



LUDWIG-
MAXIMILIANS-
UNIVERSITÄT
MÜNCHEN



Modulhandbuch / Program Catalog
Master's degree Evolution, Ecology and Systematics
(Master of Science, M.Sc.)

(120 ECTS points)

Based on the Examination Regulations from March 28, 2012

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Table of Contents

Abbreviations and Explanations	3
Module: P 1 Individual research training 1	4
Module: P 2 Presentation and discussion of scientific studies	6
Module: P 3 Evolutionary Genetics.....	8
Module: P 4 Evolutionary Ecology	10
Module: P 5 Systematic Data and Evidence	12
Module: P 6 Individual research training 2	14
Module: P 7 Statistics and field trip.....	16
Module: P 8 Concepts and methods in subdisciplines of Evolution, Ecology and Systematics and related fields.....	18
Module: P 9 Individual research training 3	24
Module: P 10 Preparation for the master's thesis.....	26
Modul: P 11 Master's project	28

Abbreviations and Explanations

CP	Credit Points, ECTS-Punkte
ECTS	European Credit Transfer and Accumulation System
h	hours
SS	summer semester
SWS	hours per week per semester/credit hours
WS	winter semester

1. In the program catalog assigned ECTS points are designated as follows: ECTS points that are not listed in parentheses are awarded upon successful completion of the respective graded exam. ECTS points listed in parentheses are for calculation purposes only
2. The semester for choosing the course, can be either binding or can be considered as a recommendation, according to the stipulations stated in Appendix 2 in the examination regulations, and are indicated in the catalog either by "designated semester" or "recommended semester", respectively.
3. The program catalog is intended to serve as an orientation for the master's program, both in structure and content. For detailed regulations, please see the official examination regulations under www.lmu.de/studienangebot.

Contact

Program Coordinator, Dr. Martina Bryce, ees@bio.lmu.de
Application: http://www.eeslmu.de/eeswiki/Application_procedure

Module: P 1 Individual research training 1

Program Master's degree Evolution, Ecology and Systematics
(Master of Science, M.Sc.)

Assigned courses

Course type	Required course	Rotation	Class attendance	Preparation	ECTS
Practical course	P 1.1 Practical course: Individual Research Training 1: Lab Rotation	WS	6 h (0,4 SWS)	114 h	4
Seminar	P 1.2 Seminar: Skills 1: Scientific Writing	WS	30 h (2 SWS)	30 h	2

This module is comprised of 6 ECTS points. Class attendance is 2.4 SWS ; total time, including preparation time, is 180 h.

Type of module Required module with required courses.

Applicability to other degree programs

Elective guidelines None

Entry requirements None

Level Recommended semester: 1

Duration The module spans 1 semester.

Content

In this module, students work in the lab, learn a method, and carry out a small project. They write a report and give a presentation about their work. In the writing course, students learn the necessary writing skills.

In detail: Students get a thorough and hands-on review of a major research project. They do literature search and read the relevant literature and talk to all the people in the lab who are involved in the project. They learn about the methods and contribute a small sub-project (e.g. measurement) of their own. They do a short (15 min) presentation in the group where they did the research. They write a report on the project and their own contribution. They receive feedback on the report and improve it. Students learn how to do literature search. They learn how to write short

reviews: concise summaries of several articles. They learn how to write the different parts of a scientific paper: abstract, introduction, material and methods, results, conclusion and discussion. They practice writing, get feedback and give each other feedback.

Qualification goals

Students are introduced to research in practice and acquire writing skills. They learn about everyday life in research and about the scientific background, research plan, methods of a particular research project. They communicate about their work. Students are able to conduct a literature search. They are able to write reviews and they know the basics of writing a scientific paper.

Module assessment

Manuscript, presentation

Grading

The module is graded.

Pass/fail conditions for ECTS points

ECTS points are awarded for passing the exam, which is allocated to the module.

Responsible person

Dr. Volker Witte

Language

English

Additional information

Module: P 2 Presentation and discussion of scientific studies

Program Master's degree Evolution, Ecology and Systematics
(Master of Science, M.Sc.)

Assigned courses

Course type	Required course	Rotation	Class attendance	Preparation	ECTS
Seminar	P 2.1 Seminar and discussion 1: Species Concept and Adaptation	WS	30 h (2 SWS)	60 h	3
Seminar	P 2.2 Seminar: Skills 2: Presentation and discussion of scientific studies	WS	30 h (2 SWS)	30 h	2
Exercise	P 2.3 Exercise: Preparatory Math Course	WS	15 h (1 SWS)	15 h	1

This module is comprised of 6 ECTS points. Class attendance is 5 SWS ; total time, including preparation time, is 180 h.

