Module Catalogue
for the Subject

Biosciences

as a Master’s with 1 major
with the degree "Master of Science"
(120 ECTS credits)

Examination regulations version: 2018
Responsible: Faculty of Biology
## Contents

The subject is divided into

**Content and Objectives of the Programme**

**Abbreviations used, Conventions, Notes, In accordance with**

**Compulsory Electives**

Subtopic 1 (Primary Topic)

Subtopic 2 (Secondary Topic)

Subtopics 1 and 2

**Module Group 1**

### Neuroscience

- Neurobiology, Behavioural Physiology and Animal Ecology
- Molecular and Clinical Neurobiology
- Endogenous Clocks
- Neuromodulation and Neuronal Development
- Neurogenetics of Behaviour
- Developmental Neurobiology and Chronobiology
- Neurobiology F1
- Neurobiology F2

### Animal Ecology and Tropical Biology

- Neurobiology, Behavioural Physiology and Animal Ecology
- Animal Ecology and Tropical Biology
- Animal Ecology and Tropical Biology 2
- Animal Ecology F1
- Animal Ecology and Tropical Biology F2

### Behavioural Physiology and Sociobiology

- Neurobiology, Behavioural Physiology and Animal Ecology
- Animal Communication
- Experimental Sociobiology
- Neurogenetics of Behaviour
- Behavioural Physiology and Sociobiology F1
- Behavioural Physiology and Sociobiology F2

**Module Group 2**

### Molecular Cell- and Developmental Biology

- Molecular Biology
- Cell and Developmental Biology Master 1
- Cell and Developmental Biology Master 2
- Cell and Developmental Biology F1
- Cell and Developmental Biology F2

### Molecular Parasitology

- Molecular Parasitology
- Molecular Biology
- Methods in Life Sciences
- Molecular Parasitology F1
- Molecular Parasitology F2

### Microbiology and Infection Biology

- Molecular Biology
- Infection Biology
- Pathogenicity of Microorganisms
- Microbiology F1
- Microbiology F2

### Cellular and Molecular Biotechnology

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Master's with 1 major: 120 ECTS

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Tissue Engineering
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**Biosciences**

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Content and Objectives of the Programme

The study program requires the intensive theoretical and practical training in scientific topics in Biology and Life Sciences. The graduate is able to use appropriate methods to answer scientific questions and to conduct research projects.
Abbreviations used

Course types: E = field trip, K = colloquium, O = conversatorium, P = placement/lab course, R = project, S = seminar, T = tutorial, Ü = exercise, V = lecture

Term: SS = summer semester, WS = winter semester

Methods of grading: NUM = numerical grade, B/NB = (not) successfully completed

Regulations: (L)ASPO = general academic and examination regulations (for teaching-degree programmes), FSB = subject-specific provisions, SFB = list of modules

Other: A = thesis, LV = course(s), PL = assessment(s), TN = participants, VL = prerequisite(s)

Conventions

Unless otherwise stated, courses and assessments will be held in German, assessments will be offered every semester and modules are not creditable for bonus.

Notes

Should there be the option to choose between several methods of assessment, the lecturer will agree with the module coordinator on the method of assessment to be used in the current semester by two weeks after the start of the course at the latest and will communicate this in the customary manner.

Should the module comprise more than one graded assessment, all assessments will be equally weighted, unless otherwise stated below.

Should the assessment comprise several individual assessments, successful completion of the module will require successful completion of all individual assessments.

In accordance with

the general regulations governing the degree subject described in this module catalogue:

ASPO2015

associated official publications (FSB (subject-specific provisions)/SFB (list of modules)):

04-Jul-2018 (2018-42)

14-Oct-2020 (2020-97)

This module handbook seeks to render, as accurately as possible, the data that is of statutory relevance according to the examination regulations of the degree subject. However, only the FSB (subject-specific provisions) and SFB (list of modules) in their officially published versions shall be legally binding. In the case of doubt, the provisions on, in particular, module assessments specified in the FSB/SFB shall prevail.
Compulsory Electives
(90 ECTS credits)
Subtopic 1 (Primary Topic)

(45 ECTS credits)
Subtopic 2 (Secondary Topic)
(30 ECTS credits)
Subtopics 1 and 2
(ECTS credits)

30 ECTS credits in subsidiary subject area, 45 ECTS credits in main subject area
Module Group 1

(ECTS credits)
Neuroscience

(30 ECTS credits)
## Module title

**Neurobiology, Behavioural Physiology and Animal Ecology**

### Abbreviation

07-MS1-152-m01

### Module coordinator

Dean of Studies Biologie (Biology)

### Module offered by

Faculty of Biology

### ECTS

10

### Method of grading

Numerical grade

### Only after succ. compl. of module(s)

--

### Duration

1 semester

### Module level

Graduate

### Other prerequisites

--

## Contents

Timing matters: Temporal organisation in the animal kingdom. Timing plays an important role in all living systems. Animals make use of endogenous clocks to predict and adapt to daily or seasonal changes in environmental parameters. To be at the right place at the right time is of great fitness relevance if, for example, a mating partner or enough food has to be found. Many mutualistic, antagonistic or social interactions can only take place if animals are at the same place at the same time and in the appropriate developmental stage. The lecture gives an introduction to the mechanisms underlying the temporal organisation in the animal kingdom. Adopting an integrative approach, the lecture goes from timing mechanisms on the neuronal level to individual behaviour and then to interactions in social groups, populations or partners in complex and variable ecosystems.

## Intended learning outcomes

Students get to know the advantages of an integrative approach when analysing complex biological systems. They learn to relate and integrate different fields within biology. In the seminar, students practise the discussion of research findings.

## Courses

**V (3)**

Module taught in: English

## Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes).

Language of assessment: German and/or English

## Allocation of places

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## Additional information

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## Referred to in LPO I

(examination regulations for teaching-degree programmes)

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Module title | Abbreviation
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Molecular and Clinical Neurobiology | 07-MSN-152-m01

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Contents

Content of the lecture *Molekulare und klinische Neurobiologie* (*Molecular and Clinical Neurobiology*) - cells of the nervous system, properties of neurons and glial cells - ion channels and excitability of membranes, channelopathies - synapses, transmitter release, neuromuscular end plate, Myasthenia gravis - motor activity, anatomy of the human motor system, spinal reflexes, motor neuron diseases - cerebellum, ataxia and basal ganglia, Morbus Parkinson - muscles and muscle diseases - somatosensory system and pain - hippocampus, learning and memory, anterograde amnesia, visual agnosia - cortex, Morbus Alzheimer - sleep, EEG, epilepsy - sensory physiology, vision, diseases of the visual system; Reading: Kandel, *Principles of Neural Science*, 4th Edition: A detailed description of this course is also available at [http://neurobiologie.uk-wuerzburg.de/lehrveranstaltungen.html](http://neurobiologie.uk-wuerzburg.de/lehrveranstaltungen.html). The lecture Molecular and Clinical Neurobiology (incl. seminar) and *Neuroentwicklungsbiologie* (*Neurodevelopment*); Fridays 8-9 a.m.) together form one theoretical module (10 ECTS). However, you may also complete these two modules separately and have them credited within the area of mandatory electives 2.

Intended learning outcomes

Theoretical foundations of molecular and clinical neurobiology, developmental mechanisms of neuronal diseases.

Courses

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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<td>holder of the Chair of Neurobiology and Genetics</td>
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<tr>
<td>Introduction into endogenous clocks of unicellular organisms, fungi, plants and animals, with a focus on the neuronal organisation of the clock in the brain of mammals and insects. The biological functions of endogenous clocks and the underlying mechanisms will be discussed on the molecular, cellular and organismic levels. It will be explained how clocks adjust to a 24h day with variable photoperiods. Applied aspects regarding e.g. shift work or jetlag will also be discussed.</td>
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<table>
<thead>
<tr>
<th><strong>Intended learning outcomes</strong></th>
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<tbody>
<tr>
<td>The students learn fundamental principles underlying chronobiology/endogenous clocks and obtain an insight into current research in the field. In the seminar, they practise their presentation skills and the discussion of research findings in English.</td>
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<th><strong>Courses</strong> (type, number of weekly contact hours, language — if other than German)</th>
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<tr>
<td>Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)</td>
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</table>

**Referred to in LPO I** (examination regulations for teaching-degree programmes)
### Module title

**Neuromodulation and Neuronal Development**

### Abbreviation

07-MS1NMND-152-m01

### Module coordinator

holder of the Chair of Neurobiology and Genetics

### Module offered by

Faculty of Biology

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<td>numerical grade</td>
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</table>

### Duration

1 semester

### Module level

graduate

### Contents

Neuromodulation: cellular and molecular biology of neuromodulators and their receptors, modulation of synaptic transmission and membrane potential, theoretical and functional aspects of neuromodulation, model systems used to study modulation of neuronal circuits. Fundamental principles of molecular developmental neurobiology. Focus is on the establishment of the neuroectoderm, pattern generation and regional specification, neuronal precursors, neuronal growth, differentiation of neurons, axonal pathfinding, neuronal connectivity.

### Intended learning outcomes

The students learn fundamental principles underlying neuromodulation and neuronal development and obtain an insight into current research in the field. In the seminar, students practise presenting and discussing research findings in English.

### Courses

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
### Module title

**Neurogenetics of Behaviour**

### Abbreviation

07-MS1NB-152-m01

### Module coordinator

holder of the Chair of Neurobiology and Genetics

### Module offered by

Faculty of Biology

### ECTS

10

### Method of grading

Numerical grade

### Only after succ. compl. of module(s)

--

### Duration

1 semester

### Module level

Graduate

### Other prerequisites

--

### Contents

To understand how the brain controls behaviour is at the heart of neuroscience. Both brain and behaviour can be overwhelmingly complex and plastic, yet neurogenetic methods are powerful tools to dissect the principles of how the brain controls behaviour. The lecture and seminar will give a state-of-the-art view on current and important topics of behavioural neurobiology (incl. e.g. sleep, control of appetite and feeding, social behaviour, mating, mirror neurons, molecular mechanisms of auditory-guided behaviour, neurogenetic techniques) focusing on genetic model systems such as the fruit fly Drosophila, the mouse, and the nematode C. elegans.

### Intended learning outcomes

In the lecture, students acquire theoretical and methodological insights into current topics in the field of neurogenetics in general and the neurogenetics of behaviour. In the seminar, students practice presenting and discussing research findings in English.

### Courses

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Module taught in: English

### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Contents

Lecture and seminar *Endogenous Clocks*: Students acquire an overview of endogenous clocks in unicellular organisms, fungi, plants, and animals with a focus on the neuronal organisation of the endogenous clock in the brain of mammals and insects. Students learn about the biological purpose of endogenous clocks, their function on a molecular, cellular, and organismic level, as well as their adaptation to 24 hour days with varying hours of daylight. Related aspects of jetlag and shift-work are discussed. Lecture *Neuronal Development: Fundamentals* of neuronal development on the molecular level. Main focus is the establishment of the neuroectoderm, pattern formation, regional subdivision, neuronal progenitor cells, cell growth, differentiation of neurons, axonal navigation, and neuronal circuitry.

### Intended learning outcomes

Students acquire a fundamental knowledge and understanding of endogenous clocks and neuronal development and gain an insight into current research. Students also learn to independently work on reading assignments and to research specific questions that arise in their reading. Results of the students’ independent study are critically discussed in the seminar.

### Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: English

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

--
**Module title** | **Abbreviation**
---|---
Neurobiology F1 | 07-MS1NF1-152-m01

**Module coordinator**
holder of the Chair of Neurobiology and Genetics

**Module offered by**
Faculty of Biology

**ECTS** | **Method of grading** | **Duration** | **Module level** | **Other prerequisites**
---|---|---|---|---
10 | numerical grade | 1 semester | graduate | --

**Contents**
A current topic in the field of neurobiology will be investigated. The practical course will be offered in different specialisations: molecular, clinical, cellular, developmental or behavioural neurobiology or in neurogenetics. In addition to a literature search, a variety of neurobiological methods (for example: electrophysiology, immunohistochemistry, molecular biological techniques, clinical and neurogenetic techniques) and different model systems are offered. The experimental results will be documented and presented in the form of a scientific talk, a publication or a seminar paper.

**Intended learning outcomes**
The participants are able to conduct scientific research within the field of neurobiology. They have acquired the knowledge and skills (e. g. basic and advanced knowledge, special knowledge, advanced methodological background, general and specific methods) to carry out and document neurobiological experiments according to best practice.

**Courses**
(P (14) + S (1))
Module taught in: German and/or English

**Method of assessment**
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)
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<th>Module level</th>
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<td>1 semester</td>
<td>graduate</td>
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### Contents

The students will independently work on a smaller project within a current line of research at the Chair. Neurobiological, genetic or molecular techniques will be tested and adapted according to the research aim. The progress of the experiments and the current line of research will be documented and presented in the form of a scientific talk, a publication or a seminar paper.

### Intended learning outcomes

The participants are able to independently conduct scientific research within the field of neurobiology and to adapt a research plan according to the experimental progress. They have acquired the knowledge and skills (e.g. basic and advanced knowledge, special knowledge, advanced methodological background, general and specific methods) to independently carry out, document and interpret neurobiological experiments according to best practice.

### Courses

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<thead>
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<th>Type, number of weekly contact hours, language — if other than German</th>
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Module taught in: German and/or English

### Method of assessment

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Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

--
Animal Ecology and Tropical Biology
(30 ECTS credits)
# Module: Neurobiology, Behavioural Physiology and Animal Ecology

**Module title:** Neurobiology, Behavioural Physiology and Animal Ecology  
**Abbreviation:** 07-MS1-152-m01

**Module coordinator:** Dean of Studies Biologie (Biology)  
**Module offered by:** Faculty of Biology

<table>
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**Contents**

Timing matters: Temporal organisation in the animal kingdom. Timing plays an important role in all living systems. Animals make use of endogenous clocks to predict and adapt to daily or seasonal changes in environmental parameters. To be at the right place at the right time is of great fitness relevance if, for example, a mating partner or enough food has to be found. Many mutualistic, antagonistic or social interactions can only take place if animals are at the same place at the same time and in the appropriate developmental stage. The lecture gives an introduction to the mechanisms underlying the temporal organisation in the animal kingdom. Adopting an integrative approach, the lecture goes from timing mechanisms on the neuronal level to individual behaviour and then to interactions in social groups, populations or partners in complex and variable ecosystems.

**Intended learning outcomes**

Students get to know the advantages of an integrative approach when analysing complex biological systems. They learn to relate and integrate different fields within biology. In the seminar, students practise the discussion of research findings.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (3)  
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)  
Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title  | Abbreviation
---|---
Animal Ecology and Tropical Biology | 07-MS1TÖ-152-m01

Module coordinator  | Module offered by
holder of the Chair of Animal Ecology and Tropical Biology | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
10 | numerical grade | --

Duration | Module level | Other prerequisites
1 semester | graduate | --

Contents
This module consists of a lecture and a seminar. The lecture gives an overview of the theoretical foundations and current issues in animal ecology. Focus will be on biodiversity and ecosystem functions, multi-trophic interactions and food nets, evolutionary ecology, chemical ecology, tropical ecology, agricultural ecology, and global change. In the seminar, recent scientific publications within the topics mentioned above will be presented and discussed.

Intended learning outcomes
The students will acquire an advanced knowledge of ecological theories and current research issues in the field of animal ecology. They will be able to interpret scientific publications and apply the acquired knowledge to the solution of current environmental risks.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
### Module title

**Animal Ecology and Tropical Biology 2**

| Abbreviation | 07-MS1TÖ2-152-m01 |

### Module coordinator

holder of the Chair of Animal Ecology and Tropical Biology

### Module offered by

Faculty of Biology

### ECTS

<table>
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### Duration

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<td>1 semester</td>
<td>graduate</td>
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</table>

### Contents

This module provides the fundamentals of the biology of tropical habitats and tropical communities. A special focus is on the global significance of tropical systems (ecosystem goods and ecosystem services), but the biological features of these highly diverse biomes are also highlighted.

### Intended learning outcomes

The students will acquire deep knowledge of ecological theories and up-to-date research issues in the field of animal ecology of the tropics. They will be qualified to interpret scientific work and apply the knowledge they have acquired to the solution of current environmental risks.

### Courses

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Module title  Animal Ecology F1
Abbreviation  07-MS1TÖF1-152-m01

Module coordinator  holder of the Chair of Animal Ecology and Tropical Biology
Module offered by  Faculty of Biology

ECTS  10
Method of grading  Only after succ. compl. of module(s)
Numerical grade  --

Duration  1 semester
Module level  graduate
Other prerequisites  --

Contents
This module consists of several exercises and a seminar series over the course of the entire semester. The exercises can be chosen from the following electives: 1. Wild and honeybee ecology (over the course of the semester): fundamentals and techniques of beekeeping, resource utilisation, behaviour experiments, pollinator diversity and plant-pollinator-interactions. 2. Ecology and taxonomy of insects (block, 2 weeks): observation and recording in the habitat, identification and characteristics of different arthropod groups, field experiments. 3. Ecological modelling (block, 2 weeks): current methods of ecological processes modelling, simulation models, the students' own modelling project on current issues in ecology. 4. Agroecology (block, 1 week): insect communities in agroecosystems, biological pest control in landscape context, evaluation of agri-environment schemes. 5. Forest ecology (block, 1 week): arthropod communities in forest ecosystems, methods of detection, influence of management on diversity patterns and functional groups. 6. Tropical ecology (block): small projects ecological or nature conservation-related issues to be implemented in a tropical ecosystem in East Africa. In the seminar, recent scientific publications on the topics covered in the modules listed above will be presented and discussed.

Intended learning outcomes
Students will have expanded their knowledge on ecological theories and current research issues in animal ecology. They will be able to design, perform, statistically analyse and interpret scientific research. They will be familiar with animal ecological methods and possible sources of error in data interpretation. They will have deepened their knowledge of the biology and ecology of important functional taxa of arthropods. Students will have acquired the knowledge and skills necessary to perform scientific activities in the context of an F2 practical course or a Master's thesis.

Courses  (type, number of weekly contact hours, language — if other than German)
P (14) + S (1)
Module taught in: German and/or English

Method of assessment  (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
### Animal Ecology and Tropical Biology F2

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### Contents

In the F2 practical course, students will explore a scientific question as independently as possible. They will develop hypotheses, prepare a work schedule, collect data, perform experiments in the field, greenhouse or laboratory and will statistically analyse data. Students will document the results of their work in a log similar to a short scientific paper, including an introduction, material and methods, findings and a discussion of these. Students will also be required to present their findings during a wrap-up seminar. The various research groups at the Chair of Animal Ecology and Tropical Biology offer a wide variety of opportunities for students to complete an F2 practical course in Germany, another country in Europe or in the tropics. F2 practical courses may be completed in the context of an ongoing research project of the Institute or in cooperation with other institutions. For more detailed information on the F2 practical course as well as current topics or appointments for consultations, please refer to WueCampus, check out the notice board of the Chair or contact the research groups directly.

### Intended learning outcomes

Students have gained knowledge on experimental setups and methods used in the fields of animal ecology and tropical ecology. They are qualified to design scientific research and are able to collect data and interpret them statistically. They have developed knowledge and skills that allow them to set up a scientific project for their Master's thesis.

### Courses

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Module taught in: German and/or English

### Method of assessment

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Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

--
Behavioural Physiology and Sociobiology
(30 ECTS credits)
Contents
Timing matters: Temporal organisation in the animal kingdom. Timing plays an important role in all living systems. Animals make use of endogenous clocks to predict and adapt to daily or seasonal changes in environmental parameters. To be at the right place at the right time is of great fitness relevance if - for example - a mating partner or enough food has to be found. Many mutualistic, antagonistic or social interactions can only take place if animals are at the same place at the same time and in the appropriate developmental stage. The lecture gives an introduction to the mechanisms underlying the temporal organisation in the animal kingdom. Adopting an integrative approach, the lecture goes from timing mechanisms on the neuronal level to individual behaviour and then to interactions in social groups, populations or partners in complex and variable ecosystems.

Intended learning outcomes
Students get to know the advantages of an integrative approach when analysing complex biological systems. They learn to relate and integrate different fields within biology. In the seminar, students practise the discussion of research findings.

Courses (type, number of weekly contact hours, language — if other than German)
V (3)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title | Abbreviation
--- | ---
Animal Communication | 07-MS1K-152-m01

Module coordinator | Module offered by
holder of the Chair of Behavioral Physiology and Sociobiology | Faculty of Biology

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<td>graduate</td>
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Contents

The lectures deal with physiological and neurobiological principles of the different communication channels used by animals, but also highlight adaptive values and evolutionary aspects of animal signalling. In a follow-up seminar session, students will deepen their knowledge by presenting and discussing current papers related to the topic of the lecture.

Intended learning outcomes

Students understand the value of an integrative approach when looking at complex issues in biology. They have learned to connect findings from different research areas, such as physiology, neurobiology, behaviour and ecological conditions, in order to gain a more complete picture of a topic. In addition, students have learned to present and discuss current scientific publications within a broader theoretical framework.

Courses

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

Allocation of places

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Additional information

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Referred to in LPO I
(examination regulations for teaching-degree programmes)

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<table>
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**Contents**

The lecture covers the diversity and the development of social behaviour as well as the behavioural physiology and mechanisms of neurobiology that are the basis of the organisation of social groups. A special focus is on current research in the Faculty. With the help of selected publications, the seminar will discuss and explore in more detail the topics covered in the lecture.

**Intended learning outcomes**

Students understand the value of an integrative approach when looking at complex correlations in behavioural biology. Students are able to recognise and interpret relationships between various aspects of sociobiology. They are able to formulate scientific questions in the context of sociobiology and are able to discuss cutting edge literature in depth.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
Neurogenetics of Behaviour | 07-MS1NB-152-m01

Module coordinator | Module offered by
holder of the Chair of Neurobiology and Genetics | Faculty of Biology

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<td>graduate</td>
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</table>

Contents
To understand how the brain controls behaviour is at the heart of neuroscience. Both brain and behaviour can be overwhelmingly complex and plastic, yet neurogenetic methods are powerful tools to dissect the principles of how the brain controls behaviour. The lecture and seminar will give a state-of-the art view on current and important topics of behavioural neurobiology (incl. e. g. sleep, control of appetite and feeding, social behaviour, mating, mirror neurons, molecular mechanisms of auditory-guided behaviour, neurogenetic techniques) focusing on genetic model systems such as the fruit fly Drosophila, the mouse, and the nematode C. elegans.

Intended learning outcomes
In the lecture, students acquire theoretical and methodological insights into current topics in the field of neurogenetics in general and the neurogenetics of behaviour. In the seminar, students practise presenting and discussing research findings in English.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
### Module title

Behavioral Physiology and Sociobiology F1

| Abbreviation | 07-MS1VF1-152-m01 |

### Module coordinator

holder of the Chair of Behavioral Physiology and Sociobiology

### Module offered by

Faculty of Biology

### ECTS

10

### Method of grading

numerical grade

### Only after succ. compl. of module(s)

--

### Duration

1 semester

### Module level

graduate

### Other prerequisites

--

### Contents

Students will be integrated into one of the research groups at the Chair and will independently work on one of the current topics in the field of behavioral physiology and sociobiology. They will gain an insight into the latest physiological, neurobiological and behavioral methods. The results obtained will be graphically and statistically analysed, summarised in a scientific report and presented in a talk. Please contact the research groups at the Chair for available topics and opportunities.

### Intended learning outcomes

The students are able to independently perform scientific experiments in the field of behavioral physiology and sociobiology. In addition, they are able to process and document the results obtained and to present them to a scientific audience.

### Courses

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Module taught in: German and/or English

### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
--- | ---
Behavioural Physiology and Sociobiology F2 | 07-MS1VF2-152-m01

Module coordinator | Module offered by
--- | ---
holder of the Chair of Behavioral Physiology and Sociobiology | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
--- | --- | ---
15 | (not) successfully completed | --

Duration | Module level | Other prerequisites
--- | --- | ---
1 semester | graduate | --

Contents

Students will be integrated into one of the research groups at the Chair and will independently work on one of the current topics in the field of behavioural physiology and sociobiology. They will learn to plan experimental series and to apply the latest physiological, neurobiological and behavioural methods. The results obtained will be graphically and statistically analysed, summarised in a scientific report and presented in a talk. Please contact the research groups at the Chair for available topics and opportunities.

Intended learning outcomes

The students are able to independently perform scientific experiments in the field of behavioural physiology and sociobiology. In addition, they have learned to interpret the results obtained, taking into account current literature, and to place them in the context of other research in the field.

Courses (type, number of weekly contact hours, language — if other than German)
P (29) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

--
Module Group 2
(ECTS credits)
Molecular Cell- and Developmental Biology
(30 ECTS credits)
Module title: Molecular Biology
Abbreviation: 07-MS2-152-m01

Module coordinator: Dean of Studies Biologie (Biology)
Module offered by: Faculty of Biology

ECTS: 10
Method of grading: Only after succ. compl. of module(s)
Numerical grade: --

Duration: 1 semester
Module level: Graduate
Other prerequisites: --

Contents:
Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

Intended learning outcomes:
Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

Courses:
V (3)
Module taught in: German and/or English

Method of assessment:
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

Allocation of places:
--

Additional information:
--

Referred to in LPO I (examination regulations for teaching-degree programmes):
--
### Module title

**Cell and Developmental Biology Master 1**

### Abbreviation

07-MS2ZE1-152-m01

### Module coordinator

holder of the Chair of Cell Biology and Developmental Biology

### Module offered by

Faculty of Biology

### ECTS

10

### Method of grading

Only after succ. compl. of module(s)

### Numerical grade

--

### Duration

1 semester

### Module level

graduate

### Other prerequisites

--

### Contents

The module consists of the lecture *Zellpathologie* (Cytopathology) and the seminar *Zellbiologie-Milestones und Perspektiven* (Milestones and Perspectives of Cell Biology). The lecture describes pathological states of the cell and unravels their biological causes and consequences, such as infection, apoptosis, senescence, metabolic disorders and cancer. In the seminar *Milestones and Perspectives of Cell Biology*, classic ground-breaking publications in the field of cell biology are discussed from an unusual point of view.

### Intended learning outcomes

Students possess a knowledge of the theoretical principles underlying cell pathology and are able to put this into the broader context of cell biology research.

### Courses

(type, number of weekly contact hours, language — if other than German)

<table>
<thead>
<tr>
<th>Type</th>
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<td>S</td>
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Module taught in: German and/or English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
Cell and Developmental Biology Master 2 | 07-MS2ZE2-152-m01

Module coordinator | Module offered by
holder of the Chair of Cell Biology and Developmental Biology | Faculty of Biology

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Contents
The module consists of the lecture *Signale und Differenzierung* (Signals and Differentiation) and the seminar *Entwicklungsbioziologie - Meilensteine und Perspektiven* (Milestones and Perspectives of Developmental Biology). The lecture *Signals and Differentiation* does not attempt to impart pure textbook knowledge. Instead, historically important as well as particularly interesting and important trend-setting topics in developmental biology are presented. The topics range from classical developmental subjects such as tissue regeneration and morphogenetic cell migration to molecular stem cell biology, epigenetic plasticity, origins of multicellularity and development within changing environments. In the seminar *Milestones and Perspectives of Developmental Biology*, classic ground-breaking publications in the field of developmental biology are discussed from an unusual point of view.

Intended learning outcomes
Participants possess a knowledge of the theoretical and molecular biological principles underlying developmental biology and are able to put this into the broader context of cell and developmental biology research.

Courses (type, number of weekly contact hours, language — if other than German)
V (1) + S (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
### Module title

Cell and Developmental Biology F1

### Abbreviation

07-MS2ZEF1-152-m01

### Module coordinator

holder of the Chair of Cell Biology and Developmental Biology

### Module offered by

Faculty of Biology

### ECTS

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</tbody>
</table>

### Duration

1 semester

### Module level

graduate

### Other prerequisites

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### Contents

This 5 week full-time practical course provides an introduction to modern cell and developmental biology-related methods with a focus on bio-imaging techniques. A broad variety of model organisms is covered and the participants are encouraged to independently design and perform their own experiments. Participants use their acquired technological skills to analyse important basic biological processes. Large parts of this practical course are devoted to small projects, which should provide sustained insights into current research activities of the Chair. Interactions with Master's students, doctoral researchers and post-docs prepare participants for a working in a team-based environment.

### Intended learning outcomes

The participants are able to approach complex scientific questions in the fields of cell and developmental biology and to independently implement acquired methodological tools to answer these questions. They are able to perform and document cell and developmental biology-related experiments, adhering to a generally accepted code of scientific practice.

### Courses (type, number of weekly contact hours, language — if other than German)

P (14) + S (1)

Module taught in: German and/or English

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

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### Contents

Well-defined aspects of scientific projects are addressed with independently designed experiments in the context of current research projects in the field of cell and developmental biology. The techniques applied are evaluated on the basis of the results obtained and modified where necessary. The results of all experiments as well as the impact on the research project are presented and discussed in a progress report seminar within the research group.

### Intended learning outcomes

The participants are able to independently carry out scientific experiments in the fields of cell and developmental biology and to modify them according to the outcome. They are able to independently approach current scientific topics and to perform, interpret and document experiments, adhering to accepted rules of scientific practice.

### Courses

**P (29) + S (1)**

Module taught in: German and/or English

### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Molecular Parasitology
(30 ECTS credits)

Students who selected this subject area must take module 07-MSPAR. The second theoretical module in this subject area may be selected from the list below.
## Module Catalogue for the Subject Biosciences
### Master's with 1 major, 120 ECTS credits

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Molecular Parasitology</td>
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<td>graduate</td>
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</table>

### Contents

The lecture *Molecular Parasitology* discusses molecular and genetic aspects of parasitic diseases in humans and animals. Special emphasis is on neglected tropical diseases.

### Intended learning outcomes

Participants possess a knowledge of the theoretical principles underlying parasitology and are able to put this into the broader context of molecular cell biology research.

### Courses

(type, number of weekly contact hours, language — if other than German)

V (1) + S (2)

Module taught in: German and/or English

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<td>written examination</td>
<td>(approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate). Language of assessment: German and/or English</td>
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### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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# Module Catalogue for the Subject
## Biosciences
### Master's with 1 major, 120 ECTS credits

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</thead>
<tbody>
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### Contents

Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

### Intended learning outcomes

Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

### Courses

(type, number of weekly contact hours, language — if other than German)

<table>
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<tr>
<th>V (3)</th>
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### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
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<tbody>
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<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

Versioned molecular techniques, lipid research methods, microscopic methods, immunohistochemistry, mouse models and gene-knockout approaches, protein and molecular biology techniques, PCR, advanced protein biochemistry, methods in bioinformatics and computational biology.

**Intended learning outcomes**

Students are able to review and expand their knowledge of standard molecular techniques and are able to choose methods and techniques to design experiments in a specific research area.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (3)

Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
--- | ---
Molecular Parasitology F1 | 07-MSPARF1-171-m01

Module coordinator | Module offered by
holder of the Chair of Cell Biology and Developmental Biology | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
--- | --- | ---
10 | numerical grade | --

Duration | Module level | Other prerequisites
--- | --- | ---
1 semester | graduate | --

Contents
This 5-week full-time practical course provides an introduction to modern methods and concepts in molecular parasitology. It introduces participants to a variety of parasites and encourages them to design and perform experiments of their own. Participants use the skills they have developed to analyse important biomedical processes.

Intended learning outcomes
The participants are able to perform scientific experiments in the field of molecular parasitology and to apply appropriate methods. They are able to address and document fundamental scientific questions, adhering to the rules of good scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)
P (14) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (30 to 60 minutes).
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title | Abbreviation
---|---
Molecular Parasitology F2 | 07-MSPARF2-171-m01

Module coordinator
holder of the Chair of Cell Biology and Developmental Biology

Module offered by
Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
15 | (not) successfully completed | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents
Well-defined aspects of scientific projects are addressed with independently designed experiments in the context of current research projects in the field of molecular parasitology. The techniques applied are evaluated on the basis of the results obtained and modified where necessary. The results of all experiments as well as the impact on the research project are presented and discussed in a concluding progress report.

Intended learning outcomes
The participants are able to independently carry out scientific experiments in the field of molecular parasitology and to modify them according to the outcome. They are able to independently approach current scientific topics and to perform, interpret and document experiments, adhering to accepted rules of scientific practice.

Courses
(type, number of weekly contact hours, language — if other than German)
P (29) + S (1)
Module taught in: German and/or English

Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (30 to 60 minutes).
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Microbiology and Infection Biology
(30 ECTS credits)
Module title: Molecular Biology
Abbreviation: 07-MS2-152-m01

Module coordinator: Dean of Studies Biologie (Biology)
Module offered by: Faculty of Biology
ECTS: 10
Method of grading: Only after succ. compl. of module(s)
Numerical grade: --
Duration: 1 semester
Module level: graduate
Other prerequisites: --

Contents
Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

Intended learning outcomes
Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

Courses
Type, number of weekly contact hours, language — if other than German
V (3)
Module taught in: German and/or English

Method of assessment
Type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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<th>Module level</th>
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<tbody>
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<td>1 semester</td>
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</table>

**Contents**

Fundamentals of molecular microbiology and infection biology, mechanisms of adherence and invasion, bacterial pathogenicity factors, regulation of virulence, mechanisms of host defence and pathogen interference, current methods in infection biology.

**Intended learning outcomes**

The students are able to understand fundamental theories of molecular microbiology and infection biology, emergence of infectious diseases.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)

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**Contents**

Fundamental principles of the mode of action of microbial pathogenicity factors will be presented using selected prokaryotic and eukaryotic pathogens as model organisms. In addition, current research methods in infection biology will be presented.

**Intended learning outcomes**

Students have gained fundamental knowledge in infection biology and pathogenicity research and the mechanisms behind infectious diseases.

**Courses** (type, number of weekly contact hours, language — if other than German)

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Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Contents

Under guidance, participants will work on a current research project dealing with microbial pathogens and their interactions with the host. Participants will employ a variety of state-of-the-art methods within the fields of molecular biology, microbiology, cell biology, and immunology as well as data analysis and literature search techniques. Results will be documented and discussed in a seminar paper or an oral presentation.

