies
Module coordinator	Brose
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from summer semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 1 SWS (Block) E: 3 SWS (Block)
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	This module introduces the methods and concepts of metastudies. The lecture introduces important metastudies in the field of biodiversity research with consideration of statistical methods. In the practical training, published data are gathered, organized in a data base and analyzed by the statistical methods introduced in the lecture. Subsequently, the results of this metastudy carried out by the students are presented and discussed concerning their relation to theoretical concepts in biodiversity research.
Intended learning outcomes	Understanding the concepts and possibilities offered by metastudies, sampling of published data and organisation in data bases, statistical methods of metastudies, reporting on methods and results in metastudies.
Requirements for awarding credit points (type of examination)	Paper to be written at home for the exercise (100%)
Additional information on the module	<i>The module will be held in English. The module is offered every 2 years, so it must be taken in the second or fourth semester.</i>

## Module MEES027 E22 – Biodiversity Science-Policy interface

Module Code	MEES027
Module title (German)	E22 - Biodiversität in Gesellschaft und Politik
Module title (English)	E22 - Biodiversity Science-Policy interface
Module coordinator	Bonn
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 1 SWS (Block) S: 1 SWS (Block) EX: 1 SWS (Block)
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	The module provides an overview of current aspects of biodiversity policy as well as opportunities and challenges at the science-policy interface (including opportunities for professional career development). A special feature of the module, in addition to English as a continuous module language, is the interactive discussion with experts from the field (for example, authorities, associations / NGOs). The course covers aspects of participatory knowledge transfer and science communication as well as the innovative approach of citizen science.
Intended learning outcomes	Overview of developments in biodiversity policy and nature conservation practice; Knowledge of ways to increase policy impact of research; Insight into techniques of knowledge exchange; Ability for interdisciplinary teamwork.
Requirements for awarding credit points (type of examination)	Paper to be written at home for the exercise (70%); seminar contribution (30%)
Additional information on the module	<i>The module will be held in English. The attendance of this module is recommended for the first or third semester.</i>

## Module MEES028 E23 – Molecular and Chemical Interaction Ecology

Module Code	MEES028
Module title (German)	E23 - Molekulare und chemische Interaktionsökologie
Module title (English)	E23 - Molecular and Chemical Interaction Ecology
Module coordinator	van Dam
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 1 SWS (Block) S: 2 SWS (Block) EX: 1 day (Block)
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	This module focuses on the principles and approaches in modern day molecular (genomic) and chemical (metabolomic) ecology. We will also discuss relevant conceptual frameworks, ecological theories pertaining to current ecological biodiversity research.
Intended learning outcomes	Gene structure and function, Next Generation Sequencing Techniques, Primers in Chemical Analysis, Plant Ingredient Diversity, Phytochemistry and Metabolome Studies, Theory of Optimal Defense in Insect-Plant Interactions, Biotic and Abiotic Stress Responses, Pheromones and Sexual Communication, Microbial Ecology.
Requirements for awarding credit points (type of examination)	Seminar contribution (100%); proof of performance for the excursion
Additional information on the module	<i>The module will be held in English. The attendance of this module is recommended for the first or third semester.</i>

## Module MEES029 E24 – Microbial Ecology

Module Code	MEES029
Module title (German)	E24 - Mikrobielle Ökologie
Module title (English)	E24 - Microbial Ecology
Module coordinator	Küsel
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	2 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	L: 1 SWS S: 2 SWS P: 1 SWS (Block)
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	Microbial ecology deals with the detection, identification and function of microorganisms in the environment. In addition to the question of which organisms occur in a particular habitat, we need to know how they interact. Furthermore, we will address their biological properties, which determine their role in material cycles and how they are adapted to environmental conditions. A new set of molecular methods and in situ activity measurements allow establishing a relationship between phylogenetic and functional diversity.
Intended learning outcomes	Overview of novel methods of isotope-based methods to Omic technologies to identify important microbial functions in ecosystems.
Requirements for awarding credit points (type of examination)	Written examination (50%), oral and written contributions to seminar and practical work (50%)
Additional information on the module	<i>The module will be held in English. The beginning of this module is recommended for the first semester.</i>