Type of module Required module with required courses.

Applicability to other degree programs

Elective guidelines None

Entry requirements None

Level Recommended semester: 1

Duration The module spans 1 semester.

Content In this module, students are trained in giving scientific presentations. They prepare and improve presentations and discuss the scientific topics of the presentations. Students read scientific publications, which treat the topics adaptation, species concept and speciation from different angles. They lead discussions and take part in discussions about the scientific issues raised in these studies. The students learn elementary approaches of evolutionary and ecological modeling. The necessary mathematical concepts (such as infinite sums, recursions, functions, derivatives, integrals, differential equation systems, and probabilities) are repeated or introduced, respectively. The students learn the mathematical basics

that are necessary for understanding the theoretical contents of the subsequent courses about ecology and evolutionary biology.

Qualification goals

Students learn to communicate verbally about science. The students know why and how adaptation and speciation play a central role in evolution, ecology and systematics. They have read important publications on these central topics. They have gathered experience giving presentations in different formats, asking critical questions about scientific studies, participating in and leading of discussions. Students also refresh and learn basic principles of mathematics, which are vital to their further studies of evolution, ecology and systematics.

Module assessment

Presentation and exercise.

Grading

The module is graded.

Pass/fail conditions for ECTS points

ECTS points are awarded for passing the exam, which is allocated to the module.

Responsible person

Prof. Dr. Dirk Metzler

Language

English

Additional information

Module: P 3 Evolutionary Genetics

Program Master's degree Evolution, Ecology and Systematics
(Master of Science, M.Sc.)

Assigned courses

Course type	Required course	Rotation	Class attendance	Preparation	ECTS
Lecture	P 3.1 Lecture; Evolutionary Genetics	WS	60 h (4 SWS)	60 h	4
Tutorial	P 3.2 Tutorial: Evolutionary Genetics	WS	15 h (1 SWS)	45 h	2

This module is comprised of 6 ECTS points. Class attendance is 5 SWS ; total time, including preparation time, is 180 h.

Type of module Required module with required courses.

Applicability to other degree programs

Elective guidelines None

Entry requirements None

Level Recommended semester: 1

Duration The module spans 1 semester.

Content This module is one of the three basic modules in the first semester. Students will be introduced to the main topics of Evolutionary Genetics. They will learn basic theory, methods and examples from molecular population genetics, quantitative genetics, evolutionary genomics, Evo-Devo, rates of evolution. Furthermore, they receive questions and tasks, which must be answered in small teams. This requires literature search and further reading in textbooks and publications. The results are presented and discussed.

Qualification goals Students will have background knowledge in Evolutionary Genetics; they will get familiar with important terminology and important theory. They acquire a firm knowledge of the principles of evolutionary genetics on the phenotypic and the molecular side. They get exposed to problems of contemporary research and learn how the

basic concepts apply in this context. By conducting exercises, students work through the content of the lecture and acquire a firm understanding of the topics covered in the lecture.

Module assessmentExam

GradingThe module is graded.

Pass/fail conditions for ECTS pointsECTS points are awarded for passing the exam, which is allocated to the module.

Responsible personProf. Dr. Wolfgang Stephan

LanguageEnglish

Additional information

Module: P 4 Evolutionary Ecology

Program Master's degree Evolution, Ecology and Systematics
(Master of Science, M.Sc.)

Assigned courses

Course type	Required course	Rotation	Class attendance	Preparation	ECTS
Lecture	P 4.1 Lecture: Evolutionary Ecology	WS	60 h (4 SWS)	60 h	4
Tutorial	P 4.2 Tutorial: Evolutionary Ecology	WS	15 h (1 SWS)	45 h	2

This module is comprised of 6 ECTS points. Class attendance is 5 SWS ; total time, including preparation time, is 180 h.

Type of module Required module with required courses.

Applicability to other degree programs

Elective guidelines None

Entry requirements None

Level Recommended semester: 1

Duration The module spans 1 semester.

Content This module is one of the three basic modules in the first semester. Students will be introduced to the main topics of Evolutionary Ecology. They will get an overview of the important topics in Evolutionary Ecology. The following topics will be discussed: plasticity and the ecological niche, physiological ecology, life history theory, reproductive behavioural ecology, population dynamics, species interactions, competition, community ecology, ecosystem ecology. Students receive questions and tasks, which must be answered in small teams. This requires literature search and further reading in textbooks and publications. The results are presented and discussed in the tutorial.