### Intended learning outcomes

Participants will acquire the skills to experimentally address scientific questions in molecular biology and infection biology, properly document experimental results and adhere to the standards of good scientific practice.

### Courses

P (14) + S (1)
Module taught in: German and/or English

### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
Microbiology F2 | 07-MS2MF2-152-m01

Module coordinator
holder of the Chair of Microbiology

Module offered by
Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
15 | (not) successfully completed | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents
Participants will independently work on a current research project dealing with microbiology and infection biology. They will apply advanced experimental techniques in microbiology, cell biology and molecular biology according to the project requirements. Progress of the research project will be reported in a seminar paper, a research paper or an oral presentation.

Intended learning outcomes
The participants will acquire the skills to independently perform basic research on microbiology and infection biology according to the standards of good scientific practice and to properly document, interpret and present experimental results.

Courses
(type, number of weekly contact hours, language — if other than German)
P (29) + S (1)
Module taught in: German and/or English

Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Cellular and Molecular Biotechnology
(30 ECTS credits)
## Module title
Molecular Biology

### Abbreviation
07-MS2-152-m01

### Module coordinator
Dean of Studies Biologie (Biology)

### Module offered by
Faculty of Biology

### ECTS
10

### Method of grading
Only after succ. compl. of module(s)

### Numerical grade
--

### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

## Contents
Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

## Intended learning outcomes
Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

## Courses

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### Method of assessment
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

### Language of assessment
German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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Module title
Biophysics and Molecular Biotechnology

Abbreviation
07-MS2BT-152-m01

Module coordinator
holder of the Chair of Biotechnology and Biophysics

Module offered by
Faculty of Biology

ECTS
10

Method of grading
numerical grade

Duration
1 semester

Module level
graduate

Other prerequisites
--

Contents
This lecture provides a broad overview of biophysical techniques and their applications. The first part of the lecture discusses fundamental aspects of thermodynamics, kinetics and molecular interactions. The course then moves on to discuss biophysical methods that facilitate the investigation of individual cells down to the level of single molecules. Focus is on electromanipulation and dielectric spectroscopy of cells, biomembranes, electrophysiology, ion channels, protein folding, single-molecule fluorescence methods and high-resolution as well as dynamic microscopy.

Intended learning outcomes
Students will have acquired a knowledge of fundamental biophysical methods and their applications that will enable them to independently review relevant literature. In addition, they will have become acquainted with or, where necessary, will be able to independently acquaint themselves with biophysical mechanisms.

Courses
(type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: English

Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title | Biophysics and Biochemistry
---|---
Abbreviation | 07-MS3BB-152-m01

Module coordinator | holder of the Chair of Plant Physiology and Biophysics
Faculty of Biology

ECTS | 10
Method of grading | numerical grade
Only after succ. compl. of module(s) | --

Duration | 1 semester
Module level | graduate
Other prerequisites | --

Contents
The module imparts theoretical and methodological knowledge of plant membrane transport, structural biology and biochemistry which is illustrated with specific examples from current research. Depending on the number of participants and their interests, practical demonstrations of methods that are currently used give students an opportunity to experience the practical aspects of biophysical and biochemical research.

Intended learning outcomes
Students are able to use methods dealing with soluble proteins or membrane proteins in the fields of biophysics, structural biology and biochemistry. They are able to interpret the data and to discuss the results within the context of current knowledge.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
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Language of assessment: German and/or English

Allocation of places
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Additional information
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## Contents

Advances and current results of bioinformatics are explained and discussed, this includes results from genome and sequence analysis, protein domains and protein families, large-scale data analysis (e. g. net generation sequences, proteomics data), analysis of different functional RNAs (e. g. miRNAs, IncRNAs).

## Intended learning outcomes

Understand recent results in bioinformatics. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions in bioinformatics.

## Courses

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

## Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

## Allocation of places

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## Additional information

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**Contents**

This practical course provides students with an insight into different biotechnological and biophysical topics and methods. Under expert guidance, students will perform selected experiments on the following topics: cellular and molecular biotechnology, nano and microsystems biotechnology, biomaterials and biosensors, high-resolution fluorescence microscopy, fluorescence spectroscopy, analysis and electromanipulation of cells.

**Intended learning outcomes**

Students will have acquired a knowledge of fundamental biotechnological and biophysical methods and their applications that will enable them to independently review relevant literature. In addition, they will have become acquainted with - or, where necessary, will be able to independently acquaint themselves with - biophysical mechanisms. Students will have acquired practical experience performing experiments, using a variety of scientific tools. In the seminar, students will have acquired detailed theoretical knowledge on these experiments and will have delivered a short presentation (15 minutes) on one of the experiments they performed.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (14) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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### Contents

This practical course provides students with an insight into different biotechnological and biophysical topics and is close to laboratory research. Under expert guidance, students will perform selected experiments on one of the following topics: cellular and molecular biotechnology, nano and microsystems biotechnology, biomaterials and biosensors, high-resolution fluorescence microscopy, fluorescence spectroscopy, analysis and electromanipulation of cells. Performing experiments under expert guidance, students will become acquainted with techniques and instruments. Over the duration of the course, students will then be required to work increasingly independently on current research topics. Work on current research topics will spark the students' interest in topics and will help them select a topic for their Master's thesis.

### Intended learning outcomes

Students will become acquainted with modern biophysical methods and their applications in biotechnology. They will be able to independently work on scientific problems, to independently study relevant literature and to develop a quantitative understanding of biophysical mechanisms. In the seminar, students will acquire further theoretical knowledge on experiments and will give short presentations on experiments performed.

### Courses

(P (29) + S (1))
Module taught in: German and/or English

### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)
Tissue Engineering and regenerative Medicine
(30 ECTS credits)

Students who selected this subject area must take module 07-MSTE. The second theoretical module in this subject area may be selected from the list below.
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**Contents**
No information on contents available.

**Intended learning outcomes**
No information on intended learning outcomes available.

**Courses** (type, number of weekly contact hours, language — if other than German)
V (1) + S (2)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- a) written examination (30 to 60 minutes, including multiple choice questions) or
- b) log (15 to 30 pages) or
- c) oral examination of one candidate each (30 to 60 minutes) or
- d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or
- e) presentation (30 to 60 minutes).

Students will be informed about the method, length and scope of the assessment prior to the course.

Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Contents**

Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

**Intended learning outcomes**

Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (3)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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<tbody>
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<td>graduate</td>
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</table>

**Contents**

Versioned molecular techniques, lipid research methods, microscopic methods, immunohistochemistry, mouse models and gene-knockout approaches, protein and molecular biology techniques, PCR, advanced protein biochemistry, methods in bioinformatics and computational biology.

**Intended learning outcomes**

Students are able to review and expand their knowledge of standard molecular techniques and are able to choose methods and techniques to design experiments in a specific research area.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (3)

Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
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**Contents**

No information on contents available.

**Intended learning outcomes**

No information on intended learning outcomes available.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (14) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (30 to 60 minutes).

Students will be informed about the method, length and scope of the assessment prior to the course.

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Contents**
No information on contents available.

**Intended learning outcomes**
No information on intended learning outcomes available.

**Courses** (type, number of weekly contact hours, language — if other than German)
P (29) + S (1)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (30 to 60 minutes). Students will be informed about the method, length and scope of the assessment prior to the course. Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)
--
Bioinformatics
(30 ECTS credits)

Students who selected this subject area must take module 07-MS2BI. The second theoretical module in this subject area may be selected from the list below.
<table>
<thead>
<tr>
<th>Module title</th>
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<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

### Contents

Advances and current results of bioinformatics are explained and discussed, this includes results from genome and sequence analysis, protein domains and protein families, large-scale data analysis (e. g. net generation sequences, proteomics data), analysis of different functional RNAs (e. g. miRNAs, IncRNAs).

### Intended learning outcomes

Understand recent results in bioinformatics. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions in bioinformatics.

### Courses

<table>
<thead>
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<th>(type, number of weekly contact hours, language — if other than German)</th>
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<td>V (2) + S (1)</td>
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Module taught in: German and/or English

### Method of assessment

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Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Module title: Neurobiology, Behavioural Physiology and Animal Ecology

Abbreviation: 07-MS1-152-m01

Module coordinator: Dean of Studies Biologie (Biology)

Module offered by: Faculty of Biology

ECTS: 10

Method of grading: numerical grade

Duration: 1 semester

Module level: graduate

Other prerequisites: --

Contents:
Timing matters: Temporal organisation in the animal kingdom. Timing plays an important role in all living systems. Animals make use of endogenous clocks to predict and adapt to daily or seasonal changes in environmental parameters. To be at the right place at the right time is of great fitness relevance if, for example, a mating partner or enough food has to be found. Many mutualistic, antagonistic or social interactions can only take place if animals are at the same place at the same time and in the appropriate developmental stage. The lecture gives an introduction to the mechanisms underlying the temporal organisation in the animal kingdom. Adopting an integrative approach, the lecture goes from timing mechanisms on the neuronal level to individual behaviour and then to interactions in social groups, populations or partners in complex and variable ecosystems.

Intended learning outcomes:
Students get to know the advantages of an integrative approach when analysing complex biological systems. They learn to relate and integrate different fields within biology. In the seminar, students practice the discussion of research findings.

Courses:

V (3)
Module taught in: English

Method of assessment:

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places:
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Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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<td>Molecular and Clinical Neurobiology</td>
<td>07-MS1N-152-m01</td>
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<td>Faculty of Biology</td>
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<tr>
<td>1 semester</td>
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</table>

**Contents**

Content of the lecture *Molekulare und klinische Neurobiologie* (*Molecular and Clinical Neurobiology*) - cells of the nervous system, properties of neurons and glial cells - ion channels and excitability of membranes, channelopathies - synapses, transmitter release, neuromuscular end plate, Myasthenia gravis - motor activity, anatomy of the human motor system, spinal reflexes, motor neuron diseases - cerebellum, ataxia and basal ganglia, Morbus Parkinson - muscles and muscle diseases - somatosensory system and pain - hippocampus, learning and memory, anterograde amnesia, visual agnosia - cortex, Morbus Alzheimer - sleep, EEG, epilepsy - sensory physiology, vision, diseases of the visual system; Reading: Kandel, Principles of Neural Science, 4th Edition: A detailed description of this course is also available at [http://neurobiologie.uk-wuerzburg.de/lehrveranstaltungen.html](http://neurobiologie.uk-wuerzburg.de/lehrveranstaltungen.html). The lecture Molecular and Clinical Neurobiology (incl. seminar) and *Neuroentwicklungsbiologie* (*Neurodevelopment*; Fridays 8-9 a.m.) together form one theoretical module (10 ECTS). However, you may also complete these two modules separately and have them credited within the area of mandatory electives 2.

**Intended learning outcomes**

Theoretical foundations of molecular and clinical neurobiology, developmental mechanisms of neuronal diseases.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module title
Animal Ecology and Tropical Biology

### Abbreviation
07-MS1TÖ-152-m01

### Module coordinator
holder of the Chair of Animal Ecology and Tropical Biology

### Module offered by
Faculty of Biology

### ECTS
10

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

### Contents
This module consists of a lecture and a seminar. The lecture gives an overview of the theoretical foundations and current issues in animal ecology. Focus will be on biodiversity and ecosystem functions, multi-trophic interactions and food nets, evolutionary ecology, chemical ecology, tropical ecology, agricultural ecology, and global change. In the seminar, recent scientific publications within the topics mentioned above will be presented and discussed.

### Intended learning outcomes
The students will acquire an advanced knowledge of ecological theories and current research issues in the field of animal ecology. They will be able to interpret scientific publications and apply the acquired knowledge to the solution of current environmental risks.

### Courses
(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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<tbody>
<tr>
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<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

The lectures deal with physiological and neurobiological principles of the different communication channels used by animals, but also highlight adaptive values and evolutionary aspects of animal signalling. In a follow-up seminar session, students will deepen their knowledge by presenting and discussing current papers related to the topic of the lecture.

**Intended learning outcomes**

Students understand the value of an integrative approach when looking at complex issues in biology. They have learned to connect findings from different research areas, such as physiology, neurobiology, behaviour and ecological conditions, in order to gain a more complete picture of a topic. In addition, students have learned to present and discuss current scientific publications within a broader theoretical framework.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
**Module title** | **Abbreviation**
--- | ---
Molecular Biology | 07-MS2-152-m01

**Module coordinator**
Dean of Studies Biologie (Biology)

**Module offered by**
Faculty of Biology

**ECTS** | **Method of grading** | **Other prerequisites**
--- | --- | ---
10 | numerical grade | --

**Duration** | **Module level**
--- | ---
1 semester | graduate

**Contents**
Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

**Intended learning outcomes**
Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

**Courses**
(type, number of weekly contact hours, language — if other than German)

V (3)
Module taught in: German and/or English

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)

--
Module title | Cell and Developmental Biology Master 1
---|---
Abbreviation | 07-MS2ZE1-152-m01

Module coordinator
holder of the Chair of Cell Biology and Developmental Biology

Module offered by
Faculty of Biology

ECTS | 10
Duration | 1 semester

Method of grading | Only after succ. compl. of module(s)
numeral grade | --

Other prerequisites
graduate | --

Contents
The module consists of the lecture *Zellpathologie* (Cytopathology) and the seminar *Zellbiologie-Milesteine und Perspektiven* (Milestones and Perspectives of Cell Biology). The lecture describes pathological states of the cell and unravels their biological causes and consequences, such as infection, apoptosis, senescence, metabolic disorders and cancer. In the seminar *Milestones and Perspectives of Cell Biology*, classic ground-breaking publications in the field of cell biology are discussed from an unusual point of view.

Intended learning outcomes
Students possess a knowledge of the theoretical principles underlying cell pathology and are able to put this into the broader context of cell biology research.

Courses
V (1) + S (2)
Module taught in: German and/or English

Method of assessment
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
Module title: Cell and Developmental Biology Master 2
Abbreviation: 07-MS2ZE2-152-m01

Module coordinator: holder of the Chair of Cell Biology and Developmental Biology
Module offered by: Faculty of Biology

ECTS: 10
Method of grading: numerical grade
Only after succ. compl. of module(s): --

Duration: 1 semester
Module level: graduate
Other prerequisites: --

Contents:
The module consists of the lecture *Signale und Differenzierung* (Signals and Differentiation) and the seminar *Entwicklungsbio- logie - Meilensteine und Perspektiven* (Milestones and Perspectives of Developmental Biology). The lecture *Signals and Differentiation* does not attempt to impart pure textbook knowledge. Instead, historically important as well as particularly interesting and important trend-setting topics in developmental biology are presented. The topics range from classical developmental subjects such as tissue regeneration and morphogenetic cell migration to molecular stem cell biology, epigenetic plasticity, origins of multicellularity and development within changing environments. In the seminar *Milestones and Perspectives of Developmental Biology*, classic ground-breaking publications in the field of developmental biology are discussed from an unusual point of view.

Intended learning outcomes:
Participants possess a knowledge of the theoretical and molecular biological principles underlying developmental biology and are able to put this into the broader context of cell and developmental biology research.

Courses:
(type, number of weekly contact hours, language — if other than German)

V (1) + S (2)
Module taught in: English

Method of assessment:
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places:
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Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
### Module title
Infection Biology

### Abbreviation
07-MS2INF-152-m01

### Module coordinator
holder of the Chair of Microbiology

### Module offered by
Faculty of Biology

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### Duration
1 semester

### Module level
graduate

### Other prerequisites
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### Contents
Fundamentals of molecular microbiology and infection biology, mechanisms of adherence and invasion, bacterial pathogenicity factors, regulation of virulence, mechanisms of host defence and pathogen interference, current methods in infection biology.

### Intended learning outcomes
The students are able to understand fundamental theories of molecular microbiology and infection biology, emergence of infectious diseases.

### Courses
(type, number of weekly contact hours, language — if other than German)

<table>
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Module taught in: German and/or English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
Pathogenicity of Microorganisms | 07-MS2PA-152-m01

Module coordinator | Module offered by
holder of the Chair of Microbiology | Faculty of Biology

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Method of grading | Only after succ. compl. of module(s)
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Duration | Module level |
1 semester | graduate |

Contents
Fundamental principles of the mode of action of microbial pathogenicity factors will be presented using selected prokaryotic and eukaryotic pathogens as model organisms. In addition, current research methods in infection biology will be presented.

Intended learning outcomes
Students have gained fundamental knowledge in infection biology and pathogenicity research and the mechanisms behind infectious diseases.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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<td>Managing Director of the Institute of Virology and Immunobiology</td>
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**Contents**


**Intended learning outcomes**

Students will gain knowledge about, and will be able to present and discuss basic concepts and methods in molecular and cellular immunology.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V (1) + S (2)

Module taught in: English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Assessment offered: Winter semester only

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Module title: Immunology 2  
Abbreviation: 07-MS2IM2-152-m01

Module coordinator: Managing Director of the Institute of Virology and Immunobiology  
Module offered by: Faculty of Biology

ECTS: 10  
Method of grading: numerical grade  
Only after succ. compl. of module(s): --

Duration: 1 semester  
Module level: graduate  
Other prerequisites: --

Contents:
Recent progress in molecular and cellular immunology. Deeper insights into selected immunology chapters, such as autoimmunity and immunomodulation, development of the immune system, immunogenetics, evolution of the immune system, infection immunology, and more.

Intended learning outcomes:
Students are able to understand current topics in immunology and to discuss these in detail.

Courses:
V (1) + S (2)  
Module taught in: English

Method of assessment:
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)  
Assessment offered: Summer semester only  
Language of assessment: German and/or English

Allocation of places: --

Additional information: --

Referred to in LPO I: (examination regulations for teaching-degree programmes)  
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**Contents**

No information on contents available.

**Intended learning outcomes**

No information on intended learning outcomes available.

**Courses (type, number of weekly contact hours, language — if other than German)**

V (1) + S (2)

Module taught in: German and/or English

**Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)**

written examination (approx. 60 to 120 minutes).

If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I (examination regulations for teaching-degree programmes)**

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### Contents

This module will discuss current topics in human genetics.

### Intended learning outcomes

Students will have gained the ability to understand current issues in human genetics and to discuss these in depth.

### Courses

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Module taught in: German and/or English

### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)
## Module title

| Current Methods in Biology | 07-MS31-152-m01 |

## Module coordinator

| holder of the Chair of Plant Physiology and Biophysics | Faculty of Biology |

## ECTS

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## Contents

This lecture series imparts the theoretical background of fundamental and up-to-date molecular biological methods in plant sciences. Special emphasis is placed on analytical tools, large-scale data analysis and their application.

### Intended learning outcomes

At the end of the lecture series, students will (I) be able to qualitatively evaluate results acquired with analytical and molecular biological methods and to integrate them into the context of the current scientific knowledge in this field (II) have gained an overview of the advantages/disadvantages of analytical and molecular biological approaches (III) be able to apply the knowledge they have acquired to design their own experimental strategies for addressing a specific research question.

### Courses

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### Allocation of places

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### Referred to in LPO I

( examination regulations for teaching-degree programmes)
Module title: Plant Ecology
Abbreviation: 07-MS31POEK-152-m01

Module coordinator:
holder of the Chair of Ecophysiology and Vegetation Ecology

Module offered by:
Faculty of Biology

ECTS: 10
Method of grading: Only after succ. compl. of module(s)
Numerical grade: --

Duration: 1 semester
Module level: graduate
Other prerequisites: --

Contents
The lecture will deal with the ecological and environmental constraints under which plants grow and develop (biogeography, biodiversity) and with the interactions of plants with abiotic and biotic environmental factors (e.g. plant-insect, plant-fungus interactions). The evolutionary adaptations on the physiological and organismic level will be emphasised in particular (stress and defence reactions, carnivory, plant protection). Corresponding experimental approaches will be illustrated. Based on selected examples from current research, the seminar will address the topics covered in the lecture in more detail. It will be complemented by topic-related guided tours in the Botanical Garden of the University of Würzburg.

Intended learning outcomes
Participants are able to identify and interpret ecological and ecophysiological interrelations and to discuss them in the context of the current state of knowledge in these fields.

Courses
V (2) + S (1)
Module taught in: German and/or English

Method of assessment
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I
(examination regulations for teaching-degree programmes)
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Module title | Abbreviation
---|---
Plant Immunobiology and Pharmaceutical Biology | 07-MS31PIP-152-m01

Module coordinator | Module offered by
---|---
holder of the Chair of Ecophysiology and Vegetation Ecology | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
10 | numerical grade | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents
This lecture addresses topics of pathogen recognition and signal transduction in plants, molecular and organismic defence and the pharmaceutical relevance of plant-derived bioactive compounds. Plant immunobiology: interactions between plants and pathogens comprise evolutionary dynamic and complex systems. Different strategies of the pathogens - bacteria, fungi and viruses - as well as defence mechanisms of the host plants will be discussed. The molecular mechanisms of pathogen recognition, signal transduction, regulation of gene expression and activation of local and systemic defence responses are in the focus of this lecture. Differences and similarities between plant and human immune systems will be pointed out. Understanding plant-pathogen-interactions and molecular mechanisms determining susceptibility and defence is fundamental for the development of strategies in plant protection. Evolution, function and pharmaceutical relevance of plant secondary metabolites: Secondary metabolites are part of effective plant defence strategies against microorganisms and herbivores and are often essential for survival. The evolution of secondary metabolism will be discussed and general as well as specific defence strategies will be explained. Pharmacological mechanisms of action and molecular targets of important classes of plant bioactive compounds will be presented. A high proportion of currently used drugs have been developed from plant secondary metabolites that have been used as lead structures to generate potent drugs with improved pharmaceutical properties. Examples of therapies with very potent plant pharmaceuticals (evidence-based medicine) as well as possibilities and limitations of phytotherapy (traditional medicine) will be discussed.

Intended learning outcomes
Students are able to understand the interaction between plants and the environment on a molecular level and to discuss the topic in the context of the scientific state of the art.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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**Contents**

The module imparts theoretical and methodological knowledge of plant membrane transport, structural biology and biochemistry which is illustrated with specific examples from current research. Depending on the number of participants and their interests, practical demonstrations of methods that are currently used give students an opportunity to experience the practical aspects of biophysical and biochemical research.

**Intended learning outcomes**

Students are able to use methods dealing with soluble proteins or membrane proteins in the fields of biophysics, structural biology and biochemistry. They are able to interpret the data and to discuss the results within the context of current knowledge.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Contents

Advances and current results of computational systems biology are explained and discussed, this includes results from functional genomics, dynamics of the transcriptome, of metabolism and metabolic networks as well as regulatory networks.

### Intended learning outcomes

Understand recent results in systems biology. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions of systems biology.

### Courses

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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**Contents**

Detailed insight into methods in bioinformatics; depending on the topic selected, fields covered include: genomics (sequence-, domain analysis and annotation), omics data analysis (NGS, transcriptomics, metabolomics, proteomics), topological and structural analysis of biological interactions including statistical methods, phylogenetic analysis, protein structure analysis. Results are documented in the form of a presentation, a publication or a term paper.

**Intended learning outcomes**

Students have gained knowledge on experimental setups and methods used in the field of bioinformatics. They are able to design experiments, collect data and interpret them statistically, adhering to the principles of good scientific practice.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (14) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module coordinator**
holder of the Chair of Bioinformatics

**Module offered by**
Faculty of Biology

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**Contents**
Advanced insight into methods in bioinformatics; depending on the topic selected, fields covered include: genomics (sequence-, domain analysis and annotation), omics data analysis (NGS, transcriptomics, metabolomics, proteomics), topological and structural analysis of biological interactions including statistical methods, phylogenetic analysis, protein structure analysis. The techniques applied are evaluated on the basis of the results obtained and are modified where necessary. Results are documented in the form of a presentation, a publication or a term paper.

**Intended learning outcomes**
Proficiency in one or more methods in bioinformatics that allows students to independently perform and organise a scientific project in the field of bioinformatics and to document the results obtained. Students are able to design a research project and are prepared for working on a scientific question for their thesis.

**Courses** (type, number of weekly contact hours, language — if other than German)
P (29) + S (1)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)
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Immunology

(30 ECTS credits)
### Immunology 1

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**Contents**


**Intended learning outcomes**

Students will gain knowledge about, and will be able to present and discuss basic concepts and methods in molecular and cellular immunology.

**Courses**

V (1) + S (2)

Module taught in: English

**Method of assessment**

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Assessment offered: Winter semester only

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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# Immunology 2

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**Module coordinator**
Managing Director of the Institute of Virology and Immunobiology

**Module offered by**
Faculty of Biology

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<td>10</td>
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**Duration**
1 semester

**Module level**
graduate

**Other prerequisites**
--

## Contents
Recent progress in molecular and cellular immunology. Deeper insights into selected immunology chapters, such as autoimmunity and immunomodulation, development of the immune system, immunogenetics, evolution of the immune system, infection immunology, and more.

## Intended learning outcomes
Students are able to understand current topics in immunology and to discuss these in detail.

## Courses
(V (1) + S (2))
Module taught in: English

## Method of assessment
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Assessment offered: Summer semester only
Language of assessment: German and/or English

## Allocation of places
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## Additional information
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## Referred to in LPO I
(examination regulations for teaching-degree programmes)
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## Immunology F1

<table>
<thead>
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<tbody>
<tr>
<td>Immunology F1</td>
<td>07-MS2IMF1-152-m01</td>
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### Module coordinator
Managing Director of the Institute of Virology and Immunobiology

### Module offered by
Faculty of Biology

### ECTS | Method of grading | Only after succ. compl. of module(s) |
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### Duration | Module level | Other prerequisites |
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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## Contents
Students will complete a 2-week lab course at the Institute of Virology and Immunobiology during which they will become familiar with fundamental methods in cellular and molecular immunology. Afterwards, students will select a laboratory at the Institute or one of the participating institutions (e.g. clinics, Virchow Center, molecular infection immunology and others) and will spend three weeks working on a defined project. Results of the lab course and lab project will be documented in a log and will be presented at the end of the course.

## Intended learning outcomes
The students learn to apply experimental procedures and methods in immunology, to independently address scientific questions and to appropriately document their experimental work.

## Courses

<table>
<thead>
<tr>
<th>Type</th>
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### Module taught in
German and/or English

## Method of assessment

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### Language of assessment
German and/or English

## Allocation of places
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## Additional information
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## Referred to in LPO I
(examination regulations for teaching-degree programmes)

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<table>
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<td>Faculty of Biology</td>
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

Critically reading and presenting original research papers (in English language), participants will independently investigate current problems in immunology. They will be involved in the development of a research plan and will independently apply advanced techniques in cellular and/or molecular immunology.

**Intended learning outcomes**

The participants acquire skills allowing them to work independently in the field of cellular and molecular immunology. This includes competence to address immunological problems on their own and to conduct, document and interpret their research according to good research practice.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (29) + S (1)

Module taught in: German and/or English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
**Molecular Virology**  
(30 ECTS credits)

Students who selected this subject area must take module 07-MSMV. The second theoretical module in this subject area may be selected from the list below.
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<thead>
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</thead>
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**Contents**

No information on contents available.

**Intended learning outcomes**

No information on intended learning outcomes available.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (1) + S (2)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate). Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Contents

Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

### Intended learning outcomes

Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

### Courses

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### Method of assessment

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<th>Type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus</th>
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### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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### Module title
Methods in Life Sciences

### Abbreviation
07-MLS1-171-m01

### Module coordinator
degree programme coordinator Biologie (Biology)

### Module offered by
Faculty of Biology

### ECTS
10

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

### Contents
- Versioned molecular techniques, lipid research methods, microscopic methods, immunohistochemistry, mouse models and gene-knockout approaches, protein and molecular biology techniques, PCR, advanced protein biochemistry, methods in bioinformatics and computational biology.

### Intended learning outcomes
Students are able to review and expand their knowledge of standard molecular techniques and are able to choose methods and techniques to design experiments in a specific research area.

### Courses
(type, number of weekly contact hours, language — if other than German)

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Module taught in: English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes).

Language of assessment: English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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**Contents**

No information on contents available.

**Intended learning outcomes**

No information on intended learning outcomes available.

**Courses**

(type, number of weekly contact hours, language — if other than German)

| P (14) + S (1) |

Module taught in: German and/or English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (30 to 60 minutes).

Students will be informed about the method, length and scope of the assessment prior to the course.

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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**Contents**

No information on contents available.

**Intended learning outcomes**

No information on intended learning outcomes available.

**Courses** (type, number of weekly contact hours, language — if other than German)

- P (29) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (30 to 60 minutes).

Students will be informed about the method, length and scope of the assessment prior to the course.

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO 1** (examination regulations for teaching-degree programmes)

--
Human Genetics
(30 ECTS credits)

Students who selected this subject area must take module 07-MS2HG. The second theoretical module in this subject area may be selected from the list below.
Module title | Abbreviation
--- | ---
Human Genetics | 07-MS2HG-152-m01

Module coordinator | Module offered by
Managing Director of the Institute of Human Genetics | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
--- | --- | ---
10 | numerical grade | --

Duration | Module level | Other prerequisites
--- | --- | ---
2 semester | graduate | --

Contents
This module will discuss current topics in human genetics.

Intended learning outcomes
Students will have gained the ability to understand current issues in human genetics and to discuss these in depth.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
--

Referred to in LPO I (examination regulations for teaching-degree programmes)
--
### Module title

Molecular Biology

### Abbreviation

07-MS2-152-m01

### Module coordinator

Dean of Studies Biologie (Biology)

### Module offered by

Faculty of Biology

### ECTS

10

### Method of grading

Only after succ. compl. of module(s)

### Duration

1 semester

### Module level

graduate

### Other prerequisites

--

### Contents

Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

### Intended learning outcomes

Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

### Courses

(type, number of weekly contact hours, language — if other than German)

V (3)

Module taught in: German and/or English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Module title: Cell and Developmental Biology Master 1
Abbreviation: 07-MS2ZE1-152-m01

Module coordinator: holder of the Chair of Cell Biology and Developmental Biology
Module offered by: Faculty of Biology

ECTS: 10
Method of grading: numerical grade
Only after succ. compl. of module(s): --

Duration: 1 semester
Module level: graduate
Other prerequisites: --

Contents:
The module consists of the lecture Zellpathologie (Cytopathology) and the seminar Zellbiologie-Milesteine und Perspektiven (Milestones and Perspectives of Cell Biology). The lecture describes pathological states of the cell and unravels their biological causes and consequences, such as infection, apoptosis, senescence, metabolic disorders and cancer. In the seminar Milestones and Perspectives of Cell Biology, classic ground-breaking publications in the field of cell biology are discussed from an unusual point of view.

Intended learning outcomes:
Students possess a knowledge of the theoretical principles underlying cell pathology and are able to put this into the broader context of cell biology research.

Courses:
(type, number of weekly contact hours, language — if other than German)
V (1) + S (2)
Module taught in: German and/or English

Method of assessment:
type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places:
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Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title | Abbreviation
---|---
Cell and Developmental Biology Master 2 | 07-MS2ZE2-152-m01

Module coordinator | Module offered by
holder of the Chair of Cell Biology and Developmental Biology | Faculty of Biology

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<tbody>
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<td>1 semester</td>
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Contents
The module consists of the lecture *Signale und Differenzierung* (Signals and Differentiation) and the seminar *Entwicklungsbiologie - Meilensteine und Perspektiven* (Milestones and Perspectives of Developmental Biology). The lecture *Signals and Differentiation* does not attempt to impart pure textbook knowledge. Instead, historically important as well as particularly interesting and important trend-setting topics in developmental biology are presented. The topics range from classical developmental subjects such as tissue regeneration and morphogenetic cell migration to molecular stem cell biology, epigenetic plasticity, origins of multicellularity and development within changing environments. In the seminar *Milestones and Perspectives of Developmental Biology*, classic ground-breaking publications in the field of developmental biology are discussed from an unusual point of view.

Intended learning outcomes
Participants possess a knowledge of the theoretical and molecular biological principles underlying developmental biology and are able to put this into the broader context of cell and developmental biology research.

Courses (type, number of weekly contact hours, language — if other than German)
V (1) + S (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
--

Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title | Abbreviation
---|---
Infection Biology | 07-MS2INF-152-m01

Module coordinator | Module offered by
holder of the Chair of Microbiology | Faculty of Biology

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<tbody>
<tr>
<td>1 semester</td>
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</table>

Contents
Fundamentals of molecular microbiology and infection biology, mechanisms of adherence and invasion, bacterial pathogenicity factors, regulation of virulence, mechanisms of host defence and pathogen interference, current methods in infection biology.

Intended learning outcomes
The students are able to understand fundamental theories of molecular microbiology and infection biology, emergence of infectious diseases.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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<table>
<thead>
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<tbody>
<tr>
<td>Pathogenicity of Microorganisms</td>
<td>07-MS2PA-152-m01</td>
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**Module coordinator**
holder of the Chair of Microbiology

**Module offered by**
Faculty of Biology

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<td>1 semester</td>
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</table>

**Contents**
Fundamental principles of the mode of action of microbial pathogenicity factors will be presented using selected prokaryotic and eukaryotic pathogens as model organisms. In addition, current research methods in infection biology will be presented.

**Intended learning outcomes**
Students have gained fundamental knowledge in infection biology and pathogenicity research and the mechanisms behind infectious diseases.

**Courses**
(type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: English

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)
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<tbody>
<tr>
<td>Managing Director of the Institute of Virology and Immunobiology</td>
<td>Faculty of Biology</td>
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<td>1 semester</td>
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</table>

**Contents**


**Intended learning outcomes**

Students will gain knowledge about, and will be able to present and discuss basic concepts and methods in molecular and cellular immunology.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V (1) + S (2)

Module taught in: English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Assessment offered: Winter semester only

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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## Immunology 2

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**Module coordinator**
Managing Director of the Institute of Virology and Immunobiology

**Module offered by**
Faculty of Biology

**ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** |
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<td>1 semester</td>
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### Contents
Recent progress in molecular and cellular immunology. Deeper insights into selected immunology chapters, such as autoimmunity and immunomodulation, development of the immune system, immunogenetics, evolution of the immune system, infection immunology, and more.

### Intended learning outcomes
Students are able to understand current topics in immunology and to discuss these in detail.