## Module MEES030 E25 – Science Communication

Module Code	MEES030
Module title (German)	E25 - Wissenschaftskommunikation
Module title (English)	E25 - Science Communication
Module coordinator	Schielzeth
Prerequisite modules	None
Type of module (e.g. compulsory module, required elective module)	Required elective module
Frequency of offer (how often is the module offered?)	Every second semester (from winter semester)
Duration of module	2 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	S: 4 SWS
ECTS credits	5 CP
Work load:	150 h
- In-class studying	60 h
- Independent studying (incl. preparations for examination)	90 h
Module content	An important aspect of science is the communication of scientific insights. Efficient communication is therefore an important skill for all scientists. In the highly interactive classes of this module, we will reflect upon and train scientific communication. The module will also cover the peer-review process that is central to quality control in science and will address modern approaches to open and transparent science. The focus of the module is on communication within a scientific environment, but many aspects will be applicable to other fields that require concise and efficient communication.
Intended learning outcomes	Familiarization with different publication formats; Reflection on the construction and structure of scientific texts; Familiarization with the peer review process; Training of constructive peer feedback; Practice of oral presentation; Training of improving precision by condensing
Requirements for awarding credit points (type of examination)	Seminar contribution (50%); paper to be written at home (50%)
Additional information on the module	<i>The module will be held in English. The beginning of this module is recommended for the second semester.</i>



Module <b>MEES031</b> T1 – Project Module EES	
Module Code	MEES031
Module title (German)	T1 - Projektmodul EES
Module title (English)	T1 - Project Module EES
Module coordinator	Bernhardt-Römermann, Beutel, Bonn, Brose, Fischer, Halle, Hellwig, Küsel, Olsson, Pohl, Römermann, Schielzeth, Schmidt, van Dam
The module is a prerequisite for these modules	Prerequisite for admission to the module T2 - Master Thesis EES
Type of module (e.g. compulsory module, required elective module)	Compulsory module/basic module
Frequency of offer (how often is the module offered?)	Every semester
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	S: 1 SWS
ECTS credits	30 CP
Work load:	900 h
- In-class studying	15 h
- Independent studying (incl. preparations for examination)	885 h
Module content	As part of the practical course, the active participation in a working group of the institutes participating in the Master's program takes place. This enables the preparation and data acquisition for the Master's thesis. In independent studying, the preparation for the integrating final exam takes place. The content of the exam is the overview of the research subject of the master's thesis in a biological context.
Intended learning outcomes	Independent processing of a scientific question under guidance; Experimental design and data acquisition; Integration of one's own research question into the theoretical framework of the respective section of science.
Requirements for awarding credit points (type of examination)	Oral final examination (100%); proof of performance for the seminar

Module <b>MEES032</b> T2 – Master Thesis EES	
Module Code	MEES032
Module title (German)	T2 - Masterarbeit EES
Module title (English)	T2 - Master Thesis EES
Module coordinator	Bernhardt-Römermann, Beutel, Bonn, Brose, Fischer, Halle, Hellwig, Küsel, Olsson, Pohl, Römermann, Schielzeth, Schmidt, van Dam
The module is a prerequisite for these modules	successful completion of the module T1-Project Module EES
Prerequisite modules	M.Sc. Evolution, Ecology and Systematics
Type of module (e.g. compulsory module, required elective module)	Basic module
Frequency of offer (how often is the module offered?)	Every semester
Duration of module	1 semester
Components /Types of courses (e.g. lecture, practical course, lab, tutorial, exercise, seminar, internship, ...)	
ECTS credits	30 CP
Work load: - In-class studying - Independent studying (incl. preparations for examination)	900 h
Module content	The module comprises the evaluation of the data set for the master's thesis, the literature search and all other work that serves to prepare the master's thesis. The work is essentially done as an independent study.
Intended learning outcomes	Writing an exam paper; Textual and graphic presentation of the study results; Procurement and evaluation of relevant comparative literature.
Requirements for awarding credit points (type of examination)	Master thesis EES (100%)