Qualification goals Students receive background knowledge in Evolutionary Ecology; they are familiar with important terminology and important theory and acquire a firm knowledge of the

principles of Evolutionary Ecology.

Module assessment

Exam

Grading

The module is graded.

Pass/fail conditions for ECTS points

ECTS points are awarded for passing the exam, which is allocated to the module.

Responsible person

Prof. Dr. Niels Dingemanse, Prof. Dr. Herwig Stibor.

Language

English

Additional information

Module: P 5 Systematic Data and Evidence

Program Master's degree Evolution, Ecology and Systematics
(Master of Science, M.Sc.)

Assigned courses

Course type	Required course	Rotation	Class attendance	Preparation	ECTS
Lecture	P 5.1 Lecture: Systematic Data and Evidence	WS	60 h (4 SWS)	60 h	4
Tutorial	P 5.2 Tutorial: Systematic Data and Evidence	WS	15 h (1 SWS)	45 h	2

This module is comprised of 6 ECTS points. Class attendance is 5 SWS ; total time, including preparation time, is 180 h.

Type of module Required module with required courses.

Applicability to other degree programs

Elective guidelines None

Entry requirements None

Level Recommended semester: 1

Duration The module spans 1 semester.

Content This module is one of the three basic modules in the first semester. Students will be introduced to the main topics of Systematics. In this lecture, a choice of the following topics will be discussed: paleontological and biogeographical data; the kinds of data used in primatology; speciation and radiations (diversity hotspots); principles of phylogenetics tree inference; introduction to biological collecting and collections (including visits to the Bavarian Natural History collections); taxon-specific approaches and problems (e.g., species concepts in bacteria vs. species concepts in higher organisms); role of organismic interactions in the evolution of adaptation; role of Systematics in Evolutionary Biology. Students receive questions and tasks, which must be answered in small teams. This requires literature search and further reading in textbooks and publications. The results are

presented and discussed in the tutorial.

Qualification goals

Students receive background knowledge in Systematics; they are familiar with important terminology and important theory. Participants acquire a firm understanding of the kinds of data with which phylogenetic relationships and macroevolution can be inferred. They also understand and are able to discuss some problems in Systematics. They know the role of Systematics in Evolutionary Biology.

Module assessment

Exam

Grading

The module is graded.

Pass/fail conditions for ECTS points

ECTS points are awarded for passing the exam, which is allocated to the module.

Responsible person

Prof. Dr. Susanne Renner

Language

English

Additional information

Module: P 6 Individual Research Training 2

Program Master's degree Evolution, Ecology and Systematics
(Master of Science, M.Sc.)

Assigned courses

Course type	Required course	Rotation	Class attendance	Preparation	ECTS
Practical course	P 6.1 Practical course: Individual Research Training 2: Research and Presentation	SS	6 h (0,4 SWS)	144 h	5
Seminar	P 6.2 Seminar: Skills 3: Presentation Skills	SS	15 h (1 SWS)	15 h	1
Seminar	P 6.3 Seminar and discussion 2: Classical themes in Evolution, Ecology and Systematics	SS	30 h (2 SWS)	60 h	3

This module is comprised of 9 ECTS points. Class attendance is 3.4 SWS ; total time, including preparation time, is 270 h.

Type of module Required module with required courses.

Applicability to other degree programs

Elective guidelines None

Entry requirements Pass P.1.1

Level Recommended semester: 2

Duration The module spans 1 semester.

Content Students conduct a larger (semester-long) independent research project, write a manuscript and present a poster. The IRT2 module must be carried out in a different lab from IRT1. Projects will usually be suggested by the lab advisor, but should be developed further by the student.

In detail: Students carry out a small research project on a topic in the fields of Evolution, Ecology and Systematics. They do a literature search and read relevant literature. They write a small research plan, discuss it with various people in the research group and carry it out. They write a report in the style of a scientific manuscript about their

work. Students learn how to make a poster using standard software. They also learn about software for layout and making figures. They apply this knowledge by preparing a poster about their IRT research project, which is presented at the EES conference.

The seminar is co-taught by three faculty members representing Evolution, Ecology and Systematics. Students read scientific publications on chosen classical themes of these three research areas. They prepare presentations in different formats on selected scientific studies. They are trained to lead discussions and to contribute to discussions on topics of the publications. The studies relate to classic topics from ecology, evolution and systematics and are chosen by the lecturers.