### Courses
(type, number of weekly contact hours, language — if other than German)

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<tr>
<th>Type</th>
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Module taught in: English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Assessment offered: Summer semester only

Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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**Contents**

No information on contents available.

**Intended learning outcomes**

No information on intended learning outcomes available.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (1) + S (2)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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## Human Genetics F1

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<td>Human Genetics F1</td>
<td>07-MS2HGF1-152-m01</td>
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### Module coordinator

Managing Director of the Institute of Human Genetics

### Module offered by

Faculty of Biology

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### Duration

1 semester

### Contents

Practical course on a topic in human genetics. Students spend five weeks working on a small, well-defined scientific lab project and learn how to present their data. They learn to discuss their data in a seminar. The students learn to apply experimental procedures and methods of human genetics, to independently address scientific questions and to document their experimental work in an appropriate way.

### Intended learning outcomes

Students are able to independently investigate a topic in human genetics as well as to document, interpret and discuss their results, adhering to the principles of good scientific practice.

### Courses

(type, number of weekly contact hours, language — if other than German)

P (14) + S (I)

Module taught in: German and/or English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

Current problems in the field of human genetics will be addressed by critically reading and presenting original research papers. The participants will be involved in the development of a research plan and will learn to apply advanced techniques to answer a scientific question in human genetics. This practical course will have a duration of 12 weeks (three months).

**Intended learning outcomes**

Students are able to independently investigate a topic in human genetics as well as to document, interpret and discuss their results, adhering to the principles of good scientific practice.

**Courses** (type, number of weekly contact hours, language — if other than German)

- P (29) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Physiological Chemistry
(30 ECTS credits)

Students who selected this subject area must take module 07-MS2 and must select either module 07-MS2ZE1 or module 07-MS2ZE2 as their second theoretical module.
### Module title
Molecular Biology

### Abbreviation
07-MS2-152-m01

### Module coordinator
Dean of Studies Biologie (Biology)

### Module offered by
Faculty of Biology

### ECTS
10

### Method of grading
Numerical grade

### Only after succ. compl. of module(s)
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### Duration
1 semester

### Module level
Graduate

### Other prerequisites
--

### Contents
Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

### Intended learning outcomes
Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

### Courses (type, number of weekly contact hours, language — if other than German)

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### Module taught in: German and/or English

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title
Cell and Developmental Biology Master 1

Module coordinator
holder of the Chair of Cell Biology and Developmental Biology

Module offered by
Faculty of Biology

ECTS
10

Method of grading
Numerical grade

Only after succ. compl. of module(s)
--

Duration
1 semester

Module level
Graduate

Other prerequisites
--

Contents
The module consists of the lecture Zellpathologie (Cytopathology) and the seminar Zellbiologie-Milesteine und Perspektiven (Milestones and Perspectives of Cell Biology). The lecture describes pathological states of the cell and unravels their biological causes and consequences, such as infection, apoptosis, senescence, metabolic disorders and cancer. In the seminar Milestones and Perspectives of Cell Biology, classic ground-breaking publications in the field of cell biology are discussed from an unusual point of view.

Intended learning outcomes
Students possess a knowledge of the theoretical principles underlying cell pathology and are able to put this into the broader context of cell biology research.

Courses
V (1) + S (2)

Module taught in: German and/or English

Method of assessment
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title

Cell and Developmental Biology Master 2

Abbreviation

07-MS2ZE2-152-m01

Module coordinator

holder of the Chair of Cell Biology and Developmental Biology

Module offered by

Faculty of Biology

ECTS

10

Method of grading

numerical grade

Only after succ. compl. of module(s)

Duration

1 semester

Module level

graduate

Other prerequisites

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Contents

The module consists of the lecture *Signale und Differenzierung* (Signals and Differentiation) and the seminar *Entwicklungsbio- logie - Meilensteine und Perspektiven* (Milestones and Perspectives of Developmental Biology). The lecture *Signals and Differentiation* does not attempt to impart pure textbook knowledge. Instead, historically important as well as particularly interesting and important trend-setting topics in developmental biology are presented. The topics range from classical developmental subjects such as tissue regeneration and morphogenetic cell migration to molecular stem cell biology, epigenetic plasticity, origins of multicellularity and development within changing environments. In the seminar *Milestones and Perspectives of Developmental Biology*, classic ground-breaking publications in the field of developmental biology are discussed from an unusual point of view.

Intended learning outcomes

Participants possess a knowledge of the theoretical and molecular biological principles underlying developmental biology and are able to put this into the broader context of cell and developmental biology research.

Courses (type, number of weekly contact hours, language — if other than German)

V (1) + S (2)

Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title: Cell and Developmental Biology F1
Abbreviation: 07-MS2ZEF1-152-m01

Module coordinator: holder of the Chair of Cell Biology and Developmental Biology
Module offered by: Faculty of Biology

ECTS: 10
Method of grading: numerical grade
Only after succ. compl. of module(s): --
Duration: 1 semester
Module level: graduate
Other prerequisites: --

Contents:
This 5 week full-time practical course provides an introduction to modern cell and developmental biology-related methods with a focus on bio-imaging techniques. A broad variety of model organisms is covered and the participants are encouraged to independently design and perform their own experiments. Participants use their acquired technological skills to analyse important basic biological processes. Large parts of this practical course are devoted to small projects, which should provide sustained insights into current research activities of the Chair. Interactions with Master's students, doctoral researchers and post-docs prepare participants for a working in a team-based environment.

Intended learning outcomes:
The participants are able to approach complex scientific questions in the fields of cell and developmental biology and to independently implement acquired methodological tools to answer these questions. They are able to perform and document cell and developmental biology-related experiments, adhering to a generally accepted code of scientific practice.

Courses:
(type, number of weekly contact hours, language — if other than German)
P (14) + S (1)
Module taught in: German and/or English

Method of assessment:
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places:
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Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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**Module coordinator**
Coordinator BioCareers

**Module offered by**
Faculty of Biology

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**Duration**
1 semester

**Module level**
graduate

**Other prerequisites**
Please consult with course advisory service in advance.

**Contents**
Practical course, summer school or workshop on specific topics in biology (duration: 4-6 weeks).

**Intended learning outcomes**
Proficiency in specific methods and lab techniques from selected fields of biology. Ability to apply these methods and techniques later on in a research project.

**Courses**
(type, number of weekly contact hours, language — if other than German)

P (15)
Module taught in: German and/or English

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)

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### Module title
Laboratory Research Training F1

### Abbreviation
07-MSLRTF1-152-m01

### Module coordinator
degree programme coordinator Biologie (Biology)

### Module offered by
Faculty of Biology

### ECTS
10

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
graduate

### Other prerequisites
Please consult with course advisory service in advance.

### Contents
Practical course on a biological topic. Students spend five weeks working on a small, well-defined scientific lab project and learn how to present their data. They learn to discuss their data in a seminar. The students learn to apply defined experimental procedures and methods, to independently address scientific questions and to document their experimental work in an appropriate way.

### Intended learning outcomes
Students have reinforced previously acquired lab skills, acquired new lab techniques and learned how to transfer theoretical knowledge into experiments. Students have gained expertise in the analysis of raw data, their interpretation and their presentation.

### Courses
P (14) + S (1)
Module taught in: German and/or English

### Method of assessment
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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**Module coordinator**
holder of the Chair of Biochemistry and Molecular Biology

**Module offered by**
Faculty of Biology

**ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** |
---|---|---|
| 15 | (not) successfully completed | -- |

**Duration** | **Module level** | **Other prerequisites** |
---|---|---|
| 1 semester | graduate | -- |

### Contents
Critically reading and presenting original research papers (in English language), participants will independently investigate current problems in physiological chemistry. They will be involved in the development of a research plan and will independently apply advanced techniques in molecular cell biology and/or developmental biochemistry.

### Intended learning outcomes
Students are able to plan and design research in the fields of molecular cell biology and developmental biochemistry. They are able to work according to good scientific practice and to document, interpret and discuss their results.

### Courses
(type, number of weekly contact hours, language — if other than German)

- P (29) + S (1)

Module taught in: German and/or English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places
--

### Additional information
--

### Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
Cellular Tumor Biology

(30 ECTS credits)
<table>
<thead>
<tr>
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<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

The lecture *Molekulare Tumorbiologie* (*Molecular Tumour Biology*) discusses molecular characteristics of tumours and relevant biological processes (such as signal transduction, cell growth, cell proliferation, metabolism), tumour-specific modifications and current molecular biological methods in tumour research.

**Intended learning outcomes**

Understanding of current topics and challenges in tumour research, understanding of the methods which could be used address these challenges.

**Courses** *(type, number of weekly contact hours, language — if other than German)*

V (2)

Module taught in: German and/or English

**Method of assessment** *(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)*

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** *(examination regulations for teaching-degree programmes)*

--
### Module Title

**Clinical Tumor Biology**

#### Abbreviation

07-TUM-CLIN-152-m01

### Module Coordinator

degree programme coordinator Biologie (Biology)

### Module Offered by

Faculty of Biology

### ECTS

5

### Method of Grading

Only after succ. compl. of module(s)

### Numerical Grade

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### Duration

1 semester

### Module Level

graduate

### Other Prerequisites

--

### Contents

In the lecture series *Klinische Tumorbiologie (Clinical Tumour Biology)*, current clinical aspects will be addressed. Several tumour types will be discussed (such as tumours of the skin, lung, intestine, breast, blood). Additional topics: diagnostics and pathology, different treatments and therapies and clinical trials.

### Intended Learning Outcomes

Knowledge of the similarities and differences of various tumour types. Understanding of requirements, possibilities and limitations of clinical medicine.

### Courses

(type, number of weekly contact hours, language — if other than German)

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<th>Type</th>
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Module taught in: German and/or English

### Method of Assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of Places

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### Additional Information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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**Contents**

Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

**Intended learning outcomes**

Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

**Courses (type, number of weekly contact hours, language — if other than German)**

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**Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)**

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
---|---
Cell and Developmental Biology Master 1 | 07-MS2ZE1-152-m01

Module coordinator
holder of the Chair of Cell Biology and Developmental Biology

Module offered by
Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
10 | numerical grade | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents
The module consists of the lecture Zellpathologie (Cytopathology) and the seminar Zellbiologie-Milesteine und Perspektiven (Milestones and Perspectives of Cell Biology). The lecture describes pathological states of the cell and unravels their biological causes and consequences, such as infection, apoptosis, senescence, metabolic disorders and cancer. In the seminar Milestones and Perspectives of Cell Biology, classic ground-breaking publications in the field of cell biology are discussed from an unusual point of view.

Intended learning outcomes
Students possess a knowledge of the theoretical principles underlying cell pathology and are able to put this into the broader context of cell biology research.

Courses (type, number of weekly contact hours, language — if other than German)
V (1) + S (2)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title: Cell and Developmental Biology Master 2

Abbreviation: 07-MS2ZE2-152-m01

Module coordinator: holder of the Chair of Cell Biology and Developmental Biology

Module offered by: Faculty of Biology

ECTS: 10

Method of grading: numerical grade

Duration: 1 semester

Module level: graduate

Other prerequisites: --

Contents:
The module consists of the lecture Signale und Differenzierung (Signals and Differentiation) and the seminar Entwicklungsbio- logie - Meilensteine und Perspektiven (Milestones and Perspectives of Developmental Biology). The lecture Signals and Differentiation does not attempt to impart pure textbook knowledge. Instead, historically important as well as particularly interesting and important trend-setting topics in developmental biology are presented. The topics range from classical developmental subjects such as tissue regeneration and morphogenetic cell migration to molecular stem cell biology, epigenetic plasticity, origins of multicellularity and development within changing environments. In the seminar Milestones and Perspectives of Developmental Biology, classic ground-breaking publications in the field of developmental biology are discussed from an unusual point of view.

Intended learning outcomes:
Participants possess a knowledge of the theoretical and molecular biological principles underlying developmental biology and are able to put this into the broader context of cell and developmental biology research.

Courses (type, number of weekly contact hours, language — if other than German):
V (1) + S (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus):
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places:
--

Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes):
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### Module Catalogue for the Subject
**Biosciences**

**Master's with 1 major, 120 ECTS credits**

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<td>Infection Biology</td>
<td>07-MS2INF-152-m01</td>
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<tr>
<td>holder of the Chair of Microbiology</td>
<td>Faculty of Biology</td>
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<td>graduate</td>
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</table>

### Contents

Fundamentals of molecular microbiology and infection biology, mechanisms of adherence and invasion, bacterial pathogenicity factors, regulation of virulence, mechanisms of host defence and pathogen interference, current methods in infection biology.

### Intended learning outcomes

The students are able to understand fundamental theories of molecular microbiology and infection biology, emergence of infectious diseases.

### Courses

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
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<td>Pathogenicity of Microorganisms</td>
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**Module coordinator**
holder of the Chair of Microbiology

**Module offered by**
Faculty of Biology

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**Duration**
1 semester

**Module level**
graduate

**Other prerequisites**
--

**Contents**
Fundamental principles of the mode of action of microbial pathogenicity factors will be presented using selected prokaryotic and eukaryotic pathogens as model organisms. In addition, current research methods in infection biology will be presented.

**Intended learning outcomes**
Students have gained fundamental knowledge in infection biology and pathogenicity research and the mechanisms behind infectious diseases.

**Courses**
(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: English

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English
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<tr>
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</table>

**Contents**


**Intended learning outcomes**

Students will gain knowledge about, and will be able to present and discuss basic concepts and methods in molecular and cellular immunology.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (1) + S (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Assessment offered: Winter semester only
Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO 1** (examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
Immunology 2 | 07-MS2IM2-152-m01

Module coordinator | Module offered by
Managing Director of the Institute of Virology and Immunobiology | Faculty of Biology

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<tbody>
<tr>
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</table>

Contents
Recent progress in molecular and cellular immunology. Deeper insights into selected immunology chapters, such as autoimmunity and immunomodulation, development of the immune system, immunogenetics, evolution of the immune system, infection immunology, and more.

Intended learning outcomes
Students are able to understand current topics in immunology and to discuss these in detail.

Courses (type, number of weekly contact hours, language — if other than German)
V (1) + S (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Assessment offered: Summer semester only
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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### Contents

No information on contents available.

### Intended learning outcomes

No information on intended learning outcomes available.

### Courses

- **V (1) + S (2)**
- Module taught in: German and/or English

### Method of assessment

- written examination (approx. 60 to 120 minutes).
- If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).
- Language of assessment: German and/or English

### Allocation of places

--

### Additional information

--

### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
### Module Catalogue for the Subject

**Biosciences**

**Master's with 1 major, 120 ECTS credits**

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</table>

### Contents

This module will discuss current topics in human genetics.

### Intended learning outcomes

Students will have gained the ability to understand current issues in human genetics and to discuss these in depth.

### Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

### Allocation of places

--

### Additional information

--

### Referred to in LPO I (examination regulations for teaching-degree programmes)

--
## Module title
Laboratory Research Training F1

## Abbreviation
07-MSLRTF1-152-m01

### Module coordinator
degree programme coordinator Biologie (Biology)

### Module offered by
Faculty of Biology

### ECTS
10

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
graduate

### Other prerequisites
Please consult with course advisory service in advance.

### Contents
Practical course on a biological topic. Students spend five weeks working on a small, well-defined scientific lab project and learn how to present their data. They learn to discuss their data in a seminar. The students learn to apply defined experimental procedures and methods, to independently address scientific questions and to document their experimental work in an appropriate way.

### Intended learning outcomes
Students have reinforced previously acquired lab skills, acquired new lab techniques and learned how to transfer theoretical knowledge into experiments. Students have gained expertise in the analysis of raw data, their interpretation and their presentation.

### Courses
- **P (14) + S (1)**
  - Module taught in: German and/or English

### Method of assessment
- **Language of assessment:** German and/or English
- **Allocation of places:** --
- **Additional information:** --
- **Referred to in LPO I** (examination regulations for teaching-degree programmes)
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<td>Coordinator BioCareers</td>
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</table>

**Contents**

Practical course, summer school or workshop on specific topics in biology (duration: 4-6 weeks).

**Intended learning outcomes**

Proficiency in specific methods and lab techniques from selected fields of biology. Ability to apply these methods and techniques later on in a research project.

**Courses**

(type, number of weekly contact hours, language — if other than German)

| P (15) | |
|--------| |
| Module taught in: German and/or English | |

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Module Catalogue for the Subject Biosciences

#### Master's with 1 major, 120 ECTS credits

<table>
<thead>
<tr>
<th>Module title</th>
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<td>Cellular Tumor Biology F1</td>
<td>07-MS2ZTF1-152-m01</td>
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#### Module coordinator

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<td>Faculty of Biology Biologie (Biology)</td>
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**Contents**

Under guidance, participants will work on a current topic in tumour biology. Topics will focus in particular on current problems in oncolytic virotherapy. Participants will become familiar with a variety of methods within the fields of molecular biology, infection biology and cell biology as well as literature search techniques. They will employ a broad range of methods in cell biology, infection biology and immunology. Results will be documented in the form of a presentation, a publication or a term paper.

#### Intended learning outcomes

Students are able to investigate scientific questions in molecular biology and cell biology and to document their work, adhering to the principles of good scientific practice.

#### Courses

- **P (14) + S (1)**
- Module taught in: German and/or English

#### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

#### Allocation of places

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#### Additional information

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#### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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**Contents**

Students will be involved in current research projects in tumour biology. Aspects of the scientific question will be independently addressed by the students. They will apply experimental techniques in cell biology, immunology and/or molecular biology. The techniques applied will be evaluated on the basis of the results obtained and modified where necessary. Experimental results and progress in the research project will be documented in the form of a presentation, a publication or a term paper.

**Intended learning outcomes**

Students are able to independently carry out scientific experiments on a topic in tumour biology/oncology. They are able to answer and discuss questions in the field of tumour biology/oncology. Students are able to adhere to the principles of good scientific practice and to document, interpret and discuss their results. They are able to apply specific techniques required to answer scientific questions.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (29) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module Group 3

(ECTS credits)
Molecular Plant Physiology
(30 ECTS credits)
**Module title**
Current Methods in Biology

**Abbreviation**
07-MS31-152-m01

**Module coordinator**
holder of the Chair of Plant Physiology and Biophysics

**Module offered by**
Faculty of Biology

**ECTS**
10

**Method of grading**
numerical grade

**Duration**
1 semester

**Module level**
graduate

**Other prerequisites**
--

**Contents**
This lecture series imparts the theoretical background of fundamental and up-to-date molecular biological methods in plant sciences. Special emphasis is placed on analytical tools, large-scale data analysis and their application.

**Intended learning outcomes**
At the end of the lecture series, students will (I) be able to qualitatively evaluate results acquired with analytical and molecular biological methods and to integrate them into the context of the current scientific knowledge in this field (II) have gained an overview of the advantages/disadvantages of analytical and molecular biological approaches (III) be able to apply the knowledge they have acquired to design their own experimental strategies for addressing a specific research question.

**Courses**
(type, number of weekly contact hours, language — if other than German)

V (3)
Module taught in: German and/or English

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
Plant Ecology | 07-MS31POEK-152-m01

Module coordinator | Module offered by
holder of the Chair of Ecophysiology and Vegetation Ecology | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
10 | numerical grade | --

Duration | Module level | Other prerequisites
1 semester | graduate | --

Contents
The lecture will deal with the ecological and environmental constraints under which plants grow and develop (biogeography, biodiversity) and with the interactions of plants with abiotic and biotic environmental factors (e. g. plant-insect, plant-fungus interactions). The evolutionary adaptations on the physiological and organismic level will be emphasised in particular (stress and defence reactions, carnivory, plant protection). Corresponding experimental approaches will be illustrated. Based on selected examples from current research, the seminar will address the topics covered in the lecture in more detail. It will be complemented by topic-related guided tours in the Botanical Garden of the University of Würzburg.

Intended learning outcomes
Participants are able to identify and interpret ecological and ecophysiological interrelations and to discuss them in the context of the current state of knowledge in these fields.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
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Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title | Plant Immunobiology and Pharmaceutical Biology
---|---
Abbreviation | 07-MS31PIP-152-m01

Module coordinator

Holder of the Chair of Ecophysiology and Vegetation Ecology

Module offered by

Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
10 | numerical grade | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents

This lecture addresses topics of pathogen recognition and signal transduction in plants, molecular and organis-mic defence and the pharmaceutical relevance of plant-derived bioactive compounds. Plant immunobiology: in-teractions between plants and pathogens comprise evolutionary dynamic and complex systems. Different stra-tegies of the pathogens - bacteria, fungi and viruses - as well as defence mechanisms of the host plants will be discussed. The molecular mechanisms of pathogen recognition, signal transduction, regulation of gene expres-sion and activation of local and systemic defence responses are in the focus of this lecture. Differences and si-milarities between plant and human immune systems will be pointed out. Understanding plant-pathogen-inter-actions and molecular mechanisms determining susceptibility and defence is fundamental for the development of strategies in plant protection. Evolution, function and pharmaceutical relevance of plant secondary metaboli-tes: Secondary metabolites are part of effective plant defence strategies against microorganisms and herbivores and are often essential for survival. The evolution of secondary metabolism will be discussed and general as well as specific defence strategies will be explained. Pharmacological mechanisms of action and molecular targets of important classes of plant bioactive compounds will be presented. A high proportion of currently used drugs ha-ve been developed from plant secondary metabolites that have been used as lead structures to generate potent drugs with improved pharmaceutical properties. Examples of therapies with very potent plant pharmaceuticals (evidence-based medicine) as well as possibilities and limitations of phytotherapy (traditional medicine) will be discussed.

Intended learning outcomes

Students are able to understand the interaction between plants and the environment on a molecular level and to discuss the topic in the context of the scientific state of the art.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

Allocation of places

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Additional information

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**Contents**

The module imparts theoretical and methodological knowledge of plant membrane transport, structural biology and biochemistry which is illustrated with specific examples from current research. Depending on the number of participants and their interests, practical demonstrations of methods that are currently used give students an opportunity to experience the practical aspects of biophysical and biochemical research.

**Intended learning outcomes**

Students are able to use methods dealing with soluble proteins or membrane proteins in the fields of biophysics, structural biology and biochemistry. They are able to interpret the data and to discuss the results within the context of current knowledge.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module title

**Molecular Plant Physiology F1**

| Abbreviation | 07-MS31MPPF1-152-m01 |

### Module coordinator

holder of the Chair of Plant Physiology and Biophysics

### Module offered by

Faculty of Biology

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### Contents

The module provides an in-depth insight into molecular biological strategies and methods applied in plant physiology. The students will be integrated into research projects on current topics in molecular plant physiology.

### Intended learning outcomes

The students have knowledge about basic molecular biological strategies and methods focusing on plant physiology. They are able to perform and organise their scientific laboratory work independently and document the results obtained.

### Courses

(type, number of weekly contact hours, language — if other than German)

P (14) + S (1)

Module taught in: German and/or English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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**Contents**

The students perform their research work within the context of a current research project in molecular plant physiology in a largely independent manner under supervision of a principal investigator.

**Intended learning outcomes**

Students are able to work on a scientific question, to design an experimental setup as well as to interpret, document and present their results.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (29) + S (1)

Module taught in: German and/or English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Biochemistry and Structural Biology
(30 ECTS credits)
Module title | Abbreviation
---|---
Current Methods in Biology | 07-MS31-152-m01

Module coordinator | Module offered by
holder of the Chair of Plant Physiology and Biophysics | Faculty of Biology

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Contents
This lecture series imparts the theoretical background of fundamental and up-to-date molecular biological methods in plant sciences. Special emphasis is placed on analytical tools, large-scale data analysis and their application.

Intended learning outcomes
At the end of the lecture series, students will (I) be able to qualitatively evaluate results acquired with analytical and molecular biological methods and to integrate them into the context of the current scientific knowledge in this field (II) have gained an overview of the advantages/disadvantages of analytical and molecular biological approaches (III) be able to apply the knowledge they have acquired to design their own experimental strategies for addressing a specific research question.

Courses (type, number of weekly contact hours, language — if other than German)
V (3)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
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Language of assessment: German and/or English

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**Contents**

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**Intended learning outcomes**

Students are able to use methods dealing with soluble proteins or membrane proteins in the fields of biophysics, structural biology and biochemistry. They are able to interpret the data and to discuss the results within the context of current knowledge.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Biophysics and Molecular Biotechnology

Module coordinator: holder of the Chair of Biotechnology and Biophysics
Module offered by: Faculty of Biology

ECTS: 10
Method of grading: numerical grade
Duration: 1 semester
Module level: graduate
Other prerequisites: --

Contents
This lecture provides a broad overview of biophysical techniques and their applications. The first part of the lecture discusses fundamental aspects of thermodynamics, kinetics and molecular interactions. The course then moves on to discuss biophysical methods that facilitate the investigation of individual cells down to the level of single molecules. Focus is on electromanipulation and dielectric spectroscopy of cells, biomembranes, electrophysiology, ion channels, protein folding, single-molecule fluorescence methods and high-resolution as well as dynamic microscopy.

Intended learning outcomes
Students will have acquired a knowledge of fundamental biophysical methods and their applications that will enable them to independently review relevant literature. In addition, they will have become acquainted with - or, where necessary, will be able to independently acquaint themselves with - biophysical mechanisms.

Courses
V (2) + S (1)
Module taught in: English

Method of assessment
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
### Module title

Plant Immunobiology and Pharmaceutical Biology

### Abbreviation

07-MS31PIP-152-m01

### Module coordinator

holder of the Chair of Ecophysiology and Vegetation Ecology

### Module offered by

Faculty of Biology

### ECTS

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### Contents

This lecture addresses topics of pathogen recognition and signal transduction in plants, molecular and organisic defence and the pharmaceutical relevance of plant-derived bioactive compounds. Plant immunobiology: interactions between plants and pathogens comprise evolutionary dynamic and complex systems. Different strategies of the pathogens - bacteria, fungi and viruses - as well as defence mechanisms of the host plants will be discussed. The molecular mechanisms of pathogen recognition, signal transduction, regulation of gene expression and activation of local and systemic defence responses are in the focus of this lecture. Differences and similarities between plant and human immune systems will be pointed out. Understanding plant-pathogen-interactions and molecular mechanisms determining susceptibility and defence is fundamental for the development of strategies in plant protection. Evolution, function and pharmaceutical relevance of plant secondary metabolites: Secondary metabolites are part of effective plant defence strategies against microorganisms and herbivores and are often essential for survival. The evolution of secondary metabolism will be discussed and general as well as specific defence strategies will be explained. Pharmacological mechanisms of action and molecular targets of important classes of plant bioactive compounds will be presented. A high proportion of currently used drugs have been developed from plant secondary metabolites that have been used as lead structures to generate potent drugs with improved pharmaceutical properties. Examples of therapies with very potent plant pharmaceuticals (evidence-based medicine) as well as possibilities and limitations of phytotreatment (traditional medicine) will be discussed.

### Intended learning outcomes

Students are able to understand the interaction between plants and the environment on a molecular level and to discuss the topic in the context of the scientific state of the art.

### Courses

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
Plant Ecology | 07-MS31POEK-152-m01

Module coordinator | Module offered by
holder of the Chair of Ecophysiology and Vegetation Ecology | Faculty of Biology

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<tbody>
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Contents
The lecture will deal with the ecological and environmental constraints under which plants grow and develop (biogeography, biodiversity) and with the interactions of plants with abiotic and biotic environmental factors (e.g. plant-insect, plant-fungus interactions). The evolutionary adaptations on the physiological and organismic level will be emphasised in particular (stress and defence reactions, carnivory, plant protection). Corresponding experimental approaches will be illustrated. Based on selected examples from current research, the seminar will address the topics covered in the lecture in more detail. It will be complemented by topic-related guided tours in the Botanical Garden of the University of Würzburg.

Intended learning outcomes
Participants are able to identify and interpret ecological and ecophysiological interrelations and to discuss them in the context of the current state of knowledge in these fields.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title | Biochemistry and Structural Biology F1
Abbreviation | 07-MS3BSBF1-152-m01

Module coordinator | holder of the Chair of Plant Physiology and Biophysics
Module offered by | Faculty of Biology

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Duration | Module level | Other prerequisites
1 semester | graduate | --

Contents
The module provides an in-depth insight into strategies and methods in protein biochemistry and structural biology. The students will be integrated into research projects on current topics in biochemistry and structural biology.

Intended learning outcomes
The students have knowledge about general strategies and methods of protein biochemistry and structural biology with a focus on membrane proteins. They are able to perform and organise their scientific laboratory work independently and document the results obtained.

Courses (type, number of weekly contact hours, language — if other than German)
P (14) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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<table>
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<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

The students perform their research work within the context of a current research project on biochemistry and structural biology in a largely independent manner under supervision of a principal investigator.

**Intended learning outcomes**

The students are able to independently perform and organise their scientific laboratory work in the fields of biochemistry and structural biology and to document the results obtained. They are able to design a research project and are prepared for working on a scientific question for their thesis.

**Courses**

(type, number of weekly contact hours, language — if other than German)

- P (29) + S (1)

Module taught in: German and/or English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Molecular Membran Biology
(30 ECTS credits)
Module title | Abbreviation
---|---
Current Methods in Biology | 07-MS31-152-m01

Module coordinator | Module offered by
holder of the Chair of Plant Physiology and Biophysics | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
10 | numerical grade | --

Duration | Module level | Other prerequisites
1 semester | graduate | --

Contents
This lecture series imparts the theoretical background of fundamental and up-to-date molecular biological methods in plant sciences. Special emphasis is placed on analytical tools, large-scale data analysis and their application.

Intended learning outcomes
At the end of the lecture series, students will (I) be able to qualitatively evaluate results acquired with analytical and molecular biological methods and to integrate them into the context of the current scientific knowledge in this field (II) have gained an overview of the advantages/disadvantages of analytical and molecular biological approaches (III) be able to apply the knowledge they have acquired to design their own experimental strategies for addressing a specific research question.

Courses (type, number of weekly contact hours, language — if other than German)
V (3)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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### Module title

<table>
<thead>
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<th>Biophysics and Biochemistry</th>
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### Abbreviation

07-MS3BB-152-m01

### Module coordinator

holder of the Chair of Plant Physiology and Biophysics

### Module offered by

Faculty of Biology

### ECTS

10

### Method of grading

Only after succ. compl. of module(s)

### Duration

1 semester

### Module level

graduate

### Other prerequisites

--

### Contents

The module imparts theoretical and methodological knowledge of plant membrane transport, structural biology and biochemistry which is illustrated with specific examples from current research. Depending on the number of participants and their interests, practical demonstrations of methods that are currently used give students an opportunity to experience the practical aspects of biophysical and biochemical research.

### Intended learning outcomes

Students are able to use methods dealing with soluble proteins or membrane proteins in the fields of biophysics, structural biology and biochemistry. They are able to interpret the data and to discuss the results within the context of current knowledge.

### Courses

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<th>Type</th>
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<td>S</td>
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Module taught in: English

### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Module title: Biophysics and Molecular Biotechnology
Abbreviation: 07-MS2BT-152-m01

Module coordinator: holder of the Chair of Biotechnology and Biophysics
Module offered by: Faculty of Biology

ECTS: 10
Method of grading: Numerical grade
Duration: 1 semester
Module level: Graduate
Other prerequisites: --

Contents:
This lecture provides a broad overview of biophysical techniques and their applications. The first part of the lecture discusses fundamental aspects of thermodynamics, kinetics and molecular interactions. The course then moves on to discuss biophysical methods that facilitate the investigation of individual cells down to the level of single molecules. Focus is on electromanipulation and dielectric spectroscopy of cells, biomembranes, electrophysiology, ion channels, protein folding, single-molecule fluorescence methods and high-resolution as well as dynamic microscopy.

Intended learning outcomes:
Students will have acquired a knowledge of fundamental biophysical methods and their applications that will enable them to independently review relevant literature. In addition, they will have become acquainted with - or, where necessary, will be able to independently acquaint themselves with - biophysical mechanisms.

Courses:
V (2) + S (1)
Module taught in: English

Method of assessment:
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places:
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Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title: Plant Immunobiology and Pharmaceutical Biology
Abbreviation: 07-MS31PIP-152-m01

Module coordinator: holder of the Chair of Ecophysiology and Vegetation Ecology
Module offered by: Faculty of Biology

ECTS: 10
Method of grading: Only after succ. compl. of module(s)

Duration: 1 semester
Module level: graduate
Other prerequisites: --

Contents
This lecture addresses topics of pathogen recognition and signal transduction in plants, molecular and organismic defence and the pharmaceutical relevance of plant-derived bioactive compounds. Plant immunobiology: interactions between plants and pathogens comprise evolutionary dynamic and complex systems. Different strategies of the pathogens - bacteria, fungi and viruses - as well as defence mechanisms of the host plants will be discussed. The molecular mechanisms of pathogen recognition, signal transduction, regulation of gene expression and activation of local and systemic defence responses are in the focus of this lecture. Differences and similarities between plant and human immune systems will be pointed out. Understanding plant-pathogen-interactions and molecular mechanisms determining susceptibility and defence is fundamental for the development of strategies in plant protection. Evolution, function and pharmaceutical relevance of plant secondary metabolites: Secondary metabolites are part of effective plant defence strategies against microorganisms and herbivores and are often essential for survival. The evolution of secondary metabolism will be discussed and general as well as specific defence strategies will be explained. Pharmacological mechanisms of action and molecular targets of important classes of plant bioactive compounds will be presented. A high proportion of currently used drugs have been developed from plant secondary metabolites that have been used as lead structures to generate potent drugs with improved pharmaceutical properties. Examples of therapies with very potent plant pharmaceuticals (evidence-based medicine) as well as possibilities and limitations of phytotherapy (traditional medicine) will be discussed.

Intended learning outcomes
Students are able to understand the interaction between plants and the environment on a molecular level and to discuss the topic in the context of the scientific state of the art.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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<td>holder of the Chair of Ecophysiology and Vegetation Ecology</td>
<td>Faculty of Biology</td>
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<td>graduate</td>
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</table>

**Contents**

The lecture will deal with the ecological and environmental constraints under which plants grow and develop (biogeography, biodiversity) and with the interactions of plants with abiotic and biotic environmental factors (e.g. plant-insect, plant-fungus interactions). The evolutionary adaptations on the physiological and organismic level will be emphasised in particular (stress and defence reactions, carnivory, plant protection). Corresponding experimental approaches will be illustrated. Based on selected examples from current research, the seminar will address the topics covered in the lecture in more detail. It will be complemented by topic-related guided tours in the Botanical Garden of the University of Würzburg.

**Intended learning outcomes**

Participants are able to identify and interpret ecological and ecophysiological interrelations and to discuss them in the context of the current state of knowledge in these fields.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title
Biophysics of Plant Membrane Proteins F1

Abbreviation
07-MS3BPF1-152-m01

Module coordinator
holder of the Chair of Plant Physiology and Biophysics

Module offered by
Faculty of Biology

ECTS
10

Method of grading
numerical grade

Only after succ. compl. of module(s)
--

Duration
1 semester

Module level
graduate

Other prerequisites
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Contents
The module provides an in-depth insight into biophysical strategies and methods which are used for the functional characterisation of plant membrane proteins. The students will be integrated into research projects on current topics in molecular plant membrane biology.

Intended learning outcomes
The students have knowledge of general biophysical strategies and methods with a focus on plant membrane proteins, they are able to independently work on related scientific issues and to document the results obtained.

Courses
(type, number of weekly contact hours, language — if other than German)
P (14) + S (1)
Module taught in: German and/or English

Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
--

Referred to in LPO I (examination regulations for teaching-degree programmes)
--
## Module title

Biophysics of Plant Membrane Proteins F2  

## Abbreviation

07-MS3BPF2-152-m01

## Module coordinator

holder of the Chair of Plant Physiology and Biophysics

## Module offered by

Faculty of Biology

## ECTS

15

## Method of grading

Only after succ. compl. of module(s)

## (not) successfully completed

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## Duration

1 semester

## Module level

graduate

## Other prerequisites

--

## Contents

The students perform their research work within the context of a current research project on the biophysics of plant membrane proteins in a largely independent manner under supervision of a principal investigator.

## Intended learning outcomes

The students are able to address scientific issues in biophysics, using appropriate biophysical methods. They are able to independently design the appropriate experiments as well as to analyse, document, present and discuss the results.

## Courses

(type, number of weekly contact hours, language — if other than German)

P (29) + S (1)

Module taught in: German and/or English

## Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

## Allocation of places

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## Additional information

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## Referred to in LPO I

(examination regulations for teaching-degree programmes)

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Plant Signalling
(30 ECTS credits)
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**Contents**

This lecture series imparts the theoretical background of fundamental and up-to-date molecular biological methods in plant sciences. Special emphasis is placed on analytical tools, large-scale data analysis and their application.

**Intended learning outcomes**

At the end of the lecture series, students will (I) be able to qualitatively evaluate results acquired with analytical and molecular biological methods and to integrate them into the context of the current scientific knowledge in this field (II) have gained an overview of the advantages/disadvantages of analytical and molecular biological approaches (III) be able to apply the knowledge they have acquired to design their own experimental strategies for addressing a specific research question.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (3) Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
--- | ---
Biophysics and Biochemistry | 07-MS3BB-152-m01

Module coordinator | Module offered by
holder of the Chair of Plant Physiology and Biophysics | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
10 | numerical grade | --

Duration | Module level | Other prerequisites
1 semester | graduate | --

Contents
The module imparts theoretical and methodological knowledge of plant membrane transport, structural biology and biochemistry which is illustrated with specific examples from current research. Depending on the number of participants and their interests, practical demonstrations of methods that are currently used give students an opportunity to experience the practical aspects of biophysical and biochemical research.

Intended learning outcomes
Students are able to use methods dealing with soluble proteins or membrane proteins in the fields of biophysics, structural biology and biochemistry. They are able to interpret the data and to discuss the results within the context of current knowledge.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
--

Referred to in LPO I (examination regulations for teaching-degree programmes)
--
### Module title
Plant Immunobiology and Pharmaceutical Biology

### Abbreviation
07-MS31PIP-152-m01

### Module coordinator
holder of the Chair of Ecophysiology and Vegetation Ecology

### Module offered by
Faculty of Biology

### ECTS
10

### Method of grading
Numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
Graduate

### Other prerequisites
--

### Contents
This lecture addresses topics of pathogen recognition and signal transduction in plants, molecular and organismic defence and the pharmaceutical relevance of plant-derived bioactive compounds. Plant immunobiology: interactions between plants and pathogens comprise evolutionary dynamic and complex systems. Different strategies of the pathogens - bacteria, fungi and viruses - as well as defence mechanisms of the host plants will be discussed. The molecular mechanisms of pathogen recognition, signal transduction, regulation of gene expression and activation of local and systemic defence responses are in the focus of this lecture. Differences and similarities between plant and human immune systems will be pointed out. Understanding plant-pathogen-interactions and molecular mechanisms determining susceptibility and defence is fundamental for the development of strategies in plant protection. Evolution, function and pharmaceutical relevance of plant secondary metabolites: Secondary metabolites are part of effective plant defence strategies against microorganisms and herbivores and are often essential for survival. The evolution of secondary metabolism will be discussed and general as well as specific defence strategies will be explained. Pharmacological mechanisms of action and molecular targets of important classes of plant bioactive compounds will be presented. A high proportion of currently used drugs have been developed from plant secondary metabolites that have been used as lead structures to generate potent drugs with improved pharmaceutical properties. Examples of therapies with very potent plant pharmaceuticals (evidence-based medicine) as well as possibilities and limitations of phytotherapy (traditional medicine) will be discussed.

### Intended learning outcomes
Students are able to understand the interaction between plants and the environment on a molecular level and to discuss the topic in the context of the scientific state of the art.

### Courses
(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

### Allocation of places
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### Additional information
--

### Referred to in LPO I (examination regulations for teaching-degree programmes)
--
## Module title

### Plant Ecology

### Abbreviation
07-MS31POEK-152-m01

## Module coordinator
holder of the Chair of Ecophysiology and Vegetation Ecology

## Module offered by
Faculty of Biology

## ECTS
10

## Method of grading
numerical grade

## Only after succ. compl. of module(s)
--

## Duration
1 semester

## Module level
graduate

## Other prerequisites
--

## Contents
The lecture will deal with the ecological and environmental constraints under which plants grow and develop (biogeography, biodiversity) and with the interactions of plants with abiotic and biotic environmental factors (e.g. plant-insect, plant-fungus interactions). The evolutionary adaptations on the physiological and organismic level will be emphasised in particular (stress and defence reactions, carnivory, plant protection). Corresponding experimental approaches will be illustrated. Based on selected examples from current research, the seminar will address the topics covered in the lecture in more detail. It will be complemented by topic-related guided tours in the Botanical Garden of the University of Würzburg.

## Intended learning outcomes
Participants are able to identify and interpret ecological and ecophysiological interrelations and to discuss them in the context of the current state of knowledge in these fields.

## Courses
V (2) + S (1)

Module taught in: German and/or English

## Method of assessment
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

## Allocation of places
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## Additional information
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## Referred to in LPO I
(examination regulations for teaching-degree programmes)
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<table>
<thead>
<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Plant Signalling F1</td>
<td>07-MS3SPF1-152-m01</td>
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### Module coordinator
holder of the Chair of Plant Physiology and Biophysics

### Module offered by
Faculty of Biology

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<th>ECTS</th>
<th>Method of grading</th>
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<tr>
<td>10</td>
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### Duration
1 semester

### Module level
graduate

### Other prerequisites
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### Contents
Molecular mechanisms of plant signal transduction and regulation of gene expression will be investigated in the context of plant-pathogen interaction, plant responses to abiotic stress, lipid signalling and plant hormone signalling. Specific molecular biology methods which are suitable to address these topics will be applied. In addition, students will gain experience in designing appropriate experimental approaches as well as in the documentation and presentation of results. Students will work on a current research project and learn to independently plan and perform the experiments. More information is available on request or can be found at http://www.p-bio.biozentrum.uni-wuerzburg.de/.

### Intended learning outcomes
Students will be trained to apply specific methods in the field of molecular biology, to address scientific questions, to document experimental procedures and results and to interpret experimental data.

### Courses
(type, number of weekly contact hours, language — if other than German)

- P (14) + S (1)

Module taught in: German and/or English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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Module title | Abbreviation
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Plant Signalling F2 | 07-MS3SPF2-152-m01

Module coordinator | Module offered by
holder of the Chair of Plant Physiology and Biophysics | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
--- | --- | ---
15 | (not) successfully completed | --

Duration | Module level | Other prerequisites
1 semester | graduate | --

Contents
Students will independently work on aspects of current research projects in the area of plant signal transduction and stress responses. Results will be discussed in the context of recent publications. The molecular biology and bioanalytical methods which are used will be evaluated and optimised. The aim and progress of the project will be presented in a seminar. More information is available on request or can be found at http://www.pbio.biozentrum.uni-wuerzburg.de/.

Intended learning outcomes
Students are able to independently perform scientific experiments and to use specific techniques in the field of molecular biology and bioanalytics to address scientific questions in the field of plant signal transduction. Students are able to independently work according to the rules of best practice.

Courses (type, number of weekly contact hours, language — if other than German)
P (29) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Pharmaceutical Biology & Metabolomics
(30 ECTS credits)
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<tr>
<td>Current Methods in Biology</td>
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<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

This lecture series imparts the theoretical background of fundamental and up-to-date molecular biological methods in plant sciences. Special emphasis is placed on analytical tools, large-scale data analysis and their application.

**Intended learning outcomes**

At the end of the lecture series, students will (I) be able to qualitatively evaluate results acquired with analytical and molecular biological methods and to integrate them into the context of the current scientific knowledge in this field (II) have gained an overview of the advantages/disadvantages of analytical and molecular biological approaches (III) be able to apply the knowledge they have acquired to design their own experimental strategies for addressing a specific research question.

**Courses** (type, number of weekly contact hours, language — if other than German)

- V (3)
  Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

- --
**Module title**
Plant Immunobiology and Pharmaceutical Biology

**Abbreviation**
07-MS31PIP-152-m01

**Module coordinator**
holder of the Chair of Ecophysiology and Vegetation Ecology

**Module offered by**
Faculty of Biology

**ECTS**
10

**Method of grading**
numerical grade

**Only after succ. compl. of module(s)**
--

**Duration**
1 semester

**Module level**
graduate

**Other prerequisites**
--

### Contents
This lecture addresses topics of pathogen recognition and signal transduction in plants, molecular and organis-mic defence and the pharmaceutical relevance of plant-derived bioactive compounds. Plant immunobiology: inter-actions between plants and pathogens comprise evolutionary dynamic and complex systems. Different strategies of the pathogens - bacteria, fungi and viruses - as well as defence mechanisms of the host plants will be discussed. The molecular mechanisms of pathogen recognition, signal transduction, regulation of gene expres-sion and activation of local and systemic defence responses are in the focus of this lecture. Differences and sim-ilarities between plant and human immune systems will be pointed out. Understanding plant-pathogen-inter-actions and molecular mechanisms determining susceptibility and defence is fundamental for the development of strategies in plant protection. Evolution, function and pharmaceutical relevance of plant secondary metaboli-tes: Secondary metabolites are part of effective plant defence strategies against microorganisms and herbivo-res and are often essential for survival. The evolution of secondary metabolism will be discussed and general as well as specific defence strategies will be explained. Pharmacological mechanisms of action and molecular targets of important classes of plant bioactive compounds will be presented. A high proportion of currently used drugs have been developed from plant secondary metabolites that have been used as lead structures to generate potent drugs with improved pharmaceutical properties. Examples of therapies with very potent plant pharmaceuticals (evidence-based medicine) as well as possibilities and limitations of phytotherapy (traditional medicine) will be discussed.

### Intended learning outcomes
Students are able to understand the interaction between plants and the environment on a molecular level and to discuss the topic in the context of the scientific state of the art.

### Courses
(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places
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### Additional information
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<td>Biophysics and Biochemistry</td>
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**Module coordinator**

holder of the Chair of Plant Physiology and Biophysics

**Module offered by**

Faculty of Biology

**ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** |
----------|-----------------------|----------------------------------------|
10        | numerical grade       | --                                     |

**Duration** | **Module level** | **Other prerequisites** |
-------------|------------------|------------------------|
1 semester   | graduate         | --                     |

**Contents**
The module imparts theoretical and methodological knowledge of plant membrane transport, structural biology and biochemistry which is illustrated with specific examples from current research. Depending on the number of participants and their interests, practical demonstrations of methods that are currently used give students an opportunity to experience the practical aspects of biophysical and biochemical research.

**Intended learning outcomes**

Students are able to use methods dealing with soluble proteins or membrane proteins in the fields of biophysics, structural biology and biochemistry. They are able to interpret the data and to discuss the results within the context of current knowledge.

**Courses**

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<th>type, number of weekly contact hours, language — if other than German</th>
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<td>V (2) + S (1)</td>
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Module taught in: English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
--- | ---
Plant Ecology | 07-MS31POEK-152-m01

Module coordinator | Module offered by
holder of the Chair of Ecophysiology and Vegetation Ecology | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
--- | --- | ---
10 | numerical grade | --

Duration | Module level | Other prerequisites
1 semester | graduate | --

Contents
The lecture will deal with the ecological and environmental constraints under which plants grow and develop (biogeography, biodiversity) and with the interactions of plants with abiotic and biotic environmental factors (e. g. plant-insect, plant-fungus interactions). The evolutionary adaptations on the physiological and organismic level will be emphasised in particular (stress and defence reactions, carnivory, plant protection). Corresponding experimental approaches will be illustrated. Based on selected examples from current research, the seminar will address the topics covered in the lecture in more detail. It will be complemented by topic-related guided tours in the Botanical Garden of the University of Würzburg.

Intended learning outcomes
Participants are able to identify and interpret ecological and ecophysiological interrelations and to discuss them in the context of the current state of knowledge in these fields.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title | Abbreviation
---|---
Molecular Biology | 07-MS2-152-m01

Module coordinator | Module offered by
---|---
Dean of Studies Biologie (Biology) | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
10 | numerical grade | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents
Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

Intended learning outcomes
Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

Courses (type, number of weekly contact hours, language — if other than German)

V (3) 
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
### Module title
Bioinformatics

### Abbreviation
07-MS2BI-152-m01

### Module coordinator
holder of the Chair of Bioinformatics

### Module offered by
Faculty of Biology

### ECTS
10

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

### Contents
Advances and current results of bioinformatics are explained and discussed, this includes results from genome and sequence analysis, protein domains and protein families, large-scale data analysis (e.g. net generation sequences, proteomics data), analysis of different functional RNAs (e.g. miRNAs, IncRNAs).

### Intended learning outcomes
Understand recent results in bioinformatics. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions in bioinformatics.

### Courses
(type, number of weekly contact hours, language — if other than German)

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<tr>
<th>Type</th>
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<td>S</td>
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Module taught in: German and/or English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO 1 (examination regulations for teaching-degree programmes)
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<td>Systems Biology</td>
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<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

Advances and current results of computational systems biology are explained and discussed, this includes results from functional genomics, dynamics of the transcriptome, of metabolism and metabolic networks as well as regulatory networks.

**Intended learning outcomes**

Understand recent results in systems biology. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions of systems biology.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title | Abbreviation
--- | ---
Neurobiology, Behavioural Physiology and Animal Ecology | 07-MS1-152-m01

Module coordinator | Module offered by
Dean of Studies Biologie (Biology) | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
10 | numerical grade | --

Duration | Module level | Other prerequisites
1 semester | graduate | --

Contents
Timing matters: Temporal organisation in the animal kingdom. Timing plays an important role in all living systems. Animals make use of endogenous clocks to predict and adapt to daily or seasonal changes in environmental parameters. To be at the right place at the right time is of great fitness relevance if, for example, a mating partner or enough food has to be found. Many mutualistic, antagonistic or social interactions can only take place if animals are at the same place at the same time and in the appropriate developmental stage. The lecture gives an introduction to the mechanisms underlying the temporal organisation in the animal kingdom. Adopting an integrative approach, the lecture goes from timing mechanisms on the neuronal level to individual behaviour and then to interactions in social groups, populations or partners in complex and variable ecosystems.

Intended learning outcomes
Students get to know the advantages of an integrative approach when analysing complex biological systems. They learn to relate and integrate different fields within biology. In the seminar, students practise the discussion of research findings.

Courses (type, number of weekly contact hours, language — if other than German)
V (3)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title | Abbreviation
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Pharmaceutical Biology and Metabolomics F1 | 07-MS3PBMF1-152-m01

Module coordinator | Module offered by
holder of the Chair of Pharmaceutical Biology | Faculty of Biology

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Contents
All organisms are able to reprogram their metabolism in response to various endogenous or exogenous perturbations. Reprogramming of metabolism is often correlated to phenotypic changes e.g. in disease development, physiology or behaviour. At the Chair of Pharmaceutical Biology, we apply metabolomics for gene function- or stress response analysis. Students can choose a topic from the variety of ongoing projects. Depending on the scientific question addressed by the research team at the Chair, the methodological approach involves techniques in the field of metabolomics/bioanalytics and/or molecular biology. In this module, students will be trained to use quantitative metabolite analysis methods (chromatography, mass spectrometry) and apply advanced molecular biology techniques. Depending on the project, different model organisms are studied. Prior knowledge in metabolite analysis or mass spectrometry is not required. Current scientific questions in the life sciences form the basis to impart scientific concepts and to train students in the laboratory. The module involves the experimental design, realisation and critical evaluation of scientific experiments as well as the documentation and presentation of the progress. More information is available on request or can be found at http://www.pbio.biocentrum.uni-wuerzburg.de/.

Intended learning outcomes
Students will be trained in using specific molecular biology methods and/or metabolomics approaches to address scientific questions, in the documentation of experimental procedures and results, and in the interpretation of data.

Courses (type, number of weekly contact hours, language — if other than German)
P (14) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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### Contents

Students will be involved in current research projects in pharmaceutical biology or in collaborative research projects that focus on the regulation of metabolism and analysis of metabolic pathways (e.g. in the context of reactions towards biotic or abiotic stress, functional and phenotypic analysis of mutants, or drug metabolism). Aspects of the scientific question will be independently addressed by the students. Molecular biology methods and/or metabolomic approaches will be optimised for and adapted to the specific problem. Experimental results and progress in the understanding of biological problems will be documented in the form of a log and presented in a seminar. More information is available on request or can be found at http://www.pbio.biozentrum.uni-wuerzburg.de/.

### Intended learning outcomes

The participants are able to independently carry out scientific experiments and to modify them according to the outcome. They are able to independently approach scientific topics in pharmaceutical biology and to perform, interpret and document experiments, adhering to accepted rules of scientific practice. They are able to apply specific techniques required to answer scientific questions.

### Courses

- **P** (29) + **S** (1)
  - Module taught in: German and/or English

### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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Physiological Plant Ecology
(30 ECTS credits)
## Current Methods in Biology

<table>
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<tr>
<td>Current Methods in Biology</td>
<td>07-MS31-152-m01</td>
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### Module coordinator
holder of the Chair of Plant Physiology and Biophysics

### Module offered by
Faculty of Biology

### ECTS
10

### Method of grading
numerical grade

### Method of grading
Only after succ. compl. of module(s)

### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

### Contents
This lecture series imparts the theoretical background of fundamental and up-to-date molecular biological methods in plant sciences. Special emphasis is placed on analytical tools, large-scale data analysis and their application.

### Intended learning outcomes
At the end of the lecture series, students will (I) be able to qualitatively evaluate results acquired with analytical and molecular biological methods and to integrate them into the context of the current scientific knowledge in this field (II) have gained an overview of the advantages/disadvantages of analytical and molecular biological approaches (III) be able to apply the knowledge they have acquired to design their own experimental strategies for addressing a specific research question.

### Courses (type, number of weekly contact hours, language — if other than German)

<table>
<thead>
<tr>
<th>Type</th>
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<tbody>
<tr>
<td>V</td>
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### Module taught in
German and/or English

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I (examination regulations for teaching-degree programmes)
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## Module title

<table>
<thead>
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<th>Module title</th>
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## Module coordinator

holder of the Chair of Plant Physiology and Biophysics

## Module offered by

Faculty of Biology

## ECTS

10

## Method of grading

numerical grade

## Only after succ. compl. of module(s)

--

## Duration

1 semester

## Module level

graduate

## Other prerequisites

--

## Contents

The module imparts theoretical and methodological knowledge of plant membrane transport, structural biology and biochemistry which is illustrated with specific examples from current research. Depending on the number of participants and their interests, practical demonstrations of methods that are currently used give students an opportunity to experience the practical aspects of biophysical and biochemical research.

## Intended learning outcomes

Students are able to use methods dealing with soluble proteins or membrane proteins in the fields of biophysics, structural biology and biochemistry. They are able to interpret the data and to discuss the results within the context of current knowledge.

## Courses

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Module taught in: English

## Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

## Allocation of places

--

## Additional information

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## Referred to in LPO I

(examination regulations for teaching-degree programmes)
Module title | Abbreviation
---|---
Plant Immunobiology and Pharmaceutical Biology | 07-MS31PIP-152-m01

Module coordinator | Module offered by
holder of the Chair of Ecophysiology and Vegetation Ecology | Faculty of Biology

<table>
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<tr>
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</table>

Contents

This lecture addresses topics of pathogen recognition and signal transduction in plants, molecular and organismic defence and the pharmaceutical relevance of plant-derived bioactive compounds. Plant immunobiology: interactions between plants and pathogens comprise evolutionary dynamic and complex systems. Different strategies of the pathogens - bacteria, fungi and viruses - as well as defence mechanisms of the host plants will be discussed. The molecular mechanisms of pathogen recognition, signal transduction, regulation of gene expression and activation of local and systemic defence responses are in the focus of this lecture. Differences and similarities between plant and human immune systems will be pointed out. Understanding plant-pathogen-interactions and molecular mechanisms determining susceptibility and defence is fundamental for the development of strategies in plant protection. Evolution, function and pharmaceutical relevance of plant secondary metabolites: Secondary metabolites are part of effective plant defence strategies against microorganisms and herbivores and are often essential for survival. The evolution of secondary metabolism will be discussed and general as well as specific defence strategies will be explained. Pharmacological mechanisms of action and molecular targets of important classes of plant bioactive compounds will be presented. A high proportion of currently used drugs have been developed from plant secondary metabolites that have been used as lead structures to generate potent drugs with improved pharmaceutical properties. Examples of therapies with very potent plant pharmaceuticals (evidence-based medicine) as well as possibilities and limitations of phytotherapy (traditional medicine) will be discussed.

Intended learning outcomes

Students are able to understand the interaction between plants and the environment on a molecular level and to discuss the topic in the context of the scientific state of the art.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

--
**Module title**  
Plant Ecology

**Abbreviation**  
07-MS31POEK-152-m01

**Module coordinator**  
holder of the Chair of Ecophysiology and Vegetation Ecology

**Module offered by**  
Faculty of Biology

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</table>

**Contents**

The lecture will deal with the ecological and environmental constraints under which plants grow and develop (biogeography, biodiversity) and with the interactions of plants with abiotic and biotic environmental factors (e.g. plant-insect, plant-fungus interactions). The evolutionary adaptations on the physiological and organismic level will be emphasised in particular (stress and defence reactions, carnivory, plant protection). Corresponding experimental approaches will be illustrated. Based on selected examples from current research, the seminar will address the topics covered in the lecture in more detail. It will be complemented by topic-related guided tours in the Botanical Garden of the University of Würzburg.

**Intended learning outcomes**

Participants are able to identify and interpret ecological and ecophysiological interrelations and to discuss them in the context of the current state of knowledge in these fields.

**Courses**  
(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)  
Module taught in: German and/or English

**Method of assessment**  
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)  
Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**  
(examination regulations for teaching-degree programmes)

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Module title: Physiological Plant Ecology F1
Abbreviation: 07-MS3PPEF1-152-m01

Module coordinator: holder of the Chair of Plant Physiology and Biophysics
Module offered by: Faculty of Biology

ECTS: 10
Method of grading: numerical grade
Duration: 1 semester
Module level: graduate
Other prerequisites: --

Contents:
Under the guidance of an experienced scientist, students will work on a current research topic from the field of ecology/ecophysiology. Particular emphasis will be placed on the physiological bases of the interactions between plants and abiotic and biotic environmental factors (e.g., water relations, stress, biogeography). Working concepts and complex experiments will be designed, and the results will be documented and presented in the form of a presentation, a publication or a log. The participants will be involved in ongoing projects and will deepen their knowledge on applying special methods, in ecophysiology in particular but also in chemical analysis.

Intended learning outcomes:
The participants are able to perform scientific experiments in the field of physiological plant ecology and to apply appropriate methods. They are also able to address and document questions in the field of ecology/ecophysiology, adhering to the rules of good scientific practice.

Courses:
P (14) + S (1)
Module taught in: German and/or English

Method of assessment:
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Additional information:

Referred to in LPO I (examination regulations for teaching-degree programmes)
### Module title

**Physiological Plant Ecology F2**

### Abbreviation

07-MS3PPEF2-152-m01

### Module coordinator

holder of the Chair of Plant Physiology and Biophysics

### Module offered by

Faculty of Biology

### ECTS

15

### Method of grading

Only after succ. compl. of module(s)

### (not) successfully completed

--

### Duration

1 semester

### Module level

graduate

### Other prerequisites

--

### Contents

Students will work on projects taken from ongoing research in the supervisors’ labs in the field of plant ecology and ecophysiology (e.g. plant-insect-, plant-fungus interactions; biogeography; water relations). They will do this work to a large extent on their own responsibility by performing advanced experiments, their documentation and evaluation. Based on the results obtained, the ecophysiological and analytical methods applied (e.g. measurement of transpiration, fluorescence microscopy, chlorophyll-fluorometry) will be critically assessed, and, where necessary, modified. The progress of the experiments and their contribution to more general projects will be documented and presented in the form of presentations, publications or logs.

### Intended learning outcomes

Students have gained knowledge on experimental setups and methods used in the field of plant ecophysiology. They are able to design scientific research, to collect data and to interpret them statistically, adhering to the principles of good scientific practice.

### Courses

P (29) + S (1)

Module taught in: German and/or English

### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Molecular and Chemical Plant Ecology

(30 ECTS credits)
Module title | Abbreviation
---|---
Current Methods in Biology | 07-MS31-152-m01

Module coordinator | Module offered by
holder of the Chair of Plant Physiology and Biophysics | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
10 | numerical grade | --

Duration | Module level | Other prerequisites
1 semester | graduate | --

Contents
This lecture series imparts the theoretical background of fundamental and up-to-date molecular biological methods in plant sciences. Special emphasis is placed on analytical tools, large-scale data analysis and their application.

Intended learning outcomes
At the end of the lecture series, students will (I) be able to qualitatively evaluate results acquired with analytical and molecular biological methods and to integrate them into the context of the current scientific knowledge in this field (II) have gained an overview of the advantages/disadvantages of analytical and molecular biological approaches (III) be able to apply the knowledge they have acquired to design their own experimental strategies for addressing a specific research question.

Courses (type, number of weekly contact hours, language — if other than German)
V (3)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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<table>
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<th>Module title</th>
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<td>Biophysics and Biochemistry</td>
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**Module coordinator**

holder of the Chair of Plant Physiology and Biophysics

**Module offered by**

Faculty of Biology

<table>
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<th>ECTS</th>
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<td>10</td>
<td>numerical grade</td>
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</tbody>
</table>

**Duration**

1 semester

**Module level**

graduate

**Other prerequisites**

--

**Contents**

The module imparts theoretical and methodological knowledge of plant membrane transport, structural biology and biochemistry which is illustrated with specific examples from current research. Depending on the number of participants and their interests, practical demonstrations of methods that are currently used give students an opportunity to experience the practical aspects of biophysical and biochemical research.

**Intended learning outcomes**

Students are able to use methods dealing with soluble proteins or membrane proteins in the fields of biophysics, structural biology and biochemistry. They are able to interpret the data and to discuss the results within the context of current knowledge.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Module title

Plant Immunobiology and Pharmaceutical Biology

Abbreviation

07-MS31PIP-152-m01

Module coordinator

holder of the Chair of Ecophysiology and Vegetation Ecology

Module offered by

Faculty of Biology

ECTS

10

Method of grading

Only after succ. compl. of module(s)

Numerical grade

--

Duration

1 semester

Module level

Graduate

Other prerequisites

--

Contents

This lecture addresses topics of pathogen recognition and signal transduction in plants, molecular and organismic defence and the pharmaceutical relevance of plant-derived bioactive compounds. Plant immunobiology: interactions between plants and pathogens comprise evolutionary dynamic and complex systems. Different strategies of the pathogens - bacteria, fungi and viruses - as well as defence mechanisms of the host plants will be discussed. The molecular mechanisms of pathogen recognition, signal transduction, regulation of gene expression and activation of local and systemic defence responses are in the focus of this lecture. Differences and similarities between plant and human immune systems will be pointed out. Understanding plant-pathogen-interactions and molecular mechanisms determining susceptibility and defence is fundamental for the development of strategies in plant protection. Evolution, function and pharmaceutical relevance of plant secondary metabolites: Secondary metabolites are part of effective plant defence strategies against microorganisms and herbivores and are often essential for survival. The evolution of secondary metabolism will be discussed and general as well as specific defence strategies will be explained. Pharmacological mechanisms of action and molecular targets of important classes of plant bioactive compounds will be presented. A high proportion of currently used drugs have been developed from plant secondary metabolites that have been used as lead structures to generate potent drugs with improved pharmaceutical properties. Examples of therapies with very potent plant pharmaceuticals (evidence-based medicine) as well as possibilities and limitations of phytotherapy (traditional medicine) will be discussed.

Intended learning outcomes

Students are able to understand the interaction between plants and the environment on a molecular level and to discuss the topic in the context of the scientific state of the art.

Courses

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

Allocation of places

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Additional information

--

Referred to in LPO I (examination regulations for teaching-degree programmes)

--
### Module title
Plant Ecology

### Abbreviation
07-MS31POEK-152-m01

### Module coordinator
holder of the Chair of Ecophysiology and Vegetation Ecology

### Module offered by
Faculty of Biology

### ECTS
10

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

### Contents
The lecture will deal with the ecological and environmental constraints under which plants grow and develop (biogeography, biodiversity) and with the interactions of plants with abiotic and biotic environmental factors (e.g. plant-insect, plant-fungus interactions). The evolutionary adaptations on the physiological and organismic level will be emphasised in particular (stress and defence reactions, carnivory, plant protection). Corresponding experimental approaches will be illustrated. Based on selected examples from current research, the seminar will address the topics covered in the lecture in more detail. It will be complemented by topic-related guided tours in the Botanical Garden of the University of Würzburg.

### Intended learning outcomes
Participants are able to identify and interpret ecological and ecophysiological interrelations and to discuss them in the context of the current state of knowledge in these fields.

### Courses
- **V (2) + S (1)**
  - Module taught in: German and/or English

### Method of assessment
Type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places
--

### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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### Module: Molecular and Chemical Plant Ecology F1

**Abbreviation:** 07-MS3MCPEF1-152-m01

<table>
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<td>Molecular and Chemical Plant Ecology F1</td>
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**Module coordinator:** holder of the Chair of Plant Physiology and Biophysics  
**Module offered by:** Faculty of Biology

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<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

Under the guidance of an experienced scientist, students will work on a current research topic from the field of molecular and chemical plant ecology. Particular emphasis will be placed on the molecular and chemical bases of the interactions between plants and abiotic and biotic environmental factors (e.g., cuticular barrier properties, plant-insect, and plant-fungus interactions). Working concepts and complex experiments will be designed, and the results will be documented and presented in the form of presentations, publications or logs. The participants will be involved in ongoing projects and will deepen their knowledge on applying special methods, in molecular biology in particular but also in chemical analysis.

**Intended learning outcomes**

The participants are able to perform scientific experiments in the field of molecular and chemical plant ecology and to apply appropriate methods. They are also able to address and document questions in the field of molecular biology/chemical ecology, adhering to the rules of good scientific practice.

**Courses**  
(type, number of weekly contact hours, language — if other than German)

- P (14) + S (1)

Module taught in: German and/or English

**Method of assessment**  
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**  
(examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
---|---
Molecular and Chemical Plant Ecology F2 | 07-MS3MCPEF2-152-m01

Module coordinator | Module offered by
holder of the Chair of Plant Physiology and Biophysics | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
15 | (not) successfully completed | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents

Students will work on projects taken from ongoing research in the supervisors' labs from the field of molecular and chemical plant ecology (e.g. cuticular barrier properties, plant-insect, and plant-fungus interactions). They will do this work to a large extent on their own responsibility by performing advanced experiments, their documentation and evaluation. Based on the results obtained, the analytical, molecular biological and/or microbiological methods applied (e.g. PCR, cloning strategies, chromatography, mass spectrometry) will be critically assessed and, where necessary, modified. The progress of the experiments and their contribution to more general projects will be documented and presented in the form of presentations, publications or logs.

Intended learning outcomes

The participants are able to independently perform scientific experiments in the field of molecular and chemical plant ecology and to modify them according to the outcome. They are able to independently address, document and interpret questions in the field of molecular/chemical plant ecology, adhering to the rules of good scientific practice. Students are also able to apply specific techniques required to answer scientific questions.

Courses (type, number of weekly contact hours, language — if other than German)

P (29) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

--
System Biology
(30 ECTS credits)

Students who selected this subject area must take module 07-MS3S.
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<th>Other prerequisites</th>
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</thead>
<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

Advances and current results of computational systems biology are explained and discussed, this includes results from functional genomics, dynamics of the transcriptome, of metabolism and metabolic networks as well as regulatory networks.

**Intended learning outcomes**

Understand recent results in systems biology. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions of systems biology.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<td>holder of the Chair of Bioinformatics</td>
<td>Faculty of Biology</td>
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<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

Advances and current results of bioinformatics are explained and discussed, this includes results from genome and sequence analysis, protein domains and protein families, large-scale data analysis (e.g. net generation sequences, proteomics data), analysis of different functional RNAs (e.g. miRNAs, lncRNAs).