Qualification goals

Students acquire further research experience, write a manuscript and present a poster. They learn how to conduct a small independent research project of their own and write a paper about it. Students know how to present their work as a poster, including layout for tables and figures. Students read and discuss a series of publications on classical topics from Ecology, Evolution and Systematics. They gather experience with presentations of different formats. They improve their ability to ask critical questions on scientific studies and of contributing to and leading discussions.

Module assessment

Manuscript, poster

Grading

The module is graded.

Pass/fail conditions for ECTS points

ECTS points are awarded for passing the exams, which are allocated to the module.

Responsible person

Dr. Justina Wolinska

Language

English

Additional information

Module: P 7 Statistics and field trip

Program Master's degree Evolution, Ecology and Systematics
(Master of Science, M.Sc.)

Assigned courses

Course type	Required course	Rotation	Class attendance	Preparation	ECTS
Lecture	P 7.1 Lecture: Statistics	SS	30 h (2 SWS)	30 h	(2)
Exercise	P 7.2 Exercise: Statistics	SS	15 h (1 SWS)	15 h	(1)
Seminar	P 7.3 EES field trip Seminar	SS	15 h (1 SWS)	15 h	(1)
Excursion	P 7.4 EES field trip participation	SS	30 h (2 SWS)	30 h	(2)

This module is comprised of 6 ECTS points. Class attendance is 6 SWS ; total time, including preparation time, is 180 h.

Type of module Required module with required courses.

Applicability to other degree programs

Elective guidelines None

Entry requirements None

Level Recommended semester: 2

Duration The module spans 1 semester.

Content

The lectures will provide the students with overview and background knowledge about the most important topics in statistics for biologists. In the practical course they will apply the knowledge they have gathered, while getting familiar with main statistics software. The topics of this lecture are applied statistical testing, analysis of variance, regression and likelihood methods.

The students subsequently participate in an interdisciplinary one-week excursion. They will investigate an ecosystem from different angles, carry out small scientific projects and analyze their data statistically.

Qualification goals In this module, students acquire a firm knowledge of fundamental statistical principles and methods. Students

learn how to use the statistics software R and to apply their knowledge to practical course problems. They learn to apply and critically assess statistical rationales. In addition, they are introduced to a number of field methods and to the identification of relevant taxa.

Module assessment Presentation and report

Grading The module is graded.

Pass/fail conditions for ECTS points ECTS points are awarded for passing the exams, which are allocated to the module.

Responsible person Prof. Dr. Niels Dingemans

Language English

Additional information

Module: P 8 Concepts and Methods in Subdisciplines of Evolution, Ecology and Systematics and Related Fields

Program Master's degree Evolution, Ecology and Systematics
(Master of Science, M.Sc.)

Assigned courses

Course type	Required course	Rotation	Class attendance	Preparation	ECTS
Lecture	P 8.0.1 Lecture: Introduction to Evolutionary Genomics	SS	30 h (2 SWS)	30 h	(2)
* Exercise	P 8.0.2 Exercise: Introduction to Evolutionary Genomics	SS	15 h (1 SWS)	15 h	(1)
Lecture	P 8.0.3 Lecture: Advanced Evolutionary Genomics	SS	30 h (2 SWS)	30 h	(2)
* Exercise	P 8.0.4 Exercise: Advanced Evolutionary Genomics	SS	15 h (1 SWS)	15 h	(1)
Lecture	P 8.0.5 Lecture: Population Genetics	SS	30 h (2 SWS)	30 h	(2)
* Exercise	P 8.0.6 Exercise: Population Genetics	SS	60 h (4 SWS)	60 h	(4)
Lecture	P 8.0.7 Lecture: Functional Morphology	SS	8 h (0,5 SWS)	22 h	(1)
* Practical course	P 8.0.8 Practical course: Functional Morphology	SS	38 h (2,5 SWS)	22 h	(2)
Lecture	P 8.0.9 Lecture: Modern topics in Evolutionary Genetics	WS and SS	15 h (1 SWS)	15 h	(1)
* Exercise	P 8.0.10 Exercise: Modern topics in Evolutionary Genetics	WS and SS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.11 Lecture: Empirical Evolutionary Genetics	WS and SS	15 h (1 SWS)	15 h	(1)
* Practical course	P 8.0.12 Practical course: Empirical Evolutionary Genetics	WS and SS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.13 Lecture: Ecophysiology	SS	8 h (0,5 SWS)	22 h	(1)
* Practical course	P 8.0.14 Practical course: Ecophysiology	SS	45 h (3 SWS)	15 h	(2)
Seminar	P 8.0.15 Seminar: Summer school preparation	SS	15 h (1 SWS)	15 h	(1)