**Intended learning outcomes**

Understand recent results in bioinformatics. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions in bioinformatics.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title | Neurobiology, Behavioural Physiology and Animal Ecology | Abbreviation | 07-MS1-152-m01
---|---|---|---
Module coordinator | Dean of Studies Biologie (Biology) | Module offered by | Faculty of Biology
ECTS | 10 | Method of grading | Only after succ. compl. of module(s)
| | numerical grade | -- |
Duration | 1 semester | Module level | graduate | Other prerequisites | -- |
Contents
Timing matters: Temporal organisation in the animal kingdom. Timing plays an important role in all living systems. Animals make use of endogenous clocks to predict and adapt to daily or seasonal changes in environmental parameters. To be at the right place at the right time is of great fitness relevance if, for example, a mating partner or enough food has to be found. Many mutualistic, antagonistic or social interactions can only take place if animals are at the same place at the same time and in the appropriate developmental stage. The lecture gives an introduction to the mechanisms underlying the temporal organisation in the animal kingdom. Adopting an integrative approach, the lecture goes from timing mechanisms on the neuronal level to individual behaviour and then to interactions in social groups, populations or partners in complex and variable ecosystems.

Intended learning outcomes
Students get to know the advantages of an integrative approach when analysing complex biological systems. They learn to relate and integrate different fields within biology. In the seminar, students practise the discussion of research findings.

Courses (type, number of weekly contact hours, language — if other than German)
V (3)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
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Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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<table>
<thead>
<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Molecular and Clinical Neurobiology</td>
<td>07-MS1N-152-m01</td>
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<td>Managing Director of the Institute of Clinical Neurobiology</td>
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<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

Content of the lecture *Molekulare und klinische Neurobiologie* (*Molecular and Clinical Neurobiology*) - cells of the nervous system, properties of neurons and glial cells - ion channels and excitability of membranes, channelopathies - synapses, transmitter release, neuromuscular end plate, Myasthenia gravis - motor activity, anatomy of the human motor system, spinal reflexes, motor neuron diseases - cerebellum, ataxia and basal ganglia, Morbus Parkinson - muscles and muscle diseases - somatosensory system and pain - hippocampus, learning and memory, anterograde amnesia, visual agnosia - cortex, Morbus Alzheimer - sleep, EEG, epilepsy - sensory physiology, vision, diseases of the visual system; Reading: Kandel, Principles of Neural Science, 4th Edition: A detailed description of this course is also available at [http://neurobiologie.uk-wuerzburg.de/lehrveranstaltungen.html](http://neurobiologie.uk-wuerzburg.de/lehrveranstaltungen.html). The lecture Molecular and Clinical Neurobiology (incl. seminar) and *Neuroentwicklungsbiologie* (*Neurodevelopment*; Fridays 8-9 a. m.) together form one theoretical module (10 ECTS). However, you may also complete these two modules separately and have them credited within the area of mandatory electives 2.

**Intended learning outcomes**

Theoretical foundations of molecular and clinical neurobiology, developmental mechanisms of neuronal diseases.

**Courses** (type, number of weekly contact hours, language — if other than German)

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<th>Type</th>
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**Module taught in: German and/or English**

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module title

**Animal Ecology and Tropical Biology**

### Abbreviation

07-MS1TÖ-152-m01

### Module coordinator

holder of the Chair of Animal Ecology and Tropical Biology

### Module offered by

Faculty of Biology

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</table>

### Contents

This module consists of a lecture and a seminar. The lecture gives an overview of the theoretical foundations and current issues in animal ecology. Focus will be on biodiversity and ecosystem functions, multi-trophic interactions and food nets, evolutionary ecology, chemical ecology, tropical ecology, agricultural ecology, and global change. In the seminar, recent scientific publications within the topics mentioned above will be presented and discussed.

### Intended learning outcomes

The students will acquire an advanced knowledge of ecological theories and current research issues in the field of animal ecology. They will be able to interpret scientific publications and apply the acquired knowledge to the solution of current environmental risks.

### Courses

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<td>V (2) + S (1)</td>
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Module taught in: German and/or English

### Method of assessment

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### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

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### Module Catalogue for the Subject
Biosciences
Master's with 1 major, 120 ECTS credits

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<td>Animal Communication</td>
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<tbody>
<tr>
<td>holder of the Chair of Behavioral Physiology and Sociobiology</td>
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### Contents
The lectures deal with physiological and neurobiological principles of the different communication channels used by animals, but also highlight adaptive values and evolutionary aspects of animal signalling. In a follow-up seminar session, students will deepen their knowledge by presenting and discussing current papers related to the topic of the lecture.

### Intended learning outcomes
Students understand the value of an integrative approach when looking at complex issues in biology. They have learned to connect findings from different research areas, such as physiology, neurobiology, behaviour and ecological conditions, in order to gain a more complete picture of a topic. In addition, students have learned to present and discuss current scientific publications within a broader theoretical framework.

### Courses
(type, number of weekly contact hours, language — if other than German)

- V (2) + S (1)
  - Module taught in: German and/or English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

--
Molecular Biology

Module title

Abbreviation

Molecular Biology

07-MS2-152-m01

Module coordinator

Dean of Studies Biologie (Biology)

Module offered by

Faculty of Biology

ECTS

Method of grading

Only after succ. compl. of module(s)

10

numerical grade

--

Duration

Module level

Other prerequisites

1 semester

graduate

--

Contents

Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles, and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

Intended learning outcomes

Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

Courses

(type, number of weekly contact hours, language — if other than German)

V (3)

Module taught in: German and/or English

Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

--
Module title
Cell and Developmental Biology Master 1

Abbreviation
07-MSZ1E1-152-m01

Module coordinator
holder of the Chair of Cell Biology and Developmental Biology

Module offered by
Faculty of Biology

ECTS
10

Method of grading
numerical grade

Only after succ. compl. of module(s)
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Duration
1 semester

Module level
graduate

Other prerequisites
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Contents
The module consists of the lecture Zellpathologie (Cytopathology) and the seminar Zellbiologie-Meilensteine und Perspektiven (Milestones and Perspectives of Cell Biology). The lecture describes pathological states of the cell and unravels their biological causes and consequences, such as infection, apoptosis, senescence, metabolic disorders and cancer. In the seminar Milestones and Perspectives of Cell Biology, classic ground-breaking publications in the field of cell biology are discussed from an unusual point of view.

Intended learning outcomes
Students possess a knowledge of the theoretical principles underlying cell pathology and are able to put this into the broader context of cell biology research.

Courses (type, number of weekly contact hours, language — if other than German)
V (1) + S (2)

Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

Allocation of places
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Additional information
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**Contents**

The module consists of the lecture *Signale und Differenzierung* (Signals and Differentiation) and the seminar *Entwicklungsbio- logie - Meilensteine und Perspektiven* (Milestones and Perspectives of Developmental Biology). The lecture *Signals and Differentiation* does not attempt to impart pure textbook knowledge. Instead, historically important as well as particularly interesting and important trend-setting topics in developmental biology are presented. The topics range from classical developmental subjects such as tissue regeneration and morphogenetic cell migration to molecular stem cell biology, epigenetic plasticity, origins of multicellularity and development within changing environments. In the seminar *Milestones and Perspectives of Developmental Biology*, classic ground-breaking publications in the field of developmental biology are discussed from an unusual point of view.

**Intended learning outcomes**

Participants possess a knowledge of the theoretical and molecular biological principles underlying developmental biology and are able to put this into the broader context of cell and developmental biology research.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (1) + S (2)

Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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<table>
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<td>Infection Biology</td>
<td>07-MS2INF-152-m01</td>
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**Contents**

Fundamentals of molecular microbiology and infection biology, mechanisms of adherence and invasion, bacterial pathogenicity factors, regulation of virulence, mechanisms of host defence and pathogen interference, current methods in infection biology.

**Intended learning outcomes**

The students are able to understand fundamental theories of molecular microbiology and infection biology, emergence of infectious diseases.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
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<td>Pathogenicity of Microorganisms</td>
<td>07-MS2PA-152-m01</td>
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**Contents**

Fundamental principles of the mode of action of microbial pathogenicity factors will be presented using selected prokaryotic and eukaryotic pathogens as model organisms. In addition, current research methods in infection biology will be presented.

**Intended learning outcomes**

Students have gained fundamental knowledge in infection biology and pathogenicity research and the mechanisms behind infectious diseases.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Module Catalogue for the Subject Biosciences

**Master’s with 1 major, 120 ECTS credits**

<table>
<thead>
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<tr>
<td>Immunology 1</td>
<td>07-MS2IM1-152-m01</td>
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**Module coordinator**
Managing Director of the Institute of Virology and Immunobiology

**Module offered by**
Faculty of Biology

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**Contents**

**Intended learning outcomes**
Students will gain knowledge about, and will be able to present and discuss basic concepts and methods in molecular and cellular immunology.

**Courses** *(type, number of weekly contact hours, language — if other than German)*

V (1) + S (2)
Module taught in: English

**Method of assessment** *(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)*

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Assessment offered: Winter semester only
Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I** *(examination regulations for teaching-degree programmes)*
--
### Module title
| Immunology 2 |

### Abbreviation
| 07-MS2IM2-152-m01 |

### Module coordinator
Managing Director of the Institute of Virology and Immunobiology

### Module offered by
Faculty of Biology

### ECTS
| 10 |

### Method of grading
| numerical grade |

### Only after succ. compl. of module(s)
| -- |

### Duration
| 1 semester |

### Module level
| graduate |

### Other prerequisites
| -- |

### Contents
Recent progress in molecular and cellular immunology. Deeper insights into selected immunology chapters, such as autoimmunity and immunomodulation, development of the immune system, immunogenetics, evolution of the immune system, infection immunology, and more.

### Intended learning outcomes
Students are able to understand current topics in immunology and to discuss these in detail.

### Courses
(type, number of weekly contact hours, language — if other than German)

V (1) + S (2)

Module taught in: English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Assessment offered: Summer semester only

Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
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<tr>
<td>Molecular Virology</td>
<td>03-MSMV-171-m01</td>
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**Contents**

No information on contents available.

**Intended learning outcomes**

No information on intended learning outcomes available.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (1) + S (2)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).

If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module title
Human Genetics

### Abbreviation
07-MS2HG-152-m01

### Module coordinator
Managing Director of the Institute of Human Genetics

### Module offered by
Faculty of Biology

### ECTS
10

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
2 semester

### Module level
graduate

### Other prerequisites
--

### Contents
This module will discuss current topics in human genetics.

### Intended learning outcomes
Students will have gained the ability to understand current issues in human genetics and to discuss these in depth.

### Courses
(V (2) + S (1))
Module taught in: German and/or English

### Method of assessment
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

### Allocation of places
--

### Additional information
--

### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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### Current Methods in Biology

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<td>Current Methods in Biology</td>
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

### Contents

This lecture series imparts the theoretical background of fundamental and up-to-date molecular biological methods in plant sciences. Special emphasis is placed on analytical tools, large-scale data analysis and their application.

### Intended learning outcomes

At the end of the lecture series, students will (I) be able to qualitatively evaluate results acquired with analytical and molecular biological methods and to integrate them into the context of the current scientific knowledge in this field (II) have gained an overview of the advantages/disadvantages of analytical and molecular biological approaches (III) be able to apply the knowledge they have acquired to design their own experimental strategies for addressing a specific research question.

### Courses

<table>
<thead>
<tr>
<th>Type</th>
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<tbody>
<tr>
<td>V</td>
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</table>

**Module taught in:** German and/or English

### Method of assessment

<table>
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<th>Type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus</th>
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<tbody>
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</tr>
<tr>
<td>Language of assessment: German and/or English</td>
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### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
### Module title
Biophysics and Biochemistry

| Abbreviation       | 07-MS3BB-152-m01 |

### Module coordinator
holder of the Chair of Plant Physiology and Biophysics

### Module offered by
Faculty of Biology

<table>
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<tr>
<th>ECTS</th>
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<tr>
<td>10</td>
<td>numerical grade</td>
<td>1 semester</td>
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</table>

### Contents
The module imparts theoretical and methodological knowledge of plant membrane transport, structural biology and biochemistry which is illustrated with specific examples from current research. Depending on the number of participants and their interests, practical demonstrations of methods that are currently used give students an opportunity to experience the practical aspects of biophysical and biochemical research.

### Intended learning outcomes
Students are able to use methods dealing with soluble proteins or membrane proteins in the fields of biophysics, structural biology and biochemistry. They are able to interpret the data and to discuss the results within the context of current knowledge.

### Courses
(type, number of weekly contact hours, language — if other than German)

- **V (2) + S (1)**

Module taught in: English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places
--

### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
### Module Catalogue for the Subject Biosciences

**Master's with 1 major, 120 ECTS credits**

<table>
<thead>
<tr>
<th>Module title</th>
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<tr>
<td>Plant Immunobiology and Pharmaceutical Biology</td>
<td>07-MS31PIP-152-m01</td>
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<tbody>
<tr>
<td>holder of the Chair of Ecophysiology and Vegetation Ecology</td>
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<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

This lecture addresses topics of pathogen recognition and signal transduction in plants, molecular and organisic defence and the pharmaceutical relevance of plant-derived bioactive compounds. Plant immunobiology: interactions between plants and pathogens comprise evolutionary dynamic and complex systems. Different strategies of the pathogens - bacteria, fungi and viruses - as well as defence mechanisms of the host plants will be discussed. The molecular mechanisms of pathogen recognition, signal transduction, regulation of gene expression and activation of local and systemic defence responses are in the focus of this lecture. Differences and similarities between plant and human immune systems will be pointed out. Understanding plant-pathogen-interactions and molecular mechanisms determining susceptibility and defence is fundamental for the development of strategies in plant protection.

Evolution, function and pharmaceutical relevance of plant secondary metabolites: Secondary metabolites are parts of effective plant defence strategies against microorganisms and herbivores and are often essential for survival. The evolution of secondary metabolism will be discussed and general as well as specific defence strategies will be explained. Pharmacological mechanisms of action and molecular targets of important classes of plant bioactive compounds will be presented. A high proportion of currently used drugs have been developed from plant secondary metabolites that have been used as lead structures to generate potent drugs with improved pharmaceutical properties. Examples of therapies with very potent plant pharmaceuticals (evidence-based medicine) as well as possibilities and limitations of phytotherapy (traditional medicine) will be discussed.

**Intended learning outcomes**

Students are able to understand the interaction between plants and the environment on a molecular level and to discuss the topic in the context of the scientific state of the art.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title: Plant Ecology
Abbreviation: 07-MS31POEK-152-m01

Module coordinator:
holder of the Chair of Ecophysiology and Vegetation Ecology

Module offered by:
Faculty of Biology

ECTS: 10
Method of grading:
numerical grade

Duration: 1 semester
Module level: graduate

Other prerequisites:

Contents:
The lecture will deal with the ecological and environmental constraints under which plants grow and develop (biogeography, biodiversity) and with the interactions of plants with abiotic and biotic environmental factors (e.g. plant-insect, plant-fungus interactions). The evolutionary adaptations on the physiological and organismic level will be emphasised in particular (stress and defence reactions, carnivory, plant protection). Corresponding experimental approaches will be illustrated. Based on selected examples from current research, the seminar will address the topics covered in the lecture in more detail. It will be complemented by topic-related guided tours in the Botanical Garden of the University of Würzburg.

Intended learning outcomes:
Participants are able to identify and interpret ecological and ecophysiological interrelations and to discuss them in the context of the current state of knowledge in these fields.

Courses:
V (2) + S (1)
Module taught in: German and/or English

Method of assessment:
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places:

Additional information:

Referred to in LPO I (examination regulations for teaching-degree programmes):


Module title: Systems Biology F1  
Abbreviation: 07-MS3SYF1-152-m01

Module coordinator: holder of the Chair of Bioinformatics  
Module offered by: Faculty of Biology

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Duration: 1 semester  
Module level: graduate  
Module taught in: German and/or English

Contents:
The practical course will provide students with advanced insights into a field of systems biology and will, in particular, make students proficient in a dynamical method in systems biology (areas that may be selected include protein structure analysis and protein folding, genome analysis and evolution; dynamic network analysis, the dynamics of protein-protein interactions, modelling cellular regulation; modelling metabolism, statistical modelling).

Intended learning outcomes:
Students have gained knowledge on experimental setups and methods used in the field of systems biology. They are able to design scientific research, to collect data and to interpret them statistically, adhering to the principles of good scientific practice.

Courses:
- P (14) + S (1)

Module taught in: German and/or English

Method of assessment:
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

Allocation of places:
--

Additional information:
--

Referred to in LPO I (examination regulations for teaching-degree programmes):
--
### Module title

**Systems Biology F2**

**Abbreviation**

07-MS3SYF2-152-m01

### Module coordinator

holder of the Chair of Bioinformatics

### Module offered by

Faculty of Biology

### ECTS

15

### Method of grading

Only after succ. compl. of module(s)

### (not) successfully completed

--

### Duration

1 semester

### Module level

graduate

### Other prerequisites

--

### Contents

The practical course will provide students with advanced insights into a field of systems biology and will, in particular, make students proficient in a dynamical method in systems biology (areas that may be selected include protein structure analysis and protein folding, genome analysis and evolution; dynamic network analysis, the dynamics of protein-protein interactions, modelling cellular regulation; modelling metabolism, statistical modelling). The techniques applied are evaluated on the basis of the results obtained and are modified where necessary. Results are documented in the form of a presentation, a publication or a term paper.

### Intended learning outcomes

Proficiency in one or more methods in systems biology that allows students to independently perform and organise a scientific project in the field of bioinformatics and to document the results obtained. Students are able to design a research project and are prepared for working on a scientific question for their thesis.

### Courses

(type, number of weekly contact hours, language — if other than German)

P (29) + S (1)

Module taught in: German and/or English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

--
Module Group 4
(ECTS credits)
Neuroethology - Neurogenetics
(30 ECTS credits)

Students must combine the topics "Neuroethology -- Neurogenetics" and "Neuroethology -- Behavioural Physiology and Sociobiology".
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<td>Neurogenetics of Behaviour</td>
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<tbody>
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</table>

**Contents**

To understand how the brain controls behaviour is at the heart of neuroscience. Both brain and behaviour can be overwhelmingly complex and plastic, yet neurogenetic methods are powerful tools to dissect the principles of how the brain controls behaviour. The lecture and seminar will give a state-of-the-art view on current and important topics of behavioural neurobiology (incl. e.g. sleep, control of appetite and feeding, social behaviour, mating, mirror neurons, molecular mechanisms of auditory-guided behaviour, neurogenetic techniques) focusing on genetic model systems such as the fruit fly Drosophila, the mouse, and the nematode C. elegans.

**Intended learning outcomes**

In the lecture, students acquire theoretical and methodological insights into current topics in the field of neurogenetics in general and the neurogenetics of behaviour. In the seminar, students practise presenting and discussing research findings in English.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<td>Endogenous Clocks</td>
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**Contents**

Introduction into endogenous clocks of unicellular organisms, fungi, plants and animals, with a focus on the neuronal organisation of the clock in the brain of mammals and insects. The biological functions of endogenous clocks and the underlying mechanisms will be discussed on the molecular, cellular and organismic levels. It will be explained how clocks adjust to a 24h day with variable photoperiods. Applied aspects regarding e. g. shift work or jetlag will also be discussed.

**Intended learning outcomes**

The students learn fundamental principles underlying chronobiology/endogenous clocks and obtain an insight into current research in the field. In the seminar, they practise their presentation skills and the discussion of research findings in English.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
---|---
Neurobiology F1 | 07-MS1NF1-152-m01

Module coordinator | Module offered by
holder of the Chair of Neurobiology and Genetics | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
10 | numerical grade | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents
A current topic in the field of neurobiology will be investigated. The practical course will be offered in different specialisations: molecular, clinical, cellular, developmental or behavioural neurobiology or in neurogenetics. In addition to a literature search, a variety of neurobiological methods (for example: electrophysiology, immunohistochemistry, molecular biological techniques, clinical and neurogenetic techniques) and different model systems are offered. The experimental results will be documented and presented in the form of a scientific talk, a publication or a seminar paper.

Intended learning outcomes
The participants are able to conduct scientific research within the field of neurobiology. They have acquired the knowledge and skills (e. g. basic and advanced knowledge, special knowledge, advanced methodological background, general and specific methods) to carry out and document neurobiological experiments according to best practice.

Courses (type, number of weekly contact hours, language — if other than German)
P (14) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — If not every semester, information on whether module is creditable for bonus)
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Language of assessment: German and/or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title | Abbreviation
---|---
Neurobiology F2 | 07-MS1NF2-152-m01

**Module coordinator**
holder of the Chair of Neurobiology and Genetics

**Module offered by**
Faculty of Biology

**ECTS** | **Method of grading** | **Only after succ. compl. of module(s)**
---|---|---
15 | (not) successfully completed | --

**Duration** | **Module level** | **Other prerequisites**
---|---|---
1 semester | graduate | --

**Contents**
The students will independently work on a smaller project within a current line of research at the Chair. Neurobiological, genetic or molecular techniques will be tested and adapted according to the research aim. The progress of the experiments and the current line of research will be documented and presented in the form of a scientific talk, a publication or a seminar paper.

**Intended learning outcomes**
The participants are able to independently conduct scientific research within the field of neurobiology and to adapt a research plan according to the experimental progress. They have acquired the knowledge and skills (e.g. basic and advanced knowledge, special knowledge, advanced methodological background, general and specific methods) to independently carry out, document and interpret neurobiological experiments according to best practice.

**Courses**
(type, number of weekly contact hours, language — if other than German)
P (29) + S (1)
Module taught in: German and/or English

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**
--

**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)
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Neuroethology - Behavioural Physiology and Sociobiology
(30 ECTS credits)

Students must combine the topics "Neuroethology -- Neurogenetics" and "Neuroethology -- Behavioural Physiology and Sociobiology".
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<tr>
<td>Neurobiology, Behavioural Physiology and Animal Ecology</td>
<td>07-MS1-152-m01</td>
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**Module coordinator**
Dean of Studies Biologie (Biology)

**Module offered by**
Faculty of Biology

**ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** |
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**Duration** | **Module level** | **Other prerequisites** |
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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**Contents**
Timing matters: Temporal organisation in the animal kingdom. Timing plays an important role in all living systems. Animals make use of endogenous clocks to predict and adapt to daily or seasonal changes in environmental parameters. To be at the right place at the right time is of great fitness relevance if, for example, a mating partner or enough food has to be found. Many mutualistic, antagonistic or social interactions can only take place if animals are at the same place at the same time and in the appropriate developmental stage. The lecture gives an introduction to the mechanisms underlying the temporal organisation in the animal kingdom. Adopting an integrative approach, the lecture goes from timing mechanisms on the neuronal level to individual behaviour and then to interactions in social groups, populations or partners in complex and variable ecosystems.

**Intended learning outcomes**
Students get to know the advantages of an integrative approach when analysing complex biological systems. They learn to relate and integrate different fields within biology. In the seminar, students practise the discussion of research findings.

**Courses** *(type, number of weekly contact hours, language — if other than German)*
V (3)
Module taught in: English

**Method of assessment** *(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)*
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I** *(examination regulations for teaching-degree programmes)*
--
Module title: Experimental Sociobiology  
Abbreviation: 07-MS1ES-152-m01

Module coordinator: holder of the Chair of Behavioral Physiology and Sociobiology
Module offered by: Faculty of Biology

ECTS: 10  
Method of grading: numerical grade
Duration: 1 semester  
Module level: graduate
Other prerequisites: --

Contents:
The lecture covers the diversity and the development of social behaviour as well as the behavioural physiology and mechanisms of neurobiology that are the basis of the organisation of social groups. A special focus is on current research in the Faculty. With the help of selected publications, the seminar will discuss and explore in more detail the topics covered in the lecture.

Intended learning outcomes:
Students understand the value of an integrative approach when looking at complex correlations in behavioural biology. Students are able to recognise and interpret relationships between various aspects of sociobiology. They are able to formulate scientific questions in the context of sociobiology and are able to discuss cutting edge literature in depth.

Courses:
V (2) + S (1)  
Module taught in: English

Method of assessment:
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places:
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Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes):
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### Module Catalogue for the Subject Biosciences

#### Master's with 1 major, 120 ECTS credits

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### Contents

Students will be integrated into one of the research groups at the Chair and will independently work on one of the current topics in the field of behavioural physiology and sociobiology. They will gain an insight into the latest physiological, neurobiological and behavioural methods. The results obtained will be graphically and statistically analysed, summarised in a scientific report and presented in a talk. Please contact the research groups at the Chair for available topics and opportunities.

### Intended learning outcomes

The students are able to independently perform scientific experiments in the field of behavioural physiology and sociobiology. In addition, they are able to process and document the results obtained and to present them to a scientific audience.

### Courses (type, number of weekly contact hours, language — if other than German)

P (14) + S (1)

Module taught in: German and/or English

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

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### Module Catalogue for the Subject

**Biosciences**

**Master's with 1 major, 120 ECTS credits**

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### Contents

Students will be integrated into one of the research groups at the Chair and will independently work on one of the current topics in the field of behavioural physiology and sociobiology. They will learn to plan experimental series and to apply the latest physiological, neurobiological and behavioural methods. The results obtained will be graphically and statistically analysed, summarised in a scientific report and presented in a talk. Please contact the research groups at the Chair for available topics and opportunities.

### Intended learning outcomes

The students are able to independently perform scientific experiments in the field of behavioural physiology and sociobiology. In addition, they have learned to interpret the results obtained, taking into account current literature, and to place them in the context of other research in the field.

### Courses

P (29) + S (1)
Module taught in: German and/or English

### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)
Cell and Developmental Biology
(30 ECTS credits)

Students must combine the topics "Molecular Infection Biology" and "Cell and Developmental Biology".
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**Contents**

Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

**Intended learning outcomes**

Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (3)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title: Cell and Developmental Biology Master 2
Abbreviation: 07-MS2ZE2-152-m01

Module coordinator
holder of the Chair of Cell Biology and Developmental Biology

Module offered by
Faculty of Biology

ECTS: 10
Method of grading: numerical grade
Only after succ. compl. of module(s): --

Duration: 1 semester
Module level: graduate
Other prerequisites: --

Contents
The module consists of the lecture *Signale und Differenzierung* (Signals and Differentiation) and the seminar *Entwicklungsbiologie - Meilensteine und Perspektiven* (Milestones and Perspectives of Developmental Biology). The lecture *Signals and Differentiation* does not attempt to impart pure textbook knowledge. Instead, historically important as well as particularly interesting and important trend-setting topics in developmental biology are presented. The topics range from classical developmental subjects such as tissue regeneration and morphogenetic cell migration to molecular stem cell biology, epigenetic plasticity, origins of multicellularity and development within changing environments. In the seminar *Milestones and Perspectives of Developmental Biology*, classic ground-breaking publications in the field of developmental biology are discussed from an unusual point of view.

Intended learning outcomes
Participants possess a knowledge of the theoretical and molecular biological principles underlying development biology and are able to put this into the broader context of cell and developmental biology research.

Courses (type, number of weekly contact hours, language — if other than German)
V (1) + S (2)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title | Abbreviation
---|---
Methods in Life Sciences | 07-MLS1-152-m01

Module coordinator | Module offered by
degree programme coordinator Biologie (Biology) | Faculty of Biology

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</table>

**Contents**

Versioned molecular techniques, lipid research methods, microscopic methods, immunohistochemistry, mouse models and gene-knockout approaches, protein and molecular biology techniques, PCR, advanced protein biochemistry, methods in bioinformatics and computational biology.

**Intended learning outcomes**

Students are able to review and expand their knowledge of standard molecular techniques and are able to choose methods and techniques to design experiments in a specific research area.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (3)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
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**Contents**

This 5 week full-time practical course provides an introduction to modern cell and developmental biology-related methods with a focus on bio-imaging techniques. A broad variety of model organisms is covered and the participants are encouraged to independently design and perform their own experiments. Participants use their acquired technological skills to analyse important basic biological processes. Large parts of this practical course are devoted to small projects, which should provide sustained insights into current research activities of the Chair. Interactions with Master's students, doctoral researchers and post-docs prepare participants for a working in a team-based environment.

**Intended learning outcomes**

The participants are able to approach complex scientific questions in the fields of cell and developmental biology and to independently implement acquired methodological tools to answer these questions. They are able to perform and document cell and developmental biology-related experiments, adhering to a generally accepted code of scientific practice.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (14) + S (1)

Module taught in: German and/or English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title | Abbreviation
--- | ---
Cell and Developmental Biology F2 | 07-MS2ZEF2-152-m01

Module coordinator | Module offered by
--- | ---
holder of the Chair of Cell Biology and Developmental Biology | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
--- | --- | ---
15 | (not) successfully completed | --

Duration | Module level | Other prerequisites
--- | --- | ---
1 semester | graduate | --

Contents

Well-defined aspects of scientific projects are addressed with independently designed experiments in the context of current research projects in the field of cell and developmental biology. The techniques applied are evaluated on the basis of the results obtained and modified where necessary. The results of all experiments as well as the impact on the research project are presented and discussed in a progress report seminar within the research group.

Intended learning outcomes

The participants are able to independently carry out scientific experiments in the fields of cell and developmental biology and to modify them according to the outcome. They are able to independently approach current scientific topics and to perform, interpret and document experiments, adhering to accepted rules of scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (29) + S (1)

Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

--
**Molecular Infection Biology**
(30 ECTS credits)

Students must combine the topics "Molecular Infection Biology" and "Cell and Developmental Biology".
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**Contents**

Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

**Intended learning outcomes**

Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (3)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module title

**Methods in Life Sciences**

| Abbreviation | 07-MLS1-152-m01 |

### Module coordinator

degree programme coordinator Biologie (Biology)

### Module offered by

Faculty of Biology

### ECTS

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### Contents

Versioned molecular techniques, lipid research methods, microscopic methods, immunohistochemistry, mouse models and gene-knockout approaches, protein and molecular biology techniques, PCR, advanced protein biochemistry, methods in bioinformatics and computational biology.

### Intended learning outcomes

Students are able to review and expand their knowledge of standard molecular techniques and are able to choose methods and techniques to design experiments in a specific research area.

### Courses

(type, number of weekly contact hours, language — if other than German)

V (3)

Module taught in: English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
---|---
Pathogenicity of Microorganisms | 07-MS2PA-152-m01

Module coordinator | Module offered by
holder of the Chair of Microbiology | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
10 | numerical grade | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents
Fundamental principles of the mode of action of microbial pathogenicity factors will be presented using selected prokaryotic and eukaryotic pathogens as model organisms. In addition, current research methods in infection biology will be presented.

Intended learning outcomes
Students have gained fundamental knowledge in infection biology and pathogenicity research and the mechanisms behind infectious diseases.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title | Microbiology F1
---|---
Abbreviation | 07-MS2MF1-152-m01

Module coordinator | holder of the Chair of Microbiology
Module offered by | Faculty of Biology

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Duration | 1 semester | Module level | graduate | Other prerequisites | -- |

Contents

Under guidance, participants will work on a current research project dealing with microbial pathogens and their interactions with the host. Participants will employ a variety of state-of-the-art methods within the fields of molecular biology, microbiology, cell biology, and immunology as well as data analysis and literature search techniques. Results will be documented and discussed in a seminar paper or an oral presentation.

Intended learning outcomes

Participants will acquire the skills to experimentally address scientific questions in molecular biology and infection biology, properly document experimental results and adhere to the standards of good scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P (14) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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<td>Microbiology F2</td>
<td>07-MS2MF2-152-m01</td>
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**Module coordinator**
holder of the Chair of Microbiology

**Module offered by**
Faculty of Biology

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**Duration**
1 semester

**Module level**
graduate

**Other prerequisites**
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**Contents**
Participants will independently work on a current research project dealing with microbiology and infection biology. They will apply advanced experimental techniques in microbiology, cell biology and molecular biology according to the project requirements. Progress of the research project will be reported in a seminar paper, a research paper or an oral presentation.

**Intended learning outcomes**
The participants will acquire the skills to independently perform basic research on microbiology and infection biology according to the standards of good scientific practice and to properly document, interpret and present experimental results.

**Courses**
(type, number of weekly contact hours, language — if other than German)

- P (29) + S (1)

Module taught in: German and/or English

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**
--

**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)
--
Systems Biology and Metabolomics - Systems Biology
(30 ECTS credits)

Students must combine the topics "Systems Biology and Metabolomics -- Systems Biology" and "Systems Biology and Metabolomics -- Metabolomics".
Module title | Abbreviation
--- | ---
Topics in Systems Biology | 07-MS3TSY-152-m01

Module coordinator | Module offered by
holder of the Chair of Bioinformatics | Faculty of Biology

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Duration | Module level |
1 semester | graduate |

Contents

Advances and current results of computational systems biology are explained and discussed, this includes results from functional genomics, dynamics of the transcriptome, of metabolism and metabolic networks as well as regulatory networks.

Intended learning outcomes

Understand recent results in systems biology. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions of systems biology.

Courses

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: English

Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places

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Additional information

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Referred to in LPO I
(examination regulations for teaching-degree programmes)

--
Module title
Neurobiology, Behavioural Physiology and Animal Ecology

Abbreviation
07-MS1-152-m01

Module coordinator
Dean of Studies Biologie (Biology)

Module offered by
Faculty of Biology

ECTS
10

Method of grading
numerical grade

Only after succ. compl. of module(s)
--

Duration
1 semester

Module level
graduate

Other prerequisites
--

Contents
Timing matters: Temporal organisation in the animal kingdom. Timing plays an important role in all living systems. Animals make use of endogenous clocks to predict and adapt to daily or seasonal changes in environmental parameters. To be at the right place at the right time is of great fitness relevance if, for example, a mating partner or enough food has to be found. Many mutualistic, antagonistic or social interactions can only take place if animals are at the same place at the same time and in the appropriate developmental stage. The lecture gives an introduction to the mechanisms underlying the temporal organisation in the animal kingdom. Adopting an integrative approach, the lecture goes from timing mechanisms on the neuronal level to individual behaviour and then to interactions in social groups, populations or partners in complex and variable ecosystems.

Intended learning outcomes
Students get to know the advantages of an integrative approach when analysing complex biological systems. They learn to relate and integrate different fields within biology. In the seminar, students practise the discussion of research findings.