* Summer school	P 8.0.16 Summer school Participation	SS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.17 Lecture: Principles of Behavioural Ecology	SS	30 h (2 SWS)	45 h	(2,5)
* Practical course	P 8.0.18 Practical course: Principles of Behavioural Ecology	SS	8 h (0,5 SWS)	7 h	(0,5)
Practical course	P 8.0.19 Practical course: Experimental Behavioural Ecology	SS	45 h (3 SWS)	15 h	(2)
* Seminar	P 8.0.20 Seminar: Experimental Behavioural Ecology	SS	15 h (1 SWS)	15 h	(1)
Lecture	P 8.0.21 Lecture: Soil Mycomicrobiology	SS	8 h (0,5 SWS)	22 h	(1)
* Practical course	P 8.0.22 Practical course: Soil Mycomicrobiology	SS	45 h (3 SWS)	15 h	(2)
Lecture	P 8.0.23 Lecture: Empirical Evolutionary Ecology	WS and SS	15 h (1 SWS)	15 h	(1)
* Practical course	P 8.0.24 Practical course: Experimental Behavioural Ecology	WS and SS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.25 Lecture: Advanced topics in Ecology	WS and SS	15 h (1 SWS)	15 h	(1)
* Exercise	P 8.0.26 Exercise: Advanced topics in Ecology	WS and SS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.27 Lecture: Special topics in Ecology	WS and SS	15 h (1 SWS)	15 h	(1)
* Practical course	P 8.0.28 Practical course: Special topics in Ecology	WS and SS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.29 Lecture: Mycology	SS	15 h (1 SWS)	30 h	(1,5)
* Practical course	P 8.0.30 Practical course: Mycology	SS	30 h (2 SWS)	15 h	(1,5)
Lecture	P 8.0.31 Lecture: Phylogenetics of Plants	WS and SS	15 h (1 SWS)	15 h	(1)
* Practical course	P 8.0.32 Practical course: Phylogenetics of Plants	WS and SS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.33 Lecture: Multivariate Statistics	SS	15 h (1 SWS)	15 h	(1)
* Exercise	P 8.0.34 Exercise: Multivariate Statistics	SS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.35 Lecture: Introduction to Satellite Remote Sensing and GIS	SS	15 h (1 SWS)	15 h	(1)
* Exercise	P 8.0.36 Exercise: Introduction to Satellite	SS	30 h (2 SWS)	30 h	(2)

	Remote Sensing and GIS					
Lecture	P 8.0.37 Lecture: Marine Biology	SS	30 h (2 SWS)	30 h	(2)	
* Practical course	P 8.0.38 Practical course: Marine Biology	SS	60 h (4 SWS)	60 h	(4)	
Lecture	P 8.0.39 Lecture: Field Mycology	SS	15 h (1 SWS)	15 h	(1)	
* Excursion and practical course	P 8.0.40 Excursion and practical course: Field Mycology:	SS	45 h (3 SWS)	15 h	(2)	
Lecture	P 8.0.41 Lecture: Palaeobiology	WS	30 h (2 SWS)	30 h	(2)	
* Practical course	P 8.0.42 Practical course: Palaeobiology	WS	30 h (2 SWS)	0 h	(1)	
Lecture	P 8.0.43 Lecture: Microbiology	WS and SS	30 h (2 SWS)	30 h	(2)	
* Practical course	P 8.0.44 Practical course: Microbiology	WS and SS	30 h (2 SWS)	0 h	(1)	
Lecture	P 8.0.45 Lecture: Genetics	WS and SS	30 h (2 SWS)	30 h	(2)	
* Practical course	P 8.0.46 Practical course: Genetics	WS and SS	30 h (2 SWS)	0 h	(1)	
Lecture	P 8.0.47 Lecture: Advanced topics in General Biology	WS and SS	15 h (1 SWS)	15 h	(1)	
* Exercise	P 8.0.48 Exercise: Advanced topics in General Biology	WS and SS	30 h (2 SWS)	30 h	(2)	
Lecture	P 8.0.49 Lecture: Empirical topics in General Biology	WS and SS	15 h (1 SWS)	15 h	(1)	
* Practical course	P 8.0.50 Practical course: Empirical topics in General Biology	WS and SS	30 h (2 SWS)	30 h	(2)	
Lecture	P 8.0.51 Lecture: Bioinformatics for Biologists	WS and SS	30 h (2 SWS)	30 h	(2)	
* Practical course	P 8.0.52 Practical course: Bioinformatics for Biologists	WS and SS	60 h (4 SWS)	60 h	(4)	
Lecture	P 8.0.53 Lecture: Evolutionary Ecology Modeling	WS	15 h (1 SWS)	45 h	(2)	
* Exercise	P 8.0.54 Exercise: Evolutionary Ecology Modeling	WS	30 h (2 SWS)	90 h	(4)	
Lecture	P 8.0.55 Lecture: Functional Anatomy and Archaeobiology	WS	15 h (1 SWS)	15 h	(1)	

* Practical course	P 8.0.56 Practical course: Functional Anatomy and Archaeobiology	WS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.57 Lecture: Biogeography and Nature Conservation	WS	15 h (1 SWS)	15 h	(1)
* Practical course	P 8.0.58 Practical course: Biogeography and Nature Conservation	WS	45 h (3 SWS)	15 h	(2)
Lecture	P 8.0.59 Lecture: Advanced topics in Phylogenetics	WS and SS	15 h (1 SWS)	15 h	(1)
* Exercise	P 8.0.60 Exercise: Advanced topics in Phylogenetics	WS and SS	45 h (3 SWS)	15 h	(2)
Lecture	P 8.0.61 Lecture: Special topics in Systematics	WS and SS	15 h (1 SWS)	15 h	(1)
* Exercise	P 8.0.62 Exercise: Special topics in Systematics	WS and SS	45 h (3 SWS)	15 h	(2)
Lecture	P 8.0.63 Lecture: Changing focuses in Systematics	WS and SS	15 h (1 SWS)	15 h	(1)
* Exercise	P 8.0.64 Exercise: Changing focuses in Systematics	WS and SS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.65 Lecture: Forefront of Systematics	WS and SS	15 h (1 SWS)	15 h	(1)
* Practical course	P 8.0.66 Practical course: Forefront of Systematics	WS and SS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.67 Lecture: Invertebrates	WS	30 h (2 SWS)	60 h	(3)
* Practical course	P 8.0.68 Practical course: Invertebrates	WS	45 h (3 SWS)	45 h	(3)
Lecture	P 8.0.69 Lecture: Phylogenetic analysis of morphological and molecular characters	WS	30 h (2 SWS)	60 h	(3)
* Practical course	P 8.0.70 Practical course: Phylogenetic analysis of morphological and molecular characters	WS	45 h (3 SWS)	45 h	(3)
Seminar	P 8.0.71 Seminar: Experimental Community Ecology	WS	15 h (1 SWS)	15 h	(1)
* Practical course	P 8.0.72 Exercise: Experimental community Ecology	WS	30 h (2 SWS)	30 h	(2)
Seminar	P 8.0.73 Seminar: Experimental plankton	WS	15 h (1 SWS)	15 h	(1)

* Practical course	Ecology P 8.0.74 Practical course: Experimental plankton	WS	30 h (2 SWS)	30 h	(2)
Lecture	Ecology P 8.0.75 Lecture: Molecular clock dating – A practical course introduction	WS	15 h (1 SWS)	15 h	(1)
* Exercise	P 8.0.76 Exercise: Molecular clock dating – A practical course introduction	WS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.77 Lecture: Statistical-computational methods in Phylogenetics I	WS	15 h (1 SWS)	15 h	(1)
* Exercise	P 8.0.78 Exercise: Statistical-computational methods in Phylogenetics I	WS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.79 Lecture: Computational methods in Population Genetics I	WS	15 h (1 SWS)	15 h	(1)
* Exercise	P 8.0.80 Exercise: Computational methods in Population Genetics I	WS	30 h (2 SWS)	30 h	(2)
Lecture	P 8.0.81 Lecture: An introduction to R	WS	15 h (1 SWS)	15 h	(1)
* Exercise	P 8.0.82 Exercise: An introduction to R	WS	30 h (2 SWS)	30 h	(2)
Exercise	P 8.0.83 Exercise: PERL for beginners	WS	60 h (4 SWS)	30 h	3
Practical course	P 8.0.84 Internship 1	WS and SS	45 h (3 SWS)	45 h	3
Practical course	P 8.0.85 Internship 2	WS and SS	45 h (3 SWS)	45 h	3
Workshop	P 8.0.86 Workshop 1	WS and SS	45 h (3 SWS)	45 h	3
Workshop	P 8.0.87 Workshop 2	WS and SS	45 h (3 SWS)	45 h	3

* This course and the lecture above can be only chosen together.