Courses (type, number of weekly contact hours, language — if other than German)
V (3)

Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
## Module title

**Systems Biology F1**

**Abbreviation**

07-MS3SYF1-152-m01

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### Module coordinator

holder of the Chair of Bioinformatics

### Module offered by

Faculty of Biology

### ECTS

10

### Method of grading

numerical grade

### Only after succ. compl. of module(s)

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### Duration

1 semester

### Module level

graduate

### Other prerequisites

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### Contents

The practical course will provide students with advanced insights into a field of systems biology and will, in particular, make students proficient in a dynamical method in systems biology (areas that may be selected include protein structure analysis and protein folding, genome analysis and evolution; dynamic network analysis, the dynamics of protein-protein interactions, modelling cellular regulation; modelling metabolism, statistical modelling).

### Intended learning outcomes

Students have gained knowledge on experimental setups and methods used in the field of systems biology. They are able to design scientific research, to collect data and to interpret them statistically, adhering to the principles of good scientific practice.

### Courses

**P (14) + S (1)**

Module taught in: German and/or English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
Systems Biology F2 | 07-MS3SYF2-152-m01

Module coordinator | Module offered by
holder of the Chair of Bioinformatics | Faculty of Biology

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Contents

The practical course will provide students with advanced insights into a field of systems biology and will, in particular, make students proficient in a dynamical method in systems biology (areas that may be selected include protein structure analysis and protein folding, genome analysis and evolution; dynamic network analysis, the dynamics of protein-protein interactions, modelling cellular regulation; modelling metabolism, statistical modelling). The techniques applied are evaluated on the basis of the results obtained and are modified where necessary. Results are documented in the form of a presentation, a publication or a term paper.

Intended learning outcomes

Proficiency in one or more methods in systems biology that allows students to independently perform and organise a scientific project in the field of bioinformatics and to document the results obtained. Students are able to design a research project and are prepared for working on a scientific question for their thesis.

Courses (type, number of weekly contact hours, language — if other than German)

P (29) + S (1)

Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

--
Systems Biology and Metabolomics - Metabolomics
(30 ECTS credits)

Students must combine the topics "Systems Biology and Metabolomics -- Systems Biology" and "Systems Biology and Metabolomics -- Metabolomics".
Module title | Molecular Biology
---|---
Abbreviation | 07-MS2-152-m01

Module coordinator | Dean of Studies Biologie (Biology)

Module offered by | Faculty of Biology

ECTS | 10

Method of grading | numerical grade

Only after succ. compl. of module(s) | --

Duration | 1 semester

Module level | graduate

Other prerequisites | --

Contents

Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

Intended learning outcomes

Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

Courses (type, number of weekly contact hours, language — if other than German)

V (3)

Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

Allocation of places

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Additional information

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**Contents**

Advances and current results of bioinformatics are explained and discussed, this includes results from genome and sequence analysis, protein domains and protein families, large-scale data analysis (e.g. next generation sequences, proteomics data), analysis of different functional RNAs (e.g. miRNAs, IncRNAs).

**Intended learning outcomes**

Students are able to understand recent results in bioinformatics and discuss their implications. They have developed an advanced knowledge about typical techniques, scientific objectives and scientific questions.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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## Module Catalogue for the Subject
### Biosciences
#### Master's with 1 major, 120 ECTS credits

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### Contents

The module consists of the lecture *Signale und Differenzierung* (Signals and Differentiation) and the seminar *Entwicklungsbio- logie - Meilensteine und Perspektiven* (Milestones and Perspectives of Developmental Biology). The lecture *Signals and Differentiation* does not attempt to impart pure textbook knowledge. Instead, historically important as well as particularly interesting and important trend-setting topics in developmental biology are presented. The topics range from classical developmental subjects such as tissue regeneration and morphogenetic cell migration to molecular stem cell biology, epigenetic plasticity, origins of multicellularity and development within changing environments. In the seminar *Milestones and Perspectives of Developmental Biology*, classic ground-breaking publications in the field of developmental biology are discussed from an unusual point of view.

### Intended learning outcomes

Participants possess a knowledge of the theoretical and molecular biological principles underlying developmental biology and are able to put this into the broader context of cell and developmental biology research.

### Courses (type, number of weekly contact hours, language — if other than German)

- V (1) + S (2)
  - Module taught in: English

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
  - Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

--
Module title
Pharmaceutical Biology and Metabolomics F1

Abbreviation
07-MS3PBMF1-152-m01

Module coordinator
holder of the Chair of Pharmaceutical Biology

Module offered by
Faculty of Biology

ECTS
10

Method of grading
numerical grade

Only after succ. compl. of module(s)
--

Duration
1 semester

Module level
graduate

Other prerequisites
--

Contents
All organisms are able to reprogram their metabolism in response to various endogenous or exogenous perturbations. Reprogramming of metabolism is often correlated to phenotypic changes e. g. in disease development, physiology or behaviour. At the Chair of Pharmaceutical Biology, we apply metabolomics for gene function- or stress response analysis. Students can choose a topic from the variety of ongoing projects. Depending on the scientific question addressed by the research team at the Chair, the methodological approach involves techniques in the field of metabolomics/bioanalytics and/or molecular biology. In this module, students will be trained to use quantitative metabolite analysis methods (chromatography, mass spectrometry) and apply advanced molecular biology techniques. Depending on the project, different model organisms are studied. Prior knowledge in metabolite analysis or mass spectrometry is not required. Current scientific questions in the life sciences form the basis to impart scientific concepts and to train students in the laboratory. The module involves the experimental design, realisation and critical evaluation of scientific experiments as well as the documentation and presentation of the progress. More information is available on request or can be found at http://www.pbio.biocentrum.uni-wuerzburg.de/.

Intended learning outcomes
Students will be trained in using specific molecular biology methods and/or metabolomics approaches to address scientific questions, in the documentation of experimental procedures and results, and in the interpretation of data.

Courses
(type, number of weekly contact hours, language — if other than German)
P (14) + S (1)
Module taught in: German and/or English

Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
--

Referred to in LPO I (examination regulations for teaching-degree programmes)
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**Module title**  
Pharmaceutical Biology and Metabolomics F2

**Abbreviation**  
07-MS3PBMF2-152-m01

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**Contents**

Students will be involved in current research projects in pharmaceutical biology or in collaborative research projects that focus on the regulation of metabolism and analysis of metabolic pathways (e.g. in the context of reactions towards biotic or abiotic stress, functional and phenotypic analysis of mutants, or drug metabolism). Aspects of the scientific question will be independently addressed by the students. Molecular biology methods and/or metabolomic approaches will be optimised for and adapted to the specific problem. Experimental results and progress in the understanding of biological problems will be documented in the form of a log and presented in a seminar. More information is available on request or can be found at http://www.pbio.biozentrum.uni-wuerzburg.de/.

**Intended learning outcomes**

The participants are able to independently carry out scientific experiments and to modify them according to the outcome. They are able to independently approach scientific topics in pharmaceutical biology and to perform, interpret and document experiments, adhering to accepted rules of scientific practice. They are able to apply specific techniques required to answer scientific questions.

**Courses** (type, number of weekly contact hours, language — if other than German)

- P (29) + S (1)
- Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Molecular and Computational Biology - Computational Biology
(30 ECTS credits)

Students may combine the topic "Molecular and Computational Biology -- Computational Biology" with "Molecular and Computational Biology -- Molecular Biology". Alternatively, they may combine this topic with "Protein Chemistry" or "Molecular and Cellular Biophysics".
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**Contents**

Advances and current results of computational systems biology are explained and discussed, this includes results from functional genomics, dynamics of the transcriptome, of metabolism and metabolic networks as well as regulatory networks.

**Intended learning outcomes**

Understand recent results in systems biology. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions of systems biology.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)   
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)  
Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Topics in Bioinformatics

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**Module coordinator**
holder of the Chair of Bioinformatics

**Module offered by**
Faculty of Biology

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**Duration**
1 semester

**Module level**
graduate

**Other prerequisites**
--

### Contents
Advances and current results of bioinformatics are explained and discussed, this includes results from genome and sequence analysis, protein domains and protein families, large-scale data analysis (e.g. next generation sequences, proteomics data), analysis of different functional RNAs (e.g. miRNAs, IncRNAs).

### Intended learning outcomes
Students are able to understand recent results in bioinformatics and discuss their implications. They have developed an advanced knowledge about typical techniques, scientific objectives and scientific questions.

### Courses
(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)
Module taught in: German and/or English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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<tbody>
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<td>Computational Biology F1</td>
<td>07-MS3COBF1-152-m01</td>
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### Contents

Detailed insight into methods in bioinformatics; depending on the topic selected, fields covered include: genomics (sequence-, domain analysis and annotation), omics data analysis (NGS, transcriptomics, metabolomics, proteomics), topological and structural analysis of biological interactions including statistical methods, phylogenetic analysis, protein structure analysis. Results are documented in the form of a presentation, a publication or a term paper.

### Intended learning outcomes

Students have gained knowledge on experimental setups and methods used in the field of bioinformatics. They are able to design experiments, collect data and interpret them statistically, adhering to the principles of good scientific practice.

### Courses

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### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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(examination regulations for teaching-degree programmes)

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**Contents**

Advanced insight into methods in bioinformatics; depending on the topic selected, fields covered include: genomics (sequence-, domain analysis and annotation), omics data analysis (NGS, transcriptomics, metabolomics, proteomics), topological and structural analysis of biological interactions including statistical methods, phylogenetic analysis, protein structure analysis. The techniques applied are evaluated on the basis of the results obtained and are modified where necessary. Results are documented in the form of a presentation, a publication or a term paper.

**Intended learning outcomes**

Proficiency in one or more methods in bioinformatics that allows students to successfully conduct scientific research (for their Master's thesis). Ability to independently address topics in bioinformatics as well as document and interpret findings, adhering to the principles of good scientific practice.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (29) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Molecular and Computational Biology - Molecular Biology  
(30 ECTS credits)

Students must combine the topics "Molecular and Computational Biology -- Computational Biology" and "Molecular and Computational Biology -- Molecular Biology".
## Module title

### Molecular Biology

### Abbreviation

07-MS2-152-m01

## Module coordinator

Dean of Studies Biologie (Biology)

## Module offered by

Faculty of Biology

## ECTS

10

## Method of grading

Only after succ. compl. of module(s)

## Duration

1 semester

## Module level

graduate

## Other prerequisites

--

## Contents

Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

## Intended learning outcomes

Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

## Courses

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## Method of assessment

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Language of assessment: German and/or English

## Allocation of places

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## Additional information

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<td>Methods in Life Sciences</td>
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**Module coordinator**

degree programme coordinator Biologie (Biology)

**Module offered by**

Faculty of Biology

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**Duration**

1 semester

**Module level**

graduate

**Other prerequisites**

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**Contents**

Versioned molecular techniques, lipid research methods, microscopic methods, immunohistochemistry, mouse models and gene-knockout approaches, protein and molecular biology techniques, PCR, advanced protein biochemistry, methods in bioinformatics and computational biology.

**Intended learning outcomes**

Students are able to review and expand their knowledge of standard molecular techniques and are able to choose methods and techniques to design experiments in a specific research area.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V (3)

Module taught in: English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: English

**Allocation of places**

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**Additional information**

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<td>Topics and Concepts in Life Sciences</td>
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**Contents**

A broad variety of topics and concepts from the areas of neuroscience, infection and immunity, integrative biology, and biomedicine including for example: protein characterisation, DNA repair, Drosophila, computational biology, and neurocircuits.

**Intended learning outcomes**

Students have an overview of the current research topics in the Graduate School of Life Sciences and are able to explain their significance and scientific background.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (3)

Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: English

**Allocation of places**

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**Additional information**

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<td>Pathogenicity of Microorganisms</td>
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**Contents**
Fundamental principles of the mode of action of microbial pathogenicity factors will be presented using selected prokaryotic and eukaryotic pathogens as model organisms. In addition, current research methods in infection biology will be presented.

**Intended learning outcomes**
Students have gained fundamental knowledge in infection biology and pathogenicity research and the mechanisms behind infectious diseases.

**Courses** (type, number of weekly contact hours, language — if other than German)
V (2) + S (1)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Module coordinator**

degree programme coordinator Biologie (Biology)

**Module offered by**

Faculty of Biology

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**Duration**

1 semester

**Module level**

graduate

**Contents**

Practical course on a topic in molecular biology. Students spend five weeks working on a small, well-defined scientific lab project and learn how to present their data. They learn to discuss their data in a seminar. The students learn to apply defined experimental procedures and methods, to independently address scientific questions and to document their experimental work in an appropriate manner.

**Intended learning outcomes**

Students have reinforced previously acquired lab skills, acquired new molecular lab techniques and learned how to transfer theoretical knowledge into experiments. Students have gained expertise in the analysis of raw data, their interpretation and their presentation.

**Courses**

(P type, number of weekly contact hours, language — if other than German)

P (14) + S (1)

Module taught in: German and/or English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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## Module title

**Molecular Biology F2**

### Abbreviation

07-MSF2-152-m01

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### ECTS

15

### Method of grading

Only after succ. compl. of module(s)

### (not) successfully completed

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### Duration

1 semester

### Module level

graduate

### Other prerequisites

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## Contents

Current problems in the field of molecular biology are addressed by critically reading and presenting original research papers. The participants will be involved in the development of a research plan and will learn to apply advanced techniques to answer a scientific question in molecular biology. This practical course will have a duration of 12 weeks (three months) and will prepare participants for their theses.

## Intended learning outcomes

Students are able to independently work in a laboratory. They are able to answer and discuss questions in the field of molecular biology. Students are able to adhere to the principles of good scientific practice as well as to document, interpret and discuss their results. They are able to apply specific molecular techniques that are required to answer scientific questions.

## Courses

**P (29) + S (1)**  
Module taught in: German and/or English

## Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)  
Language of assessment: German and/or English

## Allocation of places

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## Additional information

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## Referred to in LPO I

(examination regulations for teaching-degree programmes)
Plant Ecology
(30 ECTS credits)

Students must combine the topics "Plant Ecology" and "Animal Ecology".
### Module Catalogue for the Subject
Biosciences Master's with 1 major, 120 ECTS credits

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<td>holder of the Chair of Ecophysiology and Vegetation Ecology</td>
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### Contents
The lecture will deal with the ecological and environmental constraints under which plants grow and develop (biogeography, biodiversity) and with the interactions of plants with abiotic and biotic environmental factors (e. g. plant-insect, plant-fungus interactions). The evolutionary adaptations on the physiological and organismic level will be emphasised in particular (stress and defence reactions, carnivory, plant protection). Corresponding experimental approaches will be illustrated. Based on selected examples from current research, the seminar will address the topics covered in the lecture in more detail. It will be complemented by topic-related guided tours in the Botanical Garden of the University of Würzburg.

### Intended learning outcomes
Participants are able to identify and interpret ecological and ecophysiological interrelations and to discuss them in the context of the current state of knowledge in these fields.

### Courses
(V (2) + S (1))
Module taught in: German and/or English

### Method of assessment
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes).
Language of assessment: German and/or English

### Allocation of places
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**Contents**

Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

**Intended learning outcomes**

Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

**Courses** (type, number of weekly contact hours, language — if other than German)

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**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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**Language of assessment:** German and/or English

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title | Abbreviation
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Physiological Plant Ecology F1 | 07-MS3PPEF1-152-m01

Module coordinator | Module offered by
holder of the Chair of Plant Physiology and Biophysics | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
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10 | numerical grade | --

Duration | Module level | Other prerequisites
1 semester | graduate | --

Contents
Under the guidance of an experienced scientist, students will work on a current research topic from the field of ecology/ecophysiology. Particular emphasis will be placed on the physiological bases of the interactions between plants and abiotic and biotic environmental factors (e.g., water relations, stress, biogeography). Working concepts and complex experiments will be designed, and the results will be documented and presented in the form of a presentation, a publication or a log. The participants will be involved in ongoing projects and will deepen their knowledge on applying special methods, in ecophysiology in particular but also in chemical analysis.

Intended learning outcomes
The participants are able to perform scientific experiments in the field of physiological plant ecology and to apply appropriate methods. They are also able to address and document questions in the field of ecology/ecophysiology, adhering to the rules of good scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)
P (14) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
--

Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title | Abbreviation
---|---
Physiological Plant Ecology F2 | 07-MS3PPEF2-152-m01

Module coordinator | Module offered by
holder of the Chair of Plant Physiology and Biophysics | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
15 | (not) successfully completed | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents
Students will work on projects taken from ongoing research in the supervisors’ labs in the field of plant ecology and ecophysiology (e.g. plant-insect-, plant-fungus interactions; biogeography; water relations). They will do this work to a large extent on their own responsibility by performing advanced experiments, their documentation and evaluation. Based on the results obtained, the ecophysiological and analytical methods applied (e.g. measurement of transpiration, fluorescence microscopy, chlorophyll-fluorometry) will be critically assessed, and, where necessary, modified. The progress of the experiments and their contribution to more general projects will be documented and presented in the form of presentations, publications or logs.

Intended learning outcomes
Students have gained knowledge on experimental setups and methods used in the field of plant ecophysiology. They are able to design scientific research, to collect data and to interpret them statistically, adhering to the principles of good scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)
P (29) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
--

Referred to in LPO I (examination regulations for teaching-degree programmes)
--
### Module Catalogue for the Subject

#### Biosciences

**Master's with 1 major, 120 ECTS credits**

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tr>
<td>Molecular and Chemical Plant Ecology F1</td>
<td>07-MS3MCPEF1-152-m01</td>
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<td>Faculty of Biology</td>
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<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

Under the guidance of an experienced scientist, students will work on a current research topic from the field of molecular and chemical plant ecology. Particular emphasis will be placed on the molecular and chemical bases of the interactions between plants and abiotic and biotic environmental factors (e.g., cuticular barrier properties, plant-insect, and plant-fungus interactions). Working concepts and complex experiments will be designed, and the results will be documented and presented in the form of presentations, publications or logs. The participants will be involved in ongoing projects and will deepen their knowledge on applying special methods, in molecular biology in particular but also in chemical analysis.

**Intended learning outcomes**

The participants are able to perform scientific experiments in the field of molecular and chemical plant ecology and to apply appropriate methods. They are also able to address and document questions in the field of molecular biology/chemical ecology, adhering to the rules of good scientific practice.

**Courses** (type, number of weekly contact hours, language — if other than German)

- P (14) + S (1)
  - Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

**Language of assessment**: German and/or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
## Module title
Molecular and Chemical Plant Ecology F2

## Abbreviation
07-MS3MCPEF2-152-m01

## Module coordinator
holder of the Chair of Plant Physiology and Biophysics

## Module offered by
Faculty of Biology

## ECTS
15

## Method of grading
Only after succ. compl. of module(s)

## (not) successfully completed
--

## Duration
1 semester

## Module level
graduate

## Other prerequisites
--

## Contents
Students will work on projects taken from ongoing research in the supervisors’ labs from the field of molecular and chemical plant ecology (e.g., cuticular barrier properties, plant-insect, and plant-fungus interactions). They will do this work to a large extent on their own responsibility by performing advanced experiments, their documentation and evaluation. Based on the results obtained, the analytical, molecular biological and/or microbiological methods applied (e.g., PCR, cloning strategies, chromatography, mass spectrometry) will be critically assessed and, where necessary, modified. The progress of the experiments and their contribution to more general projects will be documented and presented in the form of presentations, publications or logs.

## Intended learning outcomes
The participants are able to independently perform scientific experiments in the field of molecular and chemical plant ecology and to modify them according to the outcome. They are able to independently address, document and interpret questions in the field of molecular/chemical plant ecology, adhering to the rules of good scientific practice. Students are also able to apply specific techniques required to answer scientific questions.

## Courses
(P (29) + S (1))
Module taught in: German and/or English

## Method of assessment
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

## Allocation of places
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## Additional information
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## Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
Animal Ecology
(30 ECTS credits)

Students must combine the topics "Plant Ecology" and "Animal Ecology".
## Module title
Neurobiology, Behavioural Physiology and Animal Ecology

## Abbreviation
07-MS1-152-m01

### Module coordinator
Dean of Studies Biologie (Biology)

### Module offered by
Faculty of Biology

### ECTS
10

### Method of grading
Numerical grade

### Only after succ. compl. of module(s)

### Duration
1 semester

### Module level
Graduate

### Other prerequisites
--

## Contents
Timing matters: Temporal organisation in the animal kingdom. Timing plays an important role in all living systems. Animals make use of endogenous clocks to predict and adapt to daily or seasonal changes in environmental parameters. To be at the right place at the right time is of great fitness relevance if, for example, a mating partner or enough food has to be found. Many mutualistic, antagonistic or social interactions can only take place if animals are at the same place at the same time and in the appropriate developmental stage. The lecture gives an introduction to the mechanisms underlying the temporal organisation in the animal kingdom. Adopting an integrative approach, the lecture goes from timing mechanisms on the neuronal level to individual behaviour and then to interactions in social groups, populations or partners in complex and variable ecosystems.

### Intended learning outcomes
Students get to know the advantages of an integrative approach when analysing complex biological systems. They learn to relate and integrate different fields within biology. In the seminar, students practise the discussion of research findings.

### Courses
**V (3)**
Module taught in: English

### Method of assessment
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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<table>
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<td>Animal Ecology and Tropical Biology 2</td>
<td>07-MS1TÖ2-152-m01</td>
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<td>graduate</td>
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**Contents**

This module provides the fundamentals of the biology of tropical habitats and tropical communities. A special focus is on the global significance of tropical systems (ecosystem goods and ecosystem services), but the biological features of these highly diverse biomes are also highlighted.

**Intended learning outcomes**

The students will acquire deep knowledge of ecological theories and up-to-date research issues in the field of animal ecology of the tropics. They will be qualified to interpret scientific work and apply the knowledge they have acquired to the solution of current environmental risks.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
Animal Ecology F1 | 07-MS1TÖF1-152-m01

Module coordinator | Module offered by
holder of the Chair of Animal Ecology and Tropical Biology | Faculty of Biology

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</table>

Contents

This module consists of several exercises and a seminar series over the course of the entire semester. The exercises can be chosen from the following electives: 1. Wild and honeybee ecology (over the course of the semester): fundamentals and techniques of beekeeping, resource utilisation, behaviour experiments, pollinator diversity and plant-pollinator-interactions. 2. Ecology and taxonomy of insects (block, 2 weeks): observation and recording in the habitat, identification and characteristics of different arthropod groups, field experiments. 3. Ecological modelling (block, 2 weeks): current methods of ecological processes modelling, simulation models, the students’ own modelling project on current issues in ecology. 4. Agroecology (block, 1 week): insect communities in agroecosystems, biological pest control in landscape context, evaluation of agri-environment schemes. 5. Forest ecology (block, 1 week): arthropod communities in forest ecosystems, methods of detection, influence of management on diversity patterns and functional groups. 6. Tropical ecology (block): small projects ecological or nature conservation-related issues to be implemented in a tropical ecosystem in East Africa. In the seminar, recent scientific publications on the topics covered in the modules listed above will be presented and discussed.

Intended learning outcomes

Students will have expanded their knowledge on ecological theories and current research issues in animal ecology. They will be able to design, perform, statistically analyse and interpret scientific research. They will be familiar with animal ecological methods and possible sources of error in data interpretation. They will have deepened their knowledge of the biology and ecology of important functional taxa of arthropods. Students will have acquired the knowledge and skills necessary to perform scientific activities in the context of an F2 practical course or a Master's thesis.

Courses (type, number of weekly contact hours, language — if other than German)

P (14) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places

--

Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
--- | ---
Animal Ecology and Tropical Biology F2 | 07-MS1TÖF2-152-m01

Module coordinator | Module offered by
holder of the Chair of Animal Ecology and Tropical Biology | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
--- | --- | ---
15 | (not) successfully completed | --

Credits | Module level | Other prerequisites
--- | --- | ---
1 semester | graduate | --

Contents
In the F2 practical course, students will explore a scientific question as independently as possible. They will develop hypotheses, prepare a work schedule, collect data, perform experiments in the field, greenhouse or laboratory and will statistically analyse data. Students will document the results of their work in a log similar to a short scientific paper, including an introduction, material and methods, findings and a discussion of these. Students will also be required to present their findings during a wrap-up seminar. The various research groups at the Chair of Animal Ecology and Tropical Biology offer a wide variety of opportunities for students to complete an F2 practical course in Germany, another country in Europe or in the tropics. F2 practical courses may be completed in the context of an ongoing research project of the Institute or in cooperation with other institutions. For more detailed information on the F2 practical course as well as current topics or appointments for consultations, please refer to WueCampus, check out the notice board of the Chair or contact the research groups directly.

Intended learning outcomes
Students have gained knowledge on experimental setups and methods used in the fields of animal ecology and tropical ecology. They are qualified to design scientific research and are able to collect data and interpret them statistically. They have developed knowledge and skills that allow them to set up a scientific project for their Master’s thesis.

Courses (type, number of weekly contact hours, language — if other than German)
P (29) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Molecular and Cellular Biophysics
(30 ECTS credits)

Students must combine the topics "Molecular and Cellular Biophysics" and "Molecular and Computational Biology -- Computational Biology".
# Biophysics and Biochemistry

<table>
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<td>Biophysics and Biochemistry</td>
<td>07-MS3BB-152-m01</td>
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**Module coordinator**

holder of the Chair of Plant Physiology and Biophysics

**Module offered by**

Faculty of Biology

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</table>

**Duration**

1 semester

**Module level**

graduate

**Other prerequisites**

--

## Contents

The module imparts theoretical and methodological knowledge of plant membrane transport, structural biology and biochemistry which is illustrated with specific examples from current research. Depending on the number of participants and their interests, practical demonstrations of methods that are currently used give students an opportunity to experience the practical aspects of biophysical and biochemical research.

## Intended learning outcomes

Students are able to use methods dealing with soluble proteins or membrane proteins in the fields of biophysics, structural biology and biochemistry. They are able to interpret the data and to discuss the results within the context of current knowledge.

## Courses

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: English

## Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

## Allocation of places

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## Additional information

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## Referred to in LPO I

(examination regulations for teaching-degree programmes)

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### Module title

<table>
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<th>Biophysics and Molecular Biotechnology</th>
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### Abbreviation

| 07-MS2BT-152-m01 |

### Module coordinator

holder of the Chair of Biotechnology and Biophysics

### Module offered by

Faculty of Biology

### ECTS

| 10 |

### Method of grading

numerical grade

### Only after succ. compl. of module(s)

--

### Duration

1 semester

### Module level

graduate

### Other prerequisites

--

### Contents

This lecture provides a broad overview of biophysical techniques and their applications. The first part of the lecture discusses fundamental aspects of thermodynamics, kinetics and molecular interactions. The course then moves on to discuss biophysical methods that facilitate the investigation of individual cells down to the level of single molecules. Focus is on electromanipulation and dielectric spectroscopy of cells, biomembranes, electrophysiology, ion channels, protein folding, single-molecule fluorescence methods and high-resolution as well as dynamic microscopy.

### Intended learning outcomes

Students will have acquired a knowledge of fundamental biophysical methods and their applications that will enable them to independently review relevant literature. In addition, they will have become acquainted with - or, where necessary, will be able to independently acquaint themselves with - biophysical mechanisms.

### Courses

(type, number of weekly contact hours, language — if other than German)

| V (2) + S (1) |

Module taught in: English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Module title

Biophysics of Plant Membrane Proteins F1

Abbreviation

07-MS3BPF1-152-m01

Module coordinator

holder of the Chair of Plant Physiology and Biophysics

Module offered by

Faculty of Biology

ECTS

10

Method of grading

numerical grade

Only after succ. compl. of module(s)

Duration

1 semester

Module level

graduate

Other prerequisites

--

Contents

The module provides an in-depth insight into biophysical strategies and methods which are used for the functional characterisation of plant membrane proteins. The students will be integrated into research projects on current topics in molecular plant membrane biology.

Intended learning outcomes

The students have knowledge of general biophysical strategies and methods with a focus on plant membrane proteins, they are able to independently work on related scientific issues and to document the results obtained.

Courses

(type, number of weekly contact hours, language — if other than German)

P (14) + S (1)

Module taught in: German and/or English

Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

Allocation of places

--

Additional information

--

Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
---|---
Biophysics of Plant Membrane Proteins F2 | 07-MS3BPF2-152-m01

Module coordinator | Module offered by
holder of the Chair of Plant Physiology and Biophysics | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
15 | (not) successfully completed | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents
The students perform their research work within the context of a current research project on the biophysics of plant membrane proteins in a largely independent manner under supervision of a principal investigator.

Intended learning outcomes
The students are able to address scientific issues in biophysics, using appropriate biophysical methods. They are able to independently design the appropriate experiments as well as to analyse, document, present and discuss the results.

Courses (type, number of weekly contact hours, language — if other than German)
P (29) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
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Language of assessment: German and/or English

Allocation of places
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**Contents**

This practical course provides students with an insight into different biotechnological and biophysical topics and methods. Under expert guidance, students will perform selected experiments on the following topics: cellular and molecular biotechnology, nano and microsystems biotechnology, biomaterials and biosensors, high-resolution fluorescence microscopy, fluorescence spectroscopy, analysis and electromanipulation of cells.

**Intended learning outcomes**

Students will have acquired a knowledge of fundamental biotechnological and biophysical methods and their applications that will enable them to independently review relevant literature. In addition, they will have become acquainted with - or, where necessary, will be able to independently acquaint themselves with - biophysical mechanisms. Students will have acquired practical experience performing experiments, using a variety of scientific tools. In the seminar, students will have acquired detailed theoretical knowledge on these experiments and will have delivered a short presentation (15 minutes) on one of the experiments they performed.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (14) + S (1)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title: Biophysics and Molecular Biotechnology F2  
Abbreviation: 07-MS2BTF2-152-m01

Module coordinator: holder of the Chair of Biotechnology and Biophysics  
Module offered by: Faculty of Biology

ECTS: 15  
Method of grading: Only after succ. compl. of module(s)  
Duration: 1 semester  
Module level: graduate  
Other prerequisites: --

Contents:
This practical course provides students with an insight into different biotechnological and biophysical topics and is close to laboratory research. Under expert guidance, students will perform selected experiments on one of the following topics: cellular and molecular biotechnology, nano and microsystems biotechnology, biomaterials and biosensors, high-resolution fluorescence microscopy, fluorescence spectroscopy, analysis and electromanipulation of cells. Performing experiments under expert guidance, students will become acquainted with techniques and instruments. Over the duration of the course, students will then be required to work increasingly independently on current research topics. Work on current research topics will spark the students' interest in topics and will help them select a topic for their Master's thesis.

Intended learning outcomes:
Students will become acquainted with modern biophysical methods and their applications in biotechnology. They will be able to independently work on scientific problems, to independently study relevant literature and to develop a quantitative understanding of biophysical mechanisms. In the seminar, students will acquire further theoretical knowledge on experiments and will give short presentations on experiments performed.

Courses (type, number of weekly contact hours, language — if other than German):
P (29) + S (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus):
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places: --

Additional information: --

Referred to in LPO I (examination regulations for teaching-degree programmes): --
Protein Chemistry
(30 ECTS credits)

Students must combine the topics "Protein Chemistry" and "Molecular and Computational Biology -- Computational Biology".
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<th>Abbreviation</th>
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<tbody>
<tr>
<td>Biophysics and Biochemistry</td>
<td>07-MS3BB-152-m01</td>
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<td>holder of the Chair of Plant Physiology and Biophysics</td>
<td>Faculty of Biology</td>
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<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

The module imparts theoretical and methodological knowledge of plant membrane transport, structural biology and biochemistry which is illustrated with specific examples from current research. Depending on the number of participants and their interests, practical demonstrations of methods that are currently used give students an opportunity to experience the practical aspects of biophysical and biochemical research.

**Intended learning outcomes**

Students are able to use methods dealing with soluble proteins or membrane proteins in the fields of biophysics, structural biology and biochemistry. They are able to interpret the data and to discuss the results within the context of current knowledge.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

*Module taught in: English*

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

*Language of assessment: German and/or English*

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title
Biophysics and Molecular Biotechnology

Abbreviation
07-MS2BT-152-m01

Module coordinator
holder of the Chair of Biotechnology and Biophysics

Module offered by
Faculty of Biology

ECTS
10

Method of grading
numerical grade

Only after succ. compl. of module(s)
--

Duration
1 semester

Module level
graduate

Other prerequisites
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Contents
This lecture provides a broad overview of biophysical techniques and their applications. The first part of the lecture discusses fundamental aspects of thermodynamics, kinetics and molecular interactions. The course then moves on to discuss biophysical methods that facilitate the investigation of individual cells down to the level of single molecules. Focus is on electromanipulation and dielectric spectroscopy of cells, biomembranes, electrophysiology, ion channels, protein folding, single-molecule fluorescence methods and high-resolution as well as dynamic microscopy.

Intended learning outcomes
Students will have acquired a knowledge of fundamental biophysical methods and their applications that will enable them to independently review relevant literature. In addition, they will have become acquainted with - or, where necessary, will be able to independently acquaint themselves with - biophysical mechanisms.

Courses
(type, number of weekly contact hours, language — if other than German)
V (2) + S (1)

Module taught in: English

Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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</table>

**Contents**

The module provides an in-depth insight into strategies and methods in protein biochemistry and structural biology. The students will be integrated into research projects on current topics in biochemistry and structural biology.

**Intended learning outcomes**

The students have knowledge about general strategies and methods of protein biochemistry and structural biology with a focus on membrane proteins. They are able to perform and organise their scientific laboratory work independently and document the results obtained.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (14) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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</table>

**Contents**

The students perform their research work within the context of a current research project on biochemistry and structural biology in a largely independent manner under supervision of a principal investigator.

**Intended learning outcomes**

The students are able to independently perform and organise their scientific laboratory work in the fields of biochemistry and structural biology and to document the results obtained. They are able to design a research project and are prepared for working on a scientific question for their thesis.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (29) + S (1)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Additional Laboratory Courses and Internships

(ECTS credits)
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**Contents**

Practical course, summer school or workshop on specific topics in biology (duration: 4-6 weeks).

**Intended learning outcomes**

Proficiency in specific methods and lab techniques from selected fields of biology. Ability to apply these methods and techniques later on in a research project.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (15)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Please consult with course advisory service in advance.