This module is comprised of 24 ECTS points: a maximum of 6 ECTS can be chosen from related fields P.0.37-P8.0.52. Class attendance is 18-26 SWS ; total time, including preparation time, is about 720 h.

Type of module Mandatory module with elective courses.

Applicability to other degree Master Biology

programs

Elective guidelines	This module is comprised of 24 ECTS points: a maximum of 6 ECTS can be chosen from related fields P.0.37-P8.0.52. Class attendance is 18-26 SWS ; total time, including preparation time, is about 720 h.
Entry requirements	None
Level	Recommended semester: 2, 3
Duration	The module spans 1 semester.
Content	In complementary theoretical and practical course classes, students will be introduced in depth to concepts and methods in selected fields of evolution, ecology and systematics and related disciplines.
Qualification goals	Students acquire a firm knowledge of specific concepts and methods in selected fields of Evolution, Ecology and Systematics and related disciplines.
Module assessment	See individual courses.
Grading	The module is graded.
Pass/fail conditions for ECTS points	ECTS points are awarded for passing the exams, which are allocated to the module.
Responsible person	Prof. Dr. John Parsch
Language	English
Additional information	See „Vorlesungsverzeichnis“ LMU for choosing the courses; https://lsf.verwaltung.uni-muenchen.de

Module: P 9 Individual Research Training 3

Program Master's degree Evolution, Ecology and Systematics
(Master of Science, M.Sc.)

Assigned courses

Course type	Required course	Rotation	Class attendance	Preparation	ECTS
Practical course	P 9.1 Practical course: Individual research training 3: Pilot study	WS	9 h (0,6 SWS)	291 h	10
Seminar	P 9.2 Seminar: Skills 4: Grant writing	WS	30 h (2 SWS)	30 h	2
Seminar	P 9.3 Seminar and discussion 3: Hot topics in Evolution, Ecology and Systematics	WS	30 h (2 SWS)	60 h	3

This module is comprised of 15 ECTS points. Class attendance is 4.6 SWS ; total time, including preparation time, is 450 h.

Type of module Required module with required courses.

Applicability to other degree programs

Elective guidelines None

Entry requirements Pass P.6.1

Level Recommended semester: 3

Duration The module spans 1 semester.

Content Students carry out a pilot study as preparation for their master's thesis. The topic of the project should be in the field of Evolution, Ecology or Systematics. They find and read relevant literature. They write a small research plan and discuss this plan with various people. They collect preliminary data and /or do some preliminary analysis. They do a short (15 minutes) presentation in the group where they did the research. They write a grant proposal whose form follows standards from a big grant agency (e.g. DFG). They learn how to make a time plan and a budget. They get an overview of the most important grant agencies in Germany and Europe. They also learn how to compile a good job application, including CV and

statement of interest.

The seminar is co-taught by three faculty members representing evolution, ecology and systematics. Students read scientific publications on hotly debated issues in the three research areas. They prepare presentations of different formats on important scientific contributions. Students also lead and contribute to scholarly discussions on the topics of the studies. The publications on hotly debated topics in Ecology, Evolution and Systematics are chosen by the lecturers.

Qualification goals

Students learn how to design a research project and write a scientific grant proposal based on preliminary data or analyzes from their own pilot study. Students will be able to write a good job application and grant proposal. They will know the most important funding agencies of Germany and Europe. Students will have read and disputed a series of scientific studies on hotly debated topics in Ecology, Evolution and Systematics. They will further improve their experience with presentations in different formats, asking critical questions about papers, participating in and leading of discussions.

Module assessment

Manuscript, presentation

Grading

The module is graded.

Pass/fail conditions for ECTS points

ECTS points are awarded for passing the exam, which is allocated to the module.

Responsible person

Dr. Stefan Laurent, Prof. Dr. Wolfgang Stephan

Language

English

Additional information

Modul: P 10 Preparation for the master's thesis

Program

Master's degree Evolution, Ecology and Systematics
(Master of Science, M.Sc.)