### Contents

Practical course, summer school or workshop on specific topics in biology (duration: 6-9 weeks).

### Intended learning outcomes

Proficiency in specific methods and lab techniques from selected fields of biology. Ability to apply these methods and techniques later on in a research project.

### Courses (type, number of weekly contact hours, language — if other than German)

P (30)

Module taught in: German and/or English

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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**Module coordinator**  
Coordinator BioCareers

**Module offered by**  
Faculty of Biology

**ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** |
---|----------------------|-----------------------------------------|
10 | (not) successfully completed | -- |

**Duration** | **Module level** | **Other prerequisites** |
---|-----------------|------------------------|
1 semester | graduate | Please consult with course advisory service in advance.

**Contents**

External placement on a biological topic. Students spend 4-6 weeks working on a well-defined scientific project and learn how to present their data.

**Intended learning outcomes**

Proficiency in selected methods and lab techniques from selected fields of biology. Ability to apply these methods and techniques later on in a research project.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (15)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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### Contents
External placement on a biological topic. Students spend 6-9 weeks working on a well-defined scientific lab project and learn how to present their data.

### Intended learning outcomes
Proficiency in selected methods and lab techniques from selected fields of biology. Ability to apply these methods and techniques later on in a research project.

### Courses
(P (30))
Module taught in: German and/or English

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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Subtopic Additional Achievements
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</table>

**Contents**

Practical course, summer school or workshop on specific topics in biology (duration: 2-3 weeks).

**Intended learning outcomes**

Proficiency in specific methods and lab techniques from selected fields of biology. Ability to apply these methods and techniques later on in a research project.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (5)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module coordinator**

Coordinator: BioCareers

**Module offered by**

Faculty of Biology

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**Duration**

1 semester

**Module level**

graduate

**Other prerequisites**

Please consult with course advisory service in advance.

**Contents**

Practical course, summer school or workshop on specific topics in biology (duration: 4-6 weeks).

**Intended learning outcomes**

Proficiency in specific methods and lab techniques from selected fields of biology. Ability to apply these methods and techniques later on in a research project.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (15)

Module taught in: German and/or English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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Module title | Abbreviation
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Laboratory Course 3 | 07-MSL3-152-m01

**Module coordinator**
Coordinator BioCareers

**Module offered by**
Faculty of Biology

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**Duration**
1 semester

**Module level**
graduate

**Method of grading**
Only after succ. compl. of module(s)

**Contents**
Practical course, summer school or workshop on specific topics in biology (duration: 6-9 weeks).

**Intended learning outcomes**
Proficiency in specific methods and lab techniques from selected fields of biology. Ability to apply these methods and techniques later on in a research project.

**Courses**
(type, number of weekly contact hours, language — if other than German)

P (30)
Module taught in: German and/or English

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** |
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**Duration** | **Module level** | **Other prerequisites** |
---|---|---|
1 semester | graduate | Please consult with course advisory service in advance. |

**Contents**
Practical course during stay abroad on a selected topic in biology (duration: 2–3 weeks).

**Intended learning outcomes**
Proficiency in selected methods and lab techniques from selected fields of biology. Ability to apply these methods and techniques later on in a research project.

**Courses** (type, number of weekly contact hours, language — if other than German)
P (10)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)
--
Module title
External Internship 2

Abbreviation
07-MSA2-171-m01

Module coordinator
Coordinator BioCareers

Module offered by
Faculty of Biology

ECTS
10

Method of grading
Only after succ. compl. of module(s)

(not) successfully completed
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Duration
1 semester

Module level
graduate

Other prerequisites
Please consult with course advisory service in advance.

Contents
External placement on a biological topic. Students spend 4-6 weeks working on a well-defined scientific project and learn how to present their data.

Intended learning outcomes
Proficiency in selected methods and lab techniques from selected fields of biology. Ability to apply these methods and techniques later on in a research project.

Courses (type, number of weekly contact hours, language — if other than German)
P (15)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
**Module title**
External Internship 3

**Abbreviation**
07-MSA3-152-m01

**Module coordinator**
Coordinator BioCareers

**Module offered by**
Faculty of Biology

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**Contents**
External placement on a biological topic. Students spend 6-9 weeks working on a well-defined scientific lab project and learn how to present their data.

**Intended learning outcomes**
Proficiency in selected methods and lab techniques from selected fields of biology. Ability to apply these methods and techniques later on in a research project.

**Courses** (type, number of weekly contact hours, language — if other than German)
P (30)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)
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<tr>
<th>Module title</th>
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<tr>
<td>Biochemistry, Physiology and Genetics of Mammalian Cell Culture</td>
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</table>

**Contents**

Introduction to cell culture, cell culture lab equipment, cellular biochemistry and cell structures, cell proliferation, generation of in vitro cell models and their applications, cell culture formats, fundamental cell analytical technologies.

**Intended learning outcomes**

Students are able to understand the biochemistry, physiology and genetics of mammalian cell culture, and are able to use these techniques.

**Courses** (type, number of weekly contact hours, language — if other than German)

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Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
---|---
Molecular Techniques | 03-MSMT-152-m01

Module coordinator | Module offered by
degree programme coordinator Biologie (Biology) | Faculty of Medicine

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
3 | (not) successfully completed | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents
Introduction to new and cutting edge molecular techniques as well as methods for scientific investigation.

Intended learning outcomes
Students are able to apply molecular techniques and methods as well as to integrate these into experimental strategies and experimental set-ups to answer scientific questions.

Courses (type, number of weekly contact hours, language — if other than German)
S (3)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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### Module Catalogue for the Subject Biosciences

**Master's with 1 major, 120 ECTS credits**

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<tr>
<th>Module title</th>
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<td>Linux and Perl</td>
<td>07-ML-152-m01</td>
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### Contents

Introduction to the Linux operating system, writing computer programs using the programming language Perl to answer bioinformatic questions.

### Intended learning outcomes

Students are able to use Linux as user and to write simple Perl scripts to answer bioinformatic questions.

### Courses (type, number of weekly contact hours, language — if other than German)

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<thead>
<tr>
<th>S (3)</th>
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Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

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### Contents

No information on contents available.

### Intended learning outcomes

No information on intended learning outcomes available.

### Courses (type, number of weekly contact hours, language — if other than German)

S (1) + V (1)

Module taught in: German and/or English

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (30 to 60 minutes).

Students will be informed about the method, length and scope of the assessment prior to the course.

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Contents

No information on contents available.

### Intended learning outcomes

No information on intended learning outcomes available.

### Courses (type, number of weekly contact hours, language — if other than German)

- V (2)

  Module taught in: German and/or English

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (30 to 60 minutes).

  Students will be informed about the method, length and scope of the assessment prior to the course.

  Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

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## Module Catalogue for the Subject Biosciences
### Master's with 1 major, 120 ECTS credits

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### Contents

This seminar addresses fundamentals of the biology of tropical habitats and tropical communities. A special focus is on the global significance of tropical systems (biodiversity, ecosystem goods and ecosystem services). The course also highlights the biological features of these highly diverse biomes and compares them to the temperate zones.

### Intended learning outcomes

Students will be able to recognise the special position of tropical habitats within the biosphere and to explain the significance tropical habitats have for our ecosystem. They will be able to evaluate the consequences of human interventions into tropical systems as well as associated conservation-related issues. Students will also be able to investigate, present, and discuss up-to-date publications in different thematic areas of tropical biology.

### Courses

( type, number of weekly contact hours, language — if other than German)

S (2) Module taught in: German and/or English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (30 to 60 minutes). Students will be informed about the method, length and scope of the assessment prior to the course.

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

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</table>

**Contents**

Versioned molecular techniques, lipid research methods, microscopic methods, immunohistochemistry, mouse models and gene-knockout approaches, protein and molecular biology techniques, PCR, advanced protein biochemistry, methods in bioinformatics and computational biology.

**Intended learning outcomes**

Students are able to review and expand their knowledge of standard molecular techniques and are able to choose methods and techniques to design experiments in a specific research area.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (3)

Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Contents**

Versioned molecular techniques, lipid research methods, microscopic methods, immunohistochemistry, mouse models and gene-knockout approaches, protein and molecular biology techniques, PCR, advanced protein biochemistry, methods in bioinformatics and computational biology.

**Intended learning outcomes**

Students are able to review and expand their knowledge of standard molecular techniques and are able to choose methods and techniques to design experiments in a specific research area.

**Courses** (type, number of weekly contact hours, language — if other than German)

- V (3)
  - Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

- Language of assessment: English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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# Topics and Concepts in Life Sciences B

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<td>Topics and Concepts in Life Sciences B</td>
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## Module coordinator

degree programme coordinator Biologie (Biology)

## Module offered by

Faculty of Biology

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## Duration

1 semester

## Module level

graduate

## Other prerequisites

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## Contents

A broad variety of topics and concepts from the areas of neuroscience, infection and immunity, integrative biology, and biomedicine including for example: protein characterisation, DNA repair, Drosophila, computational biology, and neurocircuits.

## Intended learning outcomes

Students have an overview of the current research topics in the Graduate School of Life Sciences and are able to explain their significance and scientific background.

## Courses

(type, number of weekly contact hours, language — if other than German)

V (3)

Module taught in: English

## Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: English

## Allocation of places

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## Additional information

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## Referred to in LPO I

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**Contents**

A broad variety of topics and concepts from the areas of neuroscience, infection and immunity, integrative biology, and biomedicine including for example: protein characterisation, DNA repair, Drosophila, computational biology, and neurocircuits.

**Intended learning outcomes**

Students have an overview of the current research topics in the Graduate School of Life Sciences and are able to explain their significance and scientific background.

**Courses** (type, number of weekly contact hours, language — if other than German)

- V (3)
  - Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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- Language of assessment: English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title | Abbreviation
--- | ---
Molecular Tumor Biology | 07-TUM-MOL-152-m01

Module coordinator | Module offered by
--- | ---
degree programme coordinator Biologie (Biology) | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
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5 | numerical grade | --

Duration | Module level | Other prerequisites
--- | --- | ---
1 semester | graduate | --

Contents
The lecture *Molekulare Tumorbiologie* (*Molecular Tumour Biology*) discusses molecular characteristics of tumours and relevant biological processes (such as signal transduction, cell growth, cell proliferation, metabolism), tumour-specific modifications and current molecular biological methods in tumour research.

Intended learning outcomes
Understanding of current topics and challenges in tumour research, understanding of the methods which could be used address these challenges.

Courses (type, number of weekly contact hours, language — if other than German)
V (2)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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<tr>
<th><strong>Module title</strong></th>
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<tbody>
<tr>
<td>Clinical Tumor Biology</td>
<td>07-TUM-CLIN-152-m01</td>
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<td>degree programme coordinator Biologie (Biology)</td>
<td>Faculty of Biology</td>
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<th><strong>Duration</strong></th>
<th><strong>Module level</strong></th>
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<tr>
<td>1 semester</td>
<td>graduate</td>
<td>In the lecture series <em>Klinische Tumorbiologie (Clinical Tumour Biology)</em>, current clinical aspects will be addressed. Several tumour types will be discussed (such as tumours of the skin, lung, intestine, breast, blood). Additional topics: diagnostics and pathology, different treatments and therapies and clinical trials.</td>
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<tr>
<th><strong>Intended learning outcomes</strong></th>
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<tbody>
<tr>
<td>Knowledge of the similarities and differences of various tumour types. Understanding of requirements, possibilities and limitations of clinical medicine.</td>
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<th><strong>Courses</strong></th>
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<td>Module taught in: German and/or English</td>
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<th><strong>Method of assessment</strong></th>
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<th><strong>Additional information</strong></th>
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</table>
Module title | Abbreviation
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Current Methods in Biology B | 07-MS31B-152-m01

Module coordinator | Module offered by
holder of the Chair of Plant Physiology and Biophysics | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
7 | (not) successfully completed | --

Duration | Module level | Other prerequisites
1 semester | graduate | --

Contents
This lecture series imparts the theoretical background of fundamental and up-to-date molecular biological methods in plant sciences. Special emphasis is placed on analytical tools, large-scale data analysis and their application.

Intended learning outcomes
At the end of the lecture series, students will (I) be able to qualitatively evaluate results acquired with analytical and molecular biological methods and to integrate them into the context of the current scientific knowledge in this field (II) have gained an overview of the advantages/disadvantages of analytical and molecular biological approaches (III) be able to apply the knowledge they have acquired to design their own experimental strategies for addressing a specific research question.

Courses (type, number of weekly contact hours, language — if other than German)
V (3)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title | Abbreviation
---|---
Plant Ecology B | 07-MS31POEB-152-m01

Module coordinator | Module offered by
holder of the Chair of Ecophysiology and Vegetation Ecology | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
5 | (not) successfully completed | --

Duration | Module level | Other prerequisites
1 semester | graduate | --

Contents
The lecture will deal with the ecological and environmental constraints under which plants grow and develop (biogeography, biodiversity) and with the interactions of plants with abiotic and biotic environmental factors (e.g. plant-insect, plant-fungus interactions). The evolutionary adaptations on the physiological and organismic level will be emphasised in particular (stress and defence reactions, carnivory, plant protection). Corresponding experimental approaches will be illustrated.

Intended learning outcomes
Participants are able to identify and interpret ecological and ecophysiological interrelations and to discuss them in the context of the current state of knowledge in these fields.

Courses
(type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: English

Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title
Plant Immunobiology and Pharmaceutical Biology B

Abbreviation
07-MS31PIPB-152-m01

Module coordinator
holder of the Chair of Pharmaceutical Biology

Module offered by
Faculty of Biology

ECTS
5

Method of grading
Only after succ. compl. of module(s)

Duration
1 semester

Module level
graduate

Other prerequisites
--

Contents
This lecture addresses topics of pathogen recognition and signal transduction in plants, molecular and organismic defence and the pharmaceutical relevance of plant-derived bioactive compounds. Plant immunobiology: interactions between plants and pathogens comprise evolutionary dynamic and complex systems. Different strategies of the pathogens - bacteria, fungi and viruses - as well as defence mechanisms of the host plants will be discussed. The molecular mechanisms of pathogen recognition, signal transduction, regulation of gene expression and activation of local and systemic defence responses are in the focus of this lecture. Differences and similarities between plant and human immune systems will be pointed out. Understanding plant-pathogen-interactions and molecular mechanisms determining susceptibility and defence is fundamental for the development of strategies in plant protection. Evolution, function and pharmaceutical relevance of plant secondary metabolites: Secondary metabolites are part of effective plant defence strategies against microorganisms and herbivores and are often essential for survival. The evolution of secondary metabolism will be discussed and general as well as specific defence strategies will be explained. Pharmacological mechanisms of action and molecular targets of important classes of plant bioactive compounds will be presented. A high proportion of currently used drugs have been developed from plant secondary metabolites that have been used as lead structures to generate potent drugs with improved pharmaceutical properties. Examples of therapies with very potent plant pharmaceuticals (evidence-based medicine) as well as possibilities and limitations of phytotherapy (traditional medicine) will be discussed.

Intended learning outcomes
Students are able to understand the interaction between plants and the environment on a molecular level and to discuss the topic in the context of the scientific state of the art.

Courses (type, number of weekly contact hours, language — if other than German)
V (2)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
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Language of assessment: German and/or English

Allocation of places
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Additional information
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<tr>
<td>Biophysics and Biochemistry B</td>
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<tr>
<td>holder of the Chair of Plant Physiology and Biophysics</td>
<td>Faculty of Biology</td>
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<td>1 semester</td>
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**Contents**

The module imparts theoretical and methodological knowledge of plant membrane transport, structural biology and biochemistry which is illustrated with specific examples from current research. Depending on the number of participants and their interests, practical demonstrations of methods that are currently used give students an opportunity to experience the practical aspects of biophysical and biochemical research.

**Intended learning outcomes**

Students are able to use methods dealing with soluble proteins or membrane proteins in the fields of biophysics, structural biology and biochemistry. They are able to interpret the data and to discuss the results within the context of current knowledge.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2)

Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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<td>Biophysics and Molecular Biotechnology B</td>
<td>07-MS2BTB-152-m01</td>
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<td>holder of the Chair of Biotechnology and Biophysics</td>
<td>Faculty of Biology</td>
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<td>1 semester</td>
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**Contents**

This lecture provides a broad overview of biophysical techniques and their applications. The first part of the lecture discusses fundamental aspects of thermodynamics, kinetics and molecular interactions. The course then moves on to discuss biophysical methods that facilitate the investigation of individual cells down to the level of single molecules. Focus is on electromanipulation and dielectric spectroscopy of cells, electrokinetic techniques, biomembranes, electrophysiology, ion channels, protein folding, single-molecule fluorescence methods and high-resolution as well as dynamic microscopy.

**Intended learning outcomes**

Students will have acquired a knowledge of fundamental biophysical methods and their applications that will enable them to independently review relevant literature. In addition, they will have become acquainted with - or, where necessary, will be able to independently acquaint themselves with - biophysical mechanisms.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title: Neurobiology, Behavioural Physiology and Animal Ecology B  
Abbreviation: 07-MS1B-152-m01

Module coordinator: Dean of Studies Biologie (Biology)  
Module offered by: Faculty of Biology

ECTS: 7  
Method of grading: Only after succ. compl. of module(s)  
Duration: 1 semester

Contents

Timing matters: Temporal organisation in the animal kingdom. Timing plays an important role in all living systems. Animals make use of endogenous clocks to predict and adapt to daily or seasonal changes in environmental parameters. To be at the right place at the right time is of great fitness relevance if - for example - a mating partner or enough food has to be found. Many mutualistic, antagonistic or social interactions can only take place if animals are at the same place at the same time and in the appropriate developmental stage. The lecture gives an introduction to the mechanisms underlying the temporal organisation in the animal kingdom. Adopting an integrative approach, the lecture goes from timing mechanisms on the neuronal level to individual behaviour and then to interactions in social groups, populations or partners in complex and variable ecosystems.

Intended learning outcomes

Students get to know the advantages of an integrative approach when analysing complex biological systems. They learn to relate and integrate different fields within biology.

Courses

(type, number of weekly contact hours, language — if other than German)

V (3)
Module taught in: English

Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

--
Module title: Neurogenetics of Behaviour B

Abbreviation: 07-MNBB-152-m01

Module coordinator: holder of the Chair of Neurobiology and Genetics

Module offered by: Faculty of Biology

ECTS: 5

Other prerequisites: --

Contents:
To understand how the brain controls behaviour is at the heart of neuroscience. Both brain and behaviour can be overwhelmingly complex and plastic, yet neurogenetic methods are powerful tools to dissect the principles of how the brain controls behaviour. The lecture and seminar will give a state-of-the-art view on current and important topics of behavioural neurobiology (incl. e.g. sleep, control of appetite and feeding, social behaviour, mating, mirror neurons, molecular mechanisms of auditory-guided behaviour, neurogenetic techniques) focusing on genetic model systems such as the fruit fly Drosophila, the mouse, and the nematode C. elegans.

Intended learning outcomes:
In the lecture, students acquire theoretical and methodological insights into current topics in the field of neurogenetics in general and the neurogenetics of behaviour.

Courses (type, number of weekly contact hours, language — if other than German):

V (3)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus):
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Language of assessment: German and/or English

Allocation of places: --

Additional information: --

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<tr>
<td>Neuromodulation and Neuronal Development B</td>
<td>07-MENMNDB-152-m01</td>
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**Module coordinator**
holder of the Chair of Neurobiology and Genetics

**Module offered by**
Faculty of Biology

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**Duration**
1 semester

**ECTS**
5

**Method of grading**
Only after successfully completed

**Contents**
Neuromodulation: cellular and molecular biology of neuromodulators and their receptors, modulation of synaptic transmission and membrane potential, theoretical and functional aspects of neuromodulation, model systems used to study modulation of neuronal circuits. Fundamental principles of molecular developmental neurobiology. Focus is on the establishment of the neuroectoderm, pattern generation and regional specification, neuronal precursors, neuronal growth, differentiation of neurons, axonal pathfinding, neuronal connectivity.

**Intended learning outcomes**
The students learn fundamental principles underlying neuromodulation and neuronal development and obtain an insight into current research in the field.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (3)
Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
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Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)
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### Module title
Endogenous Clocks B

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<td>Endogenous Clocks B</td>
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### Module coordinator
holder of the Chair of Neurobiology and Genetics

### Module offered by
Faculty of Biology

### ECTS
5

### Method of grading
Only after succ. compl. of module(s)

### Duration
1 semester

### Module level
graduate

### Contents
Introduction into endogenous clocks of unicellular organisms, fungi, plants and animals, with a focus on the neuronal organisation of the clock in the brain of mammals and insects. The biological functions of endogenous clocks and the underlying mechanisms will be discussed on the molecular, cellular and organismic levels. It will be explained how clocks adjust to a 24h day with variable photoperiods. Applied aspects regarding e. g. shift work or jetlag will also be discussed.

### Intended learning outcomes
The students learn fundamental principles underlying chronobiology/endogenous clocks and obtain an insight into current research in the field.

### Courses
(type, number of weekly contact hours, language — if other than German)

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### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
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<th>Module title</th>
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<td>Animal Ecology and Tropical Biology B</td>
<td>07-MTÖB-152-m01</td>
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<tr>
<td>holder of the Chair of Animal Ecology and Tropical Biology</td>
<td>Faculty of Biology</td>
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<td>1 semester</td>
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</table>

### Contents

This module consists of a lecture and a seminar. The lecture gives an overview of the theoretical foundations and current issues in animal ecology. Focus will be on biodiversity and ecosystem functions, multi-trophic interactions and food nets, evolutionary ecology, chemical ecology, tropical ecology, agricultural ecology, and global change.

### Intended learning outcomes

The students will acquire an advanced knowledge of ecological theories and current research issues in the field of animal ecology. They will be able to interpret scientific publications and apply the acquired knowledge to the solution of current environmental risks.

### Courses

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<td>V (2) Module taught in: German and/or English</td>
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### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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## Module title

### Animal Ecology and Tropical Biology 2 B

### Abbreviation

07-MTÖ2B-152-m01

<table>
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<tbody>
<tr>
<td>holder of the Chair of Animal Ecology and Tropical Biology</td>
<td>Faculty of Biology</td>
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### Duration

1 semester

### Contents

This module provides the fundamentals of the biology of tropical habitats and tropical communities. A special focus is on the global significance of tropical systems (ecosystem goods and ecosystem services), but the biological features of these highly diverse biomes are also highlighted.

### Intended learning outcomes

The students will acquire deep knowledge of ecological theories and up-to-date research issues in the field of tropical ecology. They will be qualified to interpret scientific work and apply the knowledge they have acquired to the solution of current environmental risks.

### Courses

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<td>English</td>
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### Method of assessment

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Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<th>Module title</th>
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<td>Animal Communication B</td>
<td>07-MKB-152-m01</td>
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<tr>
<td>holder of the Chair of Behavioral Physiology and Sociobiology</td>
<td>Faculty of Biology</td>
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<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

The lectures deal with physiological and neurobiological principles of the different communication channels used by animals, but also highlight adaptive values and evolutionary aspects of animal signalling.

**Intended learning outcomes**

Students understand the value of an integrative approach when looking at complex issues in biology. They have learned to connect findings from different research areas, such as physiology, neurobiology, behaviour and ecological conditions, in order to gain a more complete picture of a topic. In addition, students have learned to present and discuss current scientific publications within a broader theoretical framework.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Experimental Sociobiology B

**Module title**

Experimental Sociobiology B

**Abbreviation**

07-MESB-152-m01

**Module coordinator**

holder of the Chair of Behavioral Physiology and Sociobiology

**Module offered by**

Faculty of Biology

**ECTS**

7

**Method of grading**

Only after successfully completed

**Duration**

1 semester

**Module level**

graduate

**Other prerequisites**

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### Contents

The lectures highlight the diversity and the evolution of social behaviour, but also focus on the physiological, neurobiological and behavioural mechanisms underlying the organisation of social groups. In a follow-up seminar session, students will deepen their knowledge by presenting and discussing current papers related to the topic of the lecture.

### Intended learning outcomes

Students understand the value of an integrative approach when looking at complex correlations in behavioural biology. Students are able to recognise and interpret relationships between various aspects of sociobiology. They are able to formulate scientific questions in the context of sociobiology and are able to discuss cutting edge literature in depth.

### Courses

**Type, number of weekly contact hours, language — if other than German**

V (2) + S (1)

Module taught in: English

### Method of assessment

**Type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus**

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Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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Module title | Abbreviation
--- | ---
Molecular Biology B | 07-MS2B-152-m01

Module coordinator | Module offered by
--- | ---
Dean of Studies Biologie (Biology) | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
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7 | (not) successfully completed | --

Duration | Module level | Other prerequisites
--- | --- | ---
1 semester | graduate | --

Contents
Molecular biology of the eukaryotic and prokaryotic cell. The lecture is a joint activity of the Chairs of Cell- and Developmental Biology, Microbiology, Biophysics and Bioinformatics and deals with concepts of modern molecular biology from the point of view of these different disciplines. Participants are recommended to read the textbook "Essential Cell Biology". The section on cell biology (app. a quarter of the lecture) mainly discusses the eukaryotic cell and intends to elucidate the vast diversity in structure and function of molecules, organelles and cells in addition to fundamental principles of modern molecular cell biology. The bioinformatics section (app. a quarter of the lecture) contains a large amount of examples for applications which allow the investigation of the molecular biology of a cell with bioinformatic tools. We closely adhere to the contents of the book "Essential Cell Biology" and present many clear and useful examples for the application of our tools when working on the topics of the other three Chairs. Our vision: bioinformatics essentially is molecular biology based on computing technology (time consuming "wet" experiments can be planned more easily and thus bioinformatics saves precious time). The microbiological section (app. a quarter of the lecture) deals with fundamental molecular aspects of prokaryotic cells. Key aspects include the organisation of the bacterial genome, the transcription and translation machinery, mechanisms of regulation of gene expression, transport of small molecules and macromolecules, cell division and differentiation, bacterial motility and chemotaxis, signal transduction and bacterial communication mechanisms. Recommended reading: (a) Allgemeine Mikrobiologie (Fuchs) and (b) Biology of Microorganisms (Brock).

Intended learning outcomes
Master level knowledge about the molecular biology of the eukaryotic and prokaryotic cell.

Courses (type, number of weekly contact hours, language — if other than German)
V (3)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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<td>Infection Biology B</td>
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**Module coordinator**
holder of the Chair of Microbiology

**Module offered by**
Faculty of Biology

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**Contents**
Fundamentals of molecular microbiology and infection biology, mechanisms of adherence and invasion, bacterial pathogenicity factors, regulation of virulence, mechanisms of host defence and pathogen interference, current methods in infection biology.

**Intended learning outcomes**
The students are able to understand fundamental theories of molecular microbiology and infection biology, emergence of infectious diseases.

**Courses** (type, number of weekly contact hours, language — if other than German)

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**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)
Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Contents**

Fundamental principles of the mode of action of microbial pathogenicity factors will be presented using selected prokaryotic and eukaryotic pathogens as model organisms. In addition, current research methods in infection biology will be presented.

**Intended learning outcomes**

Students have gained fundamental knowledge in infection biology and pathogenicity research and the mechanisms behind infectious diseases.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2)

Module taught in: English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Contents**

The lecture *Zellpathologie* (Cytopathology) describes pathological states of the cell and unravels their biological causes and consequences, such as infection, apoptosis, senescence, metabolic disorders and cancer.

**Intended learning outcomes**

Participants possess scientific background knowledge on cytopathology and are able to put this into the broader context of cell biology research.

**Courses** (type, number of weekly contact hours, language — if other than German)

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**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title: Cell and Developmental Biology Master 2 B
Abbreviation: 07-MZE2-B-152-m01

Module coordinator: holder of the Chair of Cell Biology and Developmental Biology
Module offered by: Faculty of Biology

ECTS: 3
Method of grading: Only after successfully completed

Duration: 1 semester
Module level: graduate
Other prerequisites: --

Contents:
The lecture *Signale und Differenzierung (Signals and Differentiation)* does not attempt to impart pure textbook knowledge. Instead, historically important as well as particularly interesting and important trend-setting topics in developmental biology are presented. The topics range from classical developmental subjects such as tissue regeneration and morphogenetic cell migration to molecular stem cell biology, epigenetic plasticity, origins of multicellularity and development within changing environments.

Intended learning outcomes:
Participants possess a knowledge of the theoretical and molecular biological principles underlying developmental biology and are able to put this into the broader context of cell and developmental biology research.

Courses (type, number of weekly contact hours, language — if other than German):
V (1)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus):
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Language of assessment: German and/or English

Allocation of places:
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Additional information:
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### Contents
Advances and current results of bioinformatics are explained and discussed, this includes results from genome and sequence analysis, protein domains and protein families, large-scale data analysis (e. g. net generation sequences, proteomics data), analysis of different functional RNAs (e. g. miRNAs, IncRNAs).

### Intended learning outcomes
Understand recent results in bioinformatics. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions in bioinformatics.

### Courses

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Language of assessment: German and/or English

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**Contents**

Advances and current results of computational systems biology are explained and discussed, this includes results from functional genomics, dynamics of the transcriptome, of metabolism and metabolic networks as well as regulatory networks.

**Intended learning outcomes**

Understand recent results in systems biology. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions of systems biology.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Module title

**Immunology 1 B**

| Abbreviation | 03-MIM1-B-152-m01 |

### Module coordinator

Managing Director of the Institute of Virology and Immunobiology

### Module offered by

Faculty of Medicine

### ECTS

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### Contents

Foundations of molecular and cellular immunology as well as infection biology which allow a deeper understanding of immune-mediated defence mechanisms against infectious diseases. For more information, please visit http://www.virologie.uni-wuerzburg.de/lehrveranstaltungen/vorlesungen_und_praktika/immunologie/immunologie_biologie_master/.

### Intended learning outcomes

Students will gain a knowledge of fundamental concepts and methods in molecular and cellular immunology and will be able to present and discuss these.

### Courses

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<td>+ S (2)</td>
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Module taught in: English

Winter semester only

### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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<td>Managing Director of the Institute of Virology and Immunobiology</td>
<td>Faculty of Medicine</td>
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**Contents**
Recent progress in molecular and cellular immunology. Deeper insights into selected immunology chapters, such as autoimmunity and immune modulation, development of the immune system, immunogenetics, evolution, infection immunology, and more.

**Intended learning outcomes**
Students are able to understand current problems in immunology and to discuss these in detail.

**Courses**
(type, number of weekly contact hours, language — if other than German)

V (1) + S (2)
Module taught in: English
Summer semester only

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Contents**

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**Intended learning outcomes**

Students will gain a knowledge of fundamental concepts and methods in molecular and cellular immunology and will be able to present and discuss these.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)

Module taught in: English

Winter semester only

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

**Allocation of places**

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<td>Immunology 2 BS</td>
<td>03-MIM2-BS-152-m01</td>
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<tr>
<td>Managing Director of the Institute of Virology and Immunobiology</td>
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<td>1 semester</td>
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**Contents**

Recent progress in molecular and cellular immunology. Deeper insights into selected immunology chapters, such as autoimmunity and immune modulation, development of the immune system, immunogenetics, evolution, infection immunology, and more.

**Intended learning outcomes**

Students are able to understand current problems in immunology and to discuss these in detail.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)
Module taught in: English
Summer semester only

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Contents**

No information on contents available.

**Intended learning outcomes**

No information on intended learning outcomes available.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (1) + S (2)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 to 120 minutes).

If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

- -

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### Contents

This course will use a combination of lectures (daily) and practical experiments. Topics to be covered in the lecture (subject to change): - nuclear envelope, nuclear pores and nuclear-cytoplasmic transport. - nuclear envelope, nuclear lamina and their role in chromatin organisation and genetic diseases. - DNA, chromatin and chromosomes. - structure and function of nucleoli. - nuclear-cytoskeletal interactions.

### Intended learning outcomes

Students are able to perform practical experiments, applying their theoretical knowledge.

### Courses

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Module taught in: German and/or English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Gene Regulation and Signal Transduction</td>
<td>07-MGRSD-152-m01</td>
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**Module coordinator**  
Dean of Studies Biologie (Biology)

**Module offered by**  
Faculty of Biology

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**Duration**  
1 semester

**Module level**  
graduate

**Other prerequisites**  
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**Contents**

In this lecture, important aspects of gene regulation and signal transduction of bacteria will be described and discussed. The lecture will discuss regulatory mechanisms on the transcriptional and post transcriptional level. Whenever appropriate, special emphasis will be placed on regulatory phenomena in pathogenic bacteria.

**Intended learning outcomes**

The lecture will discuss aspects covered in the lecture *Molekulare Biologie* (*Molecular Biology*, course no. 0610200) and in the special lecture *Mikrobiologie/Infektionsbiologie* (*Microbiology/Infection Biology*, course no. 0610220) in more detail and will explore some additional aspects.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (1)  
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

**Allocation of places**  
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**Additional information**  
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title          | Abbreviation
---------------------|-----------------
Microbial Ecology    | 07-MMIÖK-152-m01

Module coordinator   | Module offered by
Dean of Studies Biologie (Biology) | Faculty of Biology

ECTS                  | Method of grading       | Duration | Module level | Other prerequisites
3                    | Only after succ. compl. of module(s) | 1 semester | graduate | --

Contents
This lecture discusses fundamental principles of the interaction of bacteria with their environment. A major emphasis is on the interaction of mutualistic bacteria with other organisms including bacteria, invertebrates and vertebrates and, where appropriate, the comparison with commensal and pathogenic interactions. The lecture complements the focus Infektionsbiologie (Infection Biology) of the degree programme Zelluläre und Molekulare Mikrobiologie / Infektionsbiologie (Cellular and Molecular Biology / Infection Biology) in which mainly human pathogens and their host interaction mechanisms are presented. Thus, the lecture intends to identify and describe fundamental concepts of the interaction of bacteria with different host organisms and their evolution.

Intended learning outcomes
Students understand the fundamental principles and evolution of the mechanisms of interaction between bacteria and eukaryotic host organisms.