Assigned courses

Course type	Required course	Rotation	Class attendance	Preparation	ECTS
Lecture	P 10.0.1 Lecture: Special topics 1	WS und SS	15 h (1 SWS)	30 h	(1,5)
* Exercise	P 10.0.2 Exercise: Special topics 1	WS und SS	30 h (2 SWS)	15 h	(1,5)
Lecture	P 10.0.3 Lecture: Special topics 2	WS und SS	15 h (1 SWS)	30 h	(1,5)
* Exercise	P 10.0.4 Exercise: Special topics 2	WS und SS	30 h (2 SWS)	15 h	(1,5)
Lecture	P 10.0.5 Lecture: Theoretical methods 1	WS und SS	15 h (1 SWS)	30 h	(1,5)
* Exercise	P 10.0.6 Exercise: Theoretical methods 1	WS und SS	30 h (2 SWS)	15 h	(1,5)
Lecture	P 10.0.7 Lecture: Theoretical methods 2	WS und SS	15 h (1 SWS)	30 h	(1,5)
* Exercise	P 10.0.8 Exercise: Theoretical methods 2	WS und SS	30 h (2 SWS)	15 h	(1,5)
Lecture	P 10.0.9 Lecture: Empirical methods 1	WS und SS	15 h (1 SWS)	30 h	(1,5)
* Practical course	P 10.0.10 Practical course: Empirical methods 1	WS und SS	30 h (2 SWS)	15 h	(1,5)
Lecture	P 10.0.11 Lecture: Empirical Methods 2	WS und SS	15 h (1 SWS)	30 h	(1,5)
* Practical course	P 10.0.12 Practical course: Empirical methods 2	WS und SS	30 h (2 SWS)	15 h	(1,5)

* This course and the lecture above can be only chosen together.

This module is comprised of 6 ECTS points. Class attendance is 6 SWS ; total time, including preparation time, is 180 h.

Type of module

Mandatory module with elective courses.

Applicability to other degree programs

Elective guidelines	For courses in P10 module the following applies: Mandatory elective courses totaling 6 ECTS points are to be chosen.
Entry requirements	None
Level	Recommended semester: 3
Duration	The module spans 1 semester.
Content	In this module, students learn about concepts, new advances and methods in a specific research area which is related to their master's project.
Qualification goals	Students acquire a deeper knowledge of concepts, new advances and methods in a specific research area which is related to their master's project.
Module Assessment	ECTS points are awarded for passing the exams, which are allocated to the module.
Grading	The module is graded.
Pass/fail conditions for ECTS points	ECTS points are awarded for passing the exams, which are allocated to the module.
Responsible person	Prof. Dr. Herwig Stibor
Language	English
Additional information	See „Vorlesungsverzeichnis“ LMU for choosing the courses; https://lsf.verwaltung.uni-muenchen.de

Modul: P 11 Master Project

Program Master's degree Evolution, Ecology and Systematics
(Master of Science, M.Sc.)

Assigned courses

Course type	Required course	Rotation	Class attendance	Preparation	ECTS
Master's thesis	P 11.1 Master's thesis	SS	-	840 h	28
Presentation of the master's thesis	P 11.2 Presentation of the master's thesis	SS	-	30 h	1
Seminar	P 11.3 Seminar: Skills 5	SS	15 h (1 SWS)	15 h	1

This module is comprised of 30 ECTS points. Class attendance is 1 SWS ; total time, including preparation time, is 900 h.

Type of module Required module with required courses.

Applicability to other degree programs

Elective guidelines None

Entry requirements Pass P.9.1

Level Recommended semester: 4

Duration The module spans 1 semester.

Content This final module of the master's program consists of the master's thesis and a one hour seminar in which relevant topics for the student's future are discussed. The master's thesis is an independent research project as designed by the student in the "Individual Research Training 3" module. The topic of the project should be in the field of Evolution, Ecology or Systematics. They read relevant literature and become experts in the methods used in their work. Statistical analysis of the collected data is an important part of the project. The student writes a report (master's thesis) and presents his/her work in a 30 minute talk in the group where he/she did the work.

Qualification goals	The module requires skills in organization, strategic methodological planning and performance of experiments, documentation and interpretation of results, in addition to completion of a final thesis written according to international scientific standards. The oral presentation ensures communication skills, basic and applied knowledge in the given subject, and ability to explain specific processes in a broader context.
Module assessment	Master's thesis, presentation
Grading	The module is graded.
Pass/fail conditions for ECTS points	ECTS points are awarded for passing the exam, which is allocated to the module.
Responsible person	Qualified supervisor from the Faculty of Biology.
Language	English
Additional information	