Courses (type, number of weekly contact hours, language — if other than German)
V (1)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
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Language of assessment: German and/or English

Allocation of places
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Additional information
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<td>Ecology of Honey Bees and Wild Bees</td>
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**Contents**

Introduction to the life of honeybees and wild bees; principles and techniques of beekeeping (colony management, breeding, diseases); resource use of honeybees and wild bees (bee dances, flower visiting, pollen analysis, foraging behaviour, nesting aid); taxonomy of wild bees, opponents of bees, wild bees in different habitats (field trip), honeybee field trip, e.g. visit to the bee centre in Veitshöchheim.

**Intended learning outcomes**

The students will expand their knowledge on the biology and ecology of wild and honeybees, on interactions between bees and plants, and on aspects of nature conservation. They will be proficient in experimental methods of pollination ecology, the management of trial colonies, pollen analysis, and the determination of wild bees.

**Courses** (type, number of weekly contact hours, language — if other than German)

Ü (5)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes).

Students will be informed about the method, length and scope of the assessment prior to the course.

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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<td>Ecology and Taxonomy of Insects</td>
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**Contents**

Identification and classification of the characteristics of different groups of arthropods, especially insects. Knowledge of special form is provided. Observation and recording of arthropods in habitat. Experimental laboratory and field work on ecological or behaviour biological characteristics of the respective groups of arthropods. In addition, compilation of species richness and niche differentiation. The aim is to link the phylogenetic and morphological characteristics of arthropods with their ecological functions.

**Intended learning outcomes**

The students will be able to identify typical families and representatives of major insect orders. They will be able to apply special identification keys as well as to record and evaluate special behaviours. They will be able to design and evaluate experimental approaches in ecological laboratory and field studies.

**Courses**

(type, number of weekly contact hours, language — if other than German)

Ü (5)

Module taught in: German and/or English

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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<tr>
<td>Based on selected topics in ecology, students will become familiar with a variety of simulation and modelling techniques. They will also develop their own programs for the simulation of problems in the fields of demography or evolution.</td>
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<tbody>
<tr>
<td>Students have gained knowledge on selected topics in ecology and are familiar with a variety of simulation and modelling techniques. They are to develop their own programs for the simulation of problems in the field of demography or evolution.</td>
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**Contents**

Biodiversity and ecosystem functioning in agricultural ecosystems. Insect communities in different crops, pest-beneficial organisms-interactions, and biological pest control. Experiment in comparison of organically and conventionally farmed agricultural land (plant diversity, herbivore, predator, pollinator diversity). Field trip to nature conservation-related agricultural areas (e.g. semi-arid grassland), presentation of agri-environmental measures.

**Intended learning outcomes**

The students will acquire knowledge about the species diversity, structure and functional role of arthropod communities in agricultural ecosystems. They will be able to perform scientific work in agricultural ecosystems, to perform statistical analyses, and to interpret the results. They will be familiar with problems and possible solutions in agricultural ecosystems in the context of a sustainable use of biodiversity and ecosystem services.

**Courses** (type, number of weekly contact hours, language — if other than German)

Ü (3)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes).
Students will be informed about the method, length and scope of the assessment prior to the course.
Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Module Catalogue for the Subject Biosciences

**Master’s with 1 major, 120 ECTS credits**

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### Contents

Arthropod communities in forest ecosystems, methods for detection, influence of management on diversity patterns and functional groups. The course includes field studies in forest ecosystems and work of determination as well as the statistical analysis of data.

### Intended learning outcomes

The students will acquire knowledge of the species diversity, structure and functional role of arthropod communities in forests. On the basis of complex data sets, they will learn to analyse and discuss the structuring patterns of communities. In this context, the course will also discuss associated conservation-related aspects.

### Courses

(\(\text{type, number of weekly contact hours, language — if other than German}\))

Ü (3)

Module taught in: German and/or English

### Method of assessment

(\(\text{type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus}\))

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Students will be informed about the method, length and scope of the assessment prior to the course.

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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<td>Tropical Ecology</td>
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</table>

**Contents**

Small projects on ecological or nature conservation-related issues will be implemented in a tropical ecosystem. Students should become familiar with different project stages from experiment design, implementation and data analysis through to data presentation. In evening seminars, recent publications in the field of tropical ecology will be presented and discussed.

**Intended learning outcomes**

The students will learn about various tropical ecosystems and will acquire advanced knowledge of ecological and nature conservation-related research in the tropics. They will learn field ecological methods for the quantitative detection of insects and their biotic interactions and will acquire statistical knowledge in the field of data analysis.

**Courses** (type, number of weekly contact hours, language — if other than German)

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<th>Ü (3)</th>
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<tbody>
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**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
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<td>Seminar Experimental Animal Ecology</td>
<td>07-MSET-152-m01</td>
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<tr>
<td>holder of the Chair of Animal Ecology and Tropical Biology</td>
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<tbody>
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</table>

**Contents**

Introduction to and discussion of current research in: Honigbienen- und Wildbienenökologie (Ecology of Wild Bees and Honeybees, 07-MHWB), Ökologie und Taxonomie der Insekten (Ecology and Taxonomy of Insects, 07-METI), Modellierung in der Ökologie (Ecological Modelling, 07-MMIE), Agrarökologie (Agroecology, 07-MAGRE), Waldökologie (Forest Ecology, 07-MFEC), Tropenökologie (Tropical Ecology, 07-MTROP).

**Intended learning outcomes**

Students have acquired in-depth knowledge about current research in experimental animal ecology and are able to communicate and critically analyse methods and results of scientific publications.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
**Module title**
Presentation of Scientific Data

**Abbreviation**
07-MPWD-152-m01

**Module coordinator**
Coordinator BioCareers

**Module offered by**
Faculty of Biology

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**Duration**
1 semester

**Contents**
Principles for the preparation of scientific manuscripts, citations and the presentation of scientific data. Students will write a scientific mini review and present this in a talk (15 minutes). Content, structure, coherence and the logical chain of arguments will be discussed. Students will write and publish (where possible) a scientific paper or review on a selected topic in a scientific journal. The students' work will be based on original papers as well as on reviews and will follow the instructions of a scientific journal of the students' choice. These instructions can be found on the website of the respective journal under "Instructions to Authors" or similar. Both length of chapters and structure of the article should be based on the style of the journal selected. Attendance of no less than 20 scientific talks (e.g. defences of doctoral theses, presentations of research projects, retreats) including presentations by guest speakers. Students are to obtain proof of attendance from the organisers or speakers.

**Intended learning outcomes**
The students are familiar with the details of publishing scientific data in written and oral form. They have become familiar with the methodology of scientific publishing in oral or written fashion. In addition, they have enhanced their English reading, speaking and writing skills.

**Courses**
(type, number of weekly contact hours, language — if other than German)

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<thead>
<tr>
<th>Type</th>
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<th>Language</th>
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**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**
--

**Additional information**
--

**Referred to in LPO I**
(examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
---|---
Quality Assurance, Good Practice, Biosafety and Biosecurity | 07-MGLN-152-m01

| Module coordinator | Module offered by |
---|---|
Coordinator BioCareers | Faculty of Biology |

**ECTS** | **Method of grading** | **Only after succ. compl. of module(s)**
---|---|---
5 | numerical grade | --

**Duration** | **Module level** | **Other prerequisites**
---|---|---
1 semester | graduate | --

### Contents

Political instruments to conserve biodiversity (convention on biodiversity (CBD), German strategy on biodiversity) as well as corporate social responsibility in the private economy, sponsoring and marketing are discussed. These topics are critically analysed with regard to sustainability, credibility and effectiveness. In addition, the students become familiar with strategies to prevent biodiversity loss and actively contribute to these activities. Good practice in the biosciences, quality assurance approaches and quality culture. Structure, idea and fundamental principles of quality management approaches, DIN EN ISO 9001, regulatory documents and framework in the biosciences including biotechnology, biosafety, biosecurity, risk assessment.

### Intended learning outcomes

The students know relevant international conventions and German regulations on the conservation of biodiversity. They have become familiar with the regulatory and political framework for the conservation of biodiversity. They are aware of corporate responsibilities in this regard and know how to support cooperative approaches among companies and organisations on environmental protection. The students are familiar with the fundamental principles of "good practice" in research and development, and have understood the fundamental principles of quality management circles. They have developed a distinct sensitivity towards biosafety and biosecurity issues and know how to properly handle biological agents and organisms, including GMOs. In addition, they have developed a sensitivity towards the complex interdependencies in nature and are able to critically discuss socio-ethical issues in the bioscience area. Students possess the knowledge and skills required of a biosafety officer and are qualified for working in CSR or environmental management at major enterprises or mediating between environmental organisations, governments and the private sector.

### Courses

| Type | Number of weekly contact hours | Language — if other than German |
---|---|---|
V (1) + S (1) | | German and/or English |

**Module taught in:** German and/or English

**Method of assessment**

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, the following option will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions)

**Language of assessment:** German and/or English

### Allocation of places

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### Additional information

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Contents**  
Philosophical foundations and scientific principles, history and theory of mind, human memory, intentional decision making and biochemical principles of cognitive and emotional processes. Fundamental terms and principles in biology are discussed.

**Intended learning outcomes**  
The students are familiar with the hallmarks of the history of natural sciences. They have developed an increased awareness of how to use fundamental terms and definitions as well as of risks and concerns arising with knowledge and technical developments in the biosciences.

**Courses** (type, number of weekly contact hours, language — if other than German)  
S (2)
Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)  
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

**Allocation of places**  
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**Additional information**  
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</table>

**Contents**

Philosophical foundations and scientific principles, history and theory of mind, human memory, intentional decision making and biochemical principles of cognitive and emotional processes. Fundamental terms and principles in biology are discussed.

**Intended learning outcomes**

The students are familiar with the hallmarks of the history of natural sciences. They have developed an increased awareness of how to use fundamental terms and definitions as well as of risks and concerns arising with knowledge and technical developments in the biosciences.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
Entrepreneurial Management in the Biosciences | 07-MEMB-152-m01

Module coordinator | Module offered by
Coordinator BioCareers | Faculty of Biology

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
10 | (not) successfully completed | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents
Overview of the bioscience sector with a particular focus on research and development, fundamental methods and technologies, recent developments and trends in established as well as up-and-coming high-tech industries, legal framework, financing and business models, best practice examples of start-ups as well as established companies, criteria of project-based work, characteristics and elements of project work, case studies, project work in interdisciplinary teams of students where possible, selected guest lectures giving the course practical relevance.

Intended learning outcomes
Students have acquired an insight into industries and developments in the natural sciences. They are familiar with the characteristics of industries and established businesses as well as with specific characteristics of start-up companies and up-and-coming technologies. Students are also familiar with the criteria of project-based work and have gained experience working in interdisciplinary teams. They are better qualified to evaluate what approaches or methods from individual disciplines are most suitable for solving a particular problem. The experience of interdisciplinary project work students have acquired will help them enhance their entrepreneurial skills.

Courses (type, number of weekly contact hours, language — if other than German)
S (2)
Module taught in: German and/or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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<td>Entrepreneurial Thinking in the Biosciences</td>
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**Module coordinator**
Coordinator BioCareers

**Module offered by**
Faculty of Biology

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**Duration**
1 semester

**Module level**
graduate

**Other prerequisites**
--

**Contents**
Companies are presented to students opt. together with cooperative workshops. These workshops may also deal with the process of founding start-up companies in the biotech or biomedical sectors. Topics on intellectual property protection are discussed.

**Intended learning outcomes**
Students gained an insight into the business plans and market of companies. They gained an insight into industrial research and development.

**Courses**
(type, number of weekly contact hours, language — if other than German)

$\text{S (1)}$
Module taught in: German and/or English

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)

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**Module title**  
Special Subject Studies Biology and Natural Sciences 1

| Abbreviation | 07-MVMINT1-152-m01 |

**Module coordinator**  
Coordinator BioCareers

**Module offered by**  
Faculty of Biology

**ECTS**  
2

**Method of grading**  
Only after succ. compl. of module(s)

**Duration**  
1 semester

**Module level**  
graduate

**Other prerequisites**  
Please consult with course advisory service in advance.

**Contents**  
Regular specific lectures or seminars (1 weekly contact hour) in biological or natural sciences; assessment ungraded, pass required.

**Intended learning outcomes**  
Specific skills and knowledge on an interdisciplinary subject in the biological or natural sciences.

**Courses (type, number of weekly contact hours, language — if other than German)**

S (1)  
Module taught in: German and/or English  
Course type: might also be offered in V, Ü, P, R or E format

**Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)**

Successful completion as certified by the lecturer  
Language of assessment: German and/or English

**Allocation of places**  
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**Additional information**  
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**Referred to in LPO I (examination regulations for teaching-degree programmes)**  
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<td>Faculty of Biology</td>
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<td>1 semester</td>
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</table>

Please consult with course advisory service in advance.

Contents

Regular specific lecture, seminar, workshop, retreat or practical course (1 weekly contact hour) in biological or natural sciences with a graded assessment.

Intended learning outcomes

Specific skills and knowledge on an interdisciplinary subject in the biological or natural sciences.

Courses (type, number of weekly contact hours, language — if other than German)

S (1)

Module taught in: German and/or English

Course type: might also be offered in V, Ü, P, R or E format

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module title: Special Subject Studies Biology and Natural Sciences 2B
Abbreviation: 07-MVMINT2B-152-m01

Module coordinator: BioCareers
Module offered by: Faculty of Biology

ECTS: 3
Method of grading: Only after successfully completed module(s)

Duration: 1 semester
Module level: Graduate
Other prerequisites: Please consult with course advisory service in advance.

Contents:
Regular specific lecture, seminar, workshop, retreat or practical course (1 weekly contact hour) in biological or natural sciences with a graded assessment.

Intended learning outcomes:
Specific skills and knowledge on an interdisciplinary subject in the biological or natural sciences.

Courses (type, number of weekly contact hours, language — if other than German):
S (1)
Module taught in: German and/or English
Course type: might also be offered in V, Ü, P, R or E format

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus):
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Language of assessment: German and/or English

Allocation of places:

Additional information:

Referred to in LPO I (examination regulations for teaching-degree programmes):

### Module Catalogue for the Subject Biosciences

#### Master's with 1 major, 120 ECTS credits

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#### Module coordinator

Coordinator BioCareers

Faculty of Biology

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<td>graduate</td>
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#### Contents

Regular specific lecture, seminar, workshop, retreat or practical course (2 weekly contact hours) in biological or natural sciences; assessment ungraded, pass required.

#### Intended learning outcomes

Specific skills and knowledge on an interdisciplinary subject in the biological or natural sciences.

#### Courses

<table>
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Course type: might also be offered in V, Ü, P, R or E format

#### Method of assessment

Successful completion as certified by the lecturer

Language of assessment: German and/or English

#### Allocation of places

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#### Additional information

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#### Referred to in LPO I

(examination regulations for teaching-degree programmes)
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**Contents**

Regular specific lecture, seminar, workshop, retreat or practical course (2 weekly contact hours) in biological or natural sciences with a graded assessment.

**Intended learning outcomes**

Specific skills and knowledge on an interdisciplinary subject in the biological or natural sciences.

**Courses** (type, number of weekly contact hours, language — if other than German)

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<td>Course type: might also be offered in V, Ü, P, R or E format</td>
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Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module title
Special Subject Studies Biology and Natural Sciences 4B

### Abbreviation
07-MVMINT4B-152-m01

### Module coordinator
BioCareers

### Module offered by
Faculty of Biology

### ECTS
5

### Method of grading
Only after succ. compl. of module(s)

### Duration
1 semester

### Module level
graduate

### Other prerequisites
Please consult with course advisory service in advance.

### Contents
Regular specific lecture, seminar, workshop, retreat or practical course (2 weekly contact hours) in biological or natural sciences; assessment ungraded, pass required.

### Intended learning outcomes
Specific skills and knowledge on an interdisciplinary subject in the biological or natural sciences.

### Courses
<table>
<thead>
<tr>
<th>Type</th>
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<tbody>
<tr>
<td>S</td>
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</table>

Module taught in: German and/or English
Course type: might also be offered in V, Ü, P, R or E format

### Method of assessment
Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
## Module Catalogue for the Subject Biosciences
### Master's with 1 major, 120 ECTS credits

<table>
<thead>
<tr>
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<th>Abbreviation</th>
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<tr>
<td>Coordinator BioCareers</td>
<td>Faculty of Biology</td>
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<tbody>
<tr>
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<td>Please consult with course advisory service in advance.</td>
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### Contents
Regular specific lecture, seminar, workshop, retreat or practical course (3 weekly contact hours) in biological or natural sciences; assessment ungraded, pass required.

### Intended learning outcomes
Specific skills and knowledge on an interdisciplinary subject in the biological or natural sciences.

### Courses
(type, number of weekly contact hours, language — if other than German)

**S (3)**
Module taught in: German and/or English
Course type: might also be offered in V, Ü, P, R or E format

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Successful completion as certified by the lecturer
Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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### Contents

Regular specific lecture, seminar, workshop, retreat or practical course (1 weekly contact hour), offered by JMU or other institutions, in which students will acquire additional skills in areas other than biology or the natural sciences. Assessment ungraded, pass required (2 ECTS credits); decision on credit transfer to be made by module coordinators. Possible subjects are philosophy, pedagogy, history, languages, social studies, psychology, economics, and law.

### Intended learning outcomes

Specific skills and knowledge on a specific subject in an area other than biology or the natural sciences.

### Courses

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### Method of assessment

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### Allocation of places

| -- |

### Additional information

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## Module title

**Special Subject Studies outside Natural Sciences 2**

| Abbreviation | 07-MV2-152-m01 |

### Module coordinator

Coordinator: BioCareers

### Module offered by

Faculty of Biology

### ECTS

3

### Method of grading

Only after succ. compl. of module(s)

### Duration

1 semester

### Module level

graduate

### Other prerequisites

Please consult with course advisory service in advance.

## Contents

Regular specific lecture, seminar, workshop, retreat or practical course (1-2 weekly contact hours), offered by JMU or other institutions, in which students will acquire additional skills in areas other than biology or the natural sciences. Assessment ungraded, pass required (3 ECTS credits); decision on credit transfer to be made by module coordinators. Possible subjects are philosophy, pedagogy, history, languages, social studies, psychology, economics, and law.

## Intended learning outcomes

Specific skills and knowledge on a specific subject in an area other than biology or the natural sciences.

## Courses

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Module taught in: German and/or English

Course type: might also be offered in V, Ü, P, R or E format

## Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

## Allocation of places

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## Additional information

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## Referred to in LPO I

( examination regulations for teaching-degree programmes)

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<td>Faculty of Biology</td>
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<th>Other prerequisites</th>
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**Contents**

Regular specific lecture, seminar, workshop, retreat or practical course (1-2 weekly contact hours), offered by JMU or other institutions, in which students will acquire additional skills in areas other than biology or the natural sciences. Assessment ungraded, pass required (3 ECTS credits); decision on credit transfer to be made by module coordinators. Possible subjects are philosophy, pedagogy, history, languages, social studies, psychology, economics, and law.

**Intended learning outcomes**

Specific skills and knowledge on a specific subject in an area other than biology or the natural sciences.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (1)
Module taught in: German and/or English
Course type: might also be offered in V, Ü, P, R or E format

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)
Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<td>Coordinator BioCareers</td>
<td>Faculty of Biology</td>
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<th>Other prerequisites</th>
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<td>graduate</td>
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**Contents**

Regular specific lecture, seminar, workshop, retreat or practical course (2 weekly contact hours), offered by JMU or other institutions, in which students will acquire additional skills in areas other than biology or the natural sciences. Assessment ungraded, pass required (4 ECTS credits); decision on credit transfer to be made by module coordinators. Possible subjects are philosophy, pedagogy, history, languages, social studies, psychology, economics, and law.

**Intended learning outcomes**

Specific skills and knowledge on a specific subject in an area other than biology or the natural sciences.

**Courses**

- **S (2)**
  - Module taught in: German and/or English

**Method of assessment**

- Successful completion as certified by the lecturer
- Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)
## Module Catalogue for the Subject Biosciences
### Master's with 1 major, 120 ECTS credits

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<td>Coordinator BioCareers</td>
<td>Faculty of Biology</td>
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<th>Other prerequisites</th>
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
<td>Please consult with course advisory service in advance.</td>
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</table>

### Contents

Regular specific lecture, seminar, workshop, retreat or practical course (3 weekly contact hours), offered by JMU or other institutions, in which students will acquire additional skills in areas other than biology or the natural sciences. Assessment ungraded, pass required (5 ECTS credits); decision on credit transfer to be made by module coordinators. Possible subjects are philosophy, pedagogy, history, languages, social studies, psychology, economics, and law.

### Intended learning outcomes

Specific skills and knowledge on a specific subject in an area other than biology or the natural sciences.

### Courses

<table>
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<tr>
<th>S (2)</th>
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<tbody>
<tr>
<td></td>
<td>Course type: might also be offered in V, Ü, P, R or E format</td>
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### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

Language of assessment: German and/or English

### Allocation of places

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### Additional information

--

### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
**Module title**
Special Subject Studies outside Natural Sciences 4B

**Abbreviation**
07-MV4B-152-m01

**Module coordinator**
Coordinator BioCareers

**Module offered by**
Faculty of Biology

**ECTS**
5

**Method of grading**
Only after succ. compl. of module(s)

**Duration**
1 semester

**Module level**
graduate

**Other prerequisites**
Please consult with course advisory service in advance.

**Contents**
Regular specific lecture, seminar, workshop, retreat or practical course (3 weekly contact hours), offered by JMU or other institutions, in which students will acquire additional skills in areas other than biology or the natural sciences. Assessment ungraded, pass required (5 ECTS credits); decision on credit transfer to be made by module coordinators. Possible subjects are philosophy, pedagogy, history, languages, social studies, psychology, economics, and law.

**Intended learning outcomes**
Specific skills and knowledge on a specific subject in an area other than biology or the natural sciences.

**Courses**
(type, number of weekly contact hours, language — if other than German)

- S (2)
  - Module taught in: German and/or English
  - Course type: might also be offered in V, Ü, P, R or E format

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes)

**Language of assessment:** German and/or English

**Allocation of places**

**Additional information**

**Referred to in LPO I**
(examination regulations for teaching-degree programmes)

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</table>

**Contents**

Students contribute to and/or independently organise courses for Bachelor's students or pupils. Students organising courses will receive advice on contents and organisation from the degree programme coordinator. The course will comprise 0.5 weekly contact hours.

**Intended learning outcomes**

Ability to independently organise, plan and deliver courses.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (2)

Module taught in: German and/or English

Course type: might also be offered in V, Ü, P, R or E format

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Successful completion as certified by the lecturer

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<tbody>
<tr>
<td>1 semester</td>
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**Contents**

Students contribute to and/or independently organise lectures or seminars for Bachelor's students or pupils. Students organising courses will receive advice on contents and organisation from the degree programme coordinator. The course will comprise 1 weekly contact hour.

**Intended learning outcomes**

Ability to independently organise courses.

<table>
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<th>Courses</th>
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**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Successful completion as certified by the lecturer

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Contents

Students contribute to and/or independently organise courses for Bachelor's students or pupils. Students organising courses will receive advice on contents and organisation from the degree programme coordinator. The course will comprise 1.5 weekly contact hours.

### Intended learning outcomes

- Ability to independently organise courses.

### Courses

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- Module taught in: German and/or English
- Course type: might also be offered in V, Ü, P, R or E format

### Method of assessment

- Successful completion as certified by the lecturer
- Language of assessment: German and/or English

### Allocation of places

- --

### Additional information

- --

### Referred to in LPO I

- (examination regulations for teaching-degree programmes)
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**Contents**

Students contribute to and/or independently organise courses for Bachelor's students or pupils. Students organising courses will receive advice on contents and organisation from the degree programme coordinator. The course will comprise 2 weekly contact hours.

**Intended learning outcomes**

Ability to independently organise courses.

**Courses** (type, number of weekly contact hours, language — if other than German)

- S (3)
  - Module taught in: German and/or English
  - Course type: might also be offered in V, Ü, P, R or E format

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- Successful completion as certified by the lecturer
- Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Module Catalogue for the Subject Biosciences

**Master's with 1 major, 120 ECTS credits**

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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</thead>
<tbody>
<tr>
<td>Tutorial 1</td>
<td>07-FT1-152-m01</td>
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<table>
<thead>
<tr>
<th>Module coordinator</th>
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<tbody>
<tr>
<td>degree programme coordinator Biologie (Biology)</td>
<td>Faculty of Biology</td>
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<tr>
<th>ECTS</th>
<th>Method of grading</th>
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<table>
<thead>
<tr>
<th>Duration</th>
<th>Module level</th>
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<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
</tr>
</tbody>
</table>

Please consult with course advisory service in advance.

### Contents

Working as tutors, students will mentor other students during courses in particular and will help organise and design courses, in particular exercises.

### Intended learning outcomes

The tutors are able to communicate complex concepts in a clear and structured way. They have gained experience supervising a group and helping students with personal matters. The tutors have thus enhanced their own interpersonal skills and know how to share their expertise in exploring complex topics. In addition, the tutors have learned to plan and organise key elements of their own university education and the university education of the students they mentor.

### Courses

<table>
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<tr>
<th>Type</th>
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<th>Language — if other than German</th>
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Module taught in: German and/or English

### Method of assessment

Successful completion as certified by the lecturer

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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### Module Catalogue for the Subject Biosciences

**Master's with 1 major, 120 ECTS credits**

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**Contents**

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**Intended learning outcomes**

The tutors are able to communicate complex concepts in a clear and structured way. They have gained experience supervising a group and helping students with personal matters. The tutors have thus enhanced their own interpersonal skills and know how to share their expertise in exploring complex topics. In addition, the tutors have learned to plan and organise key elements of their own university education and the university education of the students they mentor.

**Courses**

(T 2)

Module taught in: German and/or English

**Method of assessment**

Successful completion as certified by the lecturer

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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### Module title

**Tutorial 3**

### Abbreviation

07-FT3-152-m01

### Module coordinator

degree programme coordinator Biologie (Biology)

### Module offered by

Faculty of Biology

### ECTS

5

### Method of grading

Only after succ. compl. of module(s)

### (not) successfully completed

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### Duration

1 semester

### Module level

undergraduate

### Other prerequisites

Please consult with course advisory service in advance.

### Contents

Working as tutors, students will mentor other students during courses in particular and will help organise and design courses, in particular exercises.

### Intended learning outcomes

The tutors are able to communicate complex concepts in a clear and structured way. They have gained experience supervising a group and helping students with personal matters. The tutors have thus enhanced their own interpersonal skills and know how to share their expertise in exploring complex topics. In addition, the tutors have learned to plan and organise key elements of their own university education and the university education of the students they mentor.

### Courses

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Module taught in: German and/or English

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Successful completion as certified by the lecturer

Language of assessment: German and/or English

### Allocation of places

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### Additional information

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(examination regulations for teaching-degree programmes)

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<table>
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<th>Module title</th>
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<tr>
<td>Workshop on scientific approaches</td>
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**Contents**

Planning of scientific projects: Choosing the right questions, selection of appropriate methods, time management and experimental setups, literature and resources, how to keep records, handling of equipment, assessment and evaluation of results incl. statistics, presentation of data, scientific writing. Besides the theoretical handling of these aspects, we will pick a current topic in field of Neurogenetics for a practical application.

**Intended learning outcomes**

The participants understand how to plan and to perform a scientific project. They are able to choose appropriate methods, to plan the experimental setup, to perform appropriate experiments, to evaluate and to analyze the results and to present and to summarize their data.

**Courses** (type, number of weekly contact hours, language — if other than German)

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**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes).

Students will be informed about the method, length and scope of the assessment prior to the course.

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO** (examination regulations for teaching-degree programmes)

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Module title: The Value of Nature
Abbreviation: 07-MGPN-182-m01

Module coordinator: holder of the Chair of Animal Ecology and Tropical Biology
Module offered by: Faculty of Biology

ECTS: 5
Method of grading: numerical grade
Duration: 1 semester
Module level: graduate
Other prerequisites: --

Contents:
In this course students will be provided with basic information on threats to biodiversity and ecosystem services as well as the economic dimension of their loss. Students discuss different methods on how to evaluate the monetary values of biodiversity and ecosystem services and will be presented different examples on how ecosystem services can generate financial revenues. In addition we will discuss new, market-based approaches on the protection of biodiversity and ecosystem service.

Intended learning outcomes:
Students gain insight in the complex of problems of biodiversity loss and the economic consequences coming along with this development. They are familiar with the current monetary evaluation methods, studies, initiatives (from politics, businesses, and society) and economic approaches aiming to solve the occurring problems; and are able to participate in current discussions on the topic in a competent way.

Courses:
Ü (3)
Module taught in: German and/or English

Method of assessment:
a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes).

Language of assessment: German and/or English

Allocation of places:
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Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes):
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Module title: Chemical Ecology
Abbreviation: 07-MCHÖKO-182-m01

Module coordinator: holder of the Chair of Animal Ecology and Tropical Biology
Module offered by: Faculty of Biology
ECTS: 5
Method of grading: numerical grade
Duration: 1 semester
Module level: graduate
Other prerequisites: --

Contents
The students will be deeply introduced into the chemical interaction of organisms with their biotic and abiotic environment with a focus on evolutionary and ecological research questions. You will learn adequate biological methods to study these interactions as well as analytical methods to characterize the substances used by the organisms. The aim of the course is to lead you to up-to-date topics in the field of chemical ecology.

Intended learning outcomes
Students will learn the basics in chemical ecology and will be taught to plan and conduct own experiments.

Courses
(3) Module taught in: German and/or English

Method of assessment
(a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes).

Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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<table>
<thead>
<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Molecular Parasitology B</td>
<td>07-MSPARB-182-m01</td>
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<thead>
<tr>
<th>Module coordinator</th>
<th>Module offered by</th>
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<tbody>
<tr>
<td>holder of the Chair of Cell Biology and Developmental Biology</td>
<td>Faculty of Biology</td>
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</table>

**Contents**

The lecture *Molecular Parasitology* discusses molecular and genetic aspects of parasitic diseases in humans and animals. Special emphasis is on neglected tropical diseases.

**Intended learning outcomes**

Participants possess a knowledge of the theoretical principles underlying parasitology and are able to put this into the broader context of molecular cell biology research.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (30 to 60 minutes, including multiple choice questions) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Students will be informed about the type and length of assessment at the beginning of the course.

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Machine Learning in Bioinformatics</td>
<td>07-MML-182-m01</td>
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<thead>
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<th>Module coordinator</th>
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</thead>
<tbody>
<tr>
<td>holder of the Chair of Bioinformatics</td>
<td>Faculty of Biology</td>
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**Contents**

Machine learning are powerful computational methods with numerous application in bioinformatics. In this seminar we shed light on several different machine learning approaches and discuss how they help to answer biological questions.

**Intended learning outcomes**

Knowledge about the different concepts and techniques of machine learning and big data analysis as well as the competence to apply this for solving bioinformatical questions.

**Courses** (type, number of weekly contact hours, language — if other than German)

- S (1)

Module taught in: German and/or English

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes).

Students will be informed about the method, length and scope of the assessment prior to the course.

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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<table>
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<td>Algorithmic Bioinformatics</td>
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</table>

**Contents**

During this lecture we will learn advanced statistical and algorithmic methods of bioinformatics including practical examples and training.

**Intended learning outcomes**

Statistical and algorithmic approaches to deal with complex problems in bioinformatics.

**Courses** (type, number of weekly contact hours, language — if other than German)

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**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Students will be informed about the method, length and scope of the assessment prior to the course.

Language of assessment: German and/or English

**Allocation of places**  
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**Additional information**  
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Module title

**Single Cell Biology**

**Abbreviation**

03-98-SCB-192-m01

### Module coordinator

**holder of the Chair of Molecular Infection Biology I**

### Module offered by

Chair of Molecular Infection Biology

### ECTS

5

### Method of grading

numerical grade

### Only after succ. compl. of module(s)

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### Duration

1 semester

### Module level

graduate

### Other prerequisites

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### Contents

The Single Cell Biology course is at the interface of genomics, bioinformatics, biology and pathology. It will give an introduction of the most recent technologies for single cell analysis and an overview of the application of single cell biology across the medical field (cancer, immunology, cardiovascular diseases, and infectious diseases). Practical components will allow the students to be familiarized with the basic tools to perform data analysis.

### Intended learning outcomes

Students are familiar with fundamental concepts of single cell biology throughout the life sciences and they can apply basic procedures to analyze single cell data sets.

### Courses (type, number of weekly contact hours, language — if other than German)

V (1,5) + Ü (0,5)

Module taught in: Englisch

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 60 minutes)

Language of assessment: English

Creditable for bonus

### Allocation of places

M.Sc. Biomed: 156

M.Sc. Biochem: 156

M.Sc. Biowis: 106

### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

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Thesis

(30 ECTS credits)
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**Contents**

Applying adequate techniques, students address a defined scientific question. They plan and perform experiments to solve problems or summarise and interpret existing data. Students have to develop a research plan and apply advanced and novel techniques in the context of a given research project, adhering to the principles of good scientific practice. The results are summarised in a written thesis and defended in a colloquium. The project is to be completed within a time frame of six months.

**Intended learning outcomes**

Students are able to independently carry out scientific experiments and to modify them according to the outcome. They are able to independently approach current scientific topics and to perform, interpret and document experiments, adhering to accepted rules of scientific practice. Students are able to discuss and defend their work in the scientific community, drawing on their knowledge of similar or related topics.

**Courses**

No courses assigned to module

Module taught in: German and/or English

**Method of assessment**

written thesis

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

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<table>
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### Contents
Verification of thesis content through oral examination. Total length should not exceed 45 minutes (30 minutes plus 15 minutes of questions pertaining to the thesis as well as related subjects).

### Intended learning outcomes
Students are able to discuss and defend their work in the scientific community, drawing on their knowledge of similar or related topics.

### Courses (type, number of weekly contact hours, language — if other than German)
K (0)
Module taught in: German and/or English

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Final colloquium (approx. 45 minutes)
comprising: talk on thesis (30 minutes) and subsequent defence of thesis (15 minutes); defence usually public
Language of assessment: German and/or English

### Allocation of places
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### Additional information
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### Referred to in LPO I (examination regulations for teaching-degree programmes)
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