Excerpt from Module Descriptions

Bachelor of Science Computer Science

Examination Regulations in the Version of: 2017

Sub-Section: Applied Subject Biology
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Applied Subject Biology

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## Basics in Biology

Modules referring to Compulsory Elective Modules I Applied Subject Biology

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Basis for

No English version available yet.
## Basics of Biology for Non-Biologists

Modules referring to Compulsory Elective Modules I Applied Subject Biology

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<td>Coordinator</td>
<td>The Dean of Studies of Biology</td>
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<td>Instructor(s)</td>
<td>Prof. Dr. Manfred Ayasse, apl. Prof. Dr. Stefan Binder, Prof. Dr. Bernhard Eikmanns, Dr. Jürgen Hoppe, Prof. Dr. Harald Wolf</td>
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### Allocation of study programmes

- Computer Science, B.Sc, PO2010
- Computer Science, B.Sc, PO2013
- Mathematics, B.Sc, PO2006
- Mathematics, B.Sc, PO2013
- Psychology, B.Sc, PO2011
- Chemistry, M.Sc, PO2013
- Computer Science, M.Sc, PO2010
- Computer Science, M.Sc, PO2013
- Mathematics, M.Sc, PO2013

### Recommended prerequisites

None

### Learning objectives

Students who have successfully completed this module

- possess substantiated factual knowledge in the areas of cell biology and (choice-dependent) general botany or general zoology concerning anatomy, metabolism, reproduction and evolution of organisms.
- are familiar with the theoretical fundamentals of two disciplines in biology named above.
- achieved comprehension for the mutual determination of form and function in an organism.

### Syllabus

This module covers the following subject-specific contents:

- Cell biology: Substance-based elements of the cell; organelles and compartmentalization; localization and meaning of metabolic processes and
other cellular processes; cell contacts and interactions; prokaryotes and eukaryotes; unicellularity and multicellularity; evolution of the cell. In addition: cellular aspects of microbiology and important methods of cell biology research.

- Botany: The lecture communicates basic knowledge in plant cell biology, plant anatomy, plant reproduction and an introduction to the feature of plant metabolism and the involved anatomical adaptations. Theoretical knowledge in plant anatomy from the lecture is supplemented and advanced by microscopic observations in the exercises.
- Zoology: Overview about body shapes, anatomies and structures and functional aspects by selected animal phyla from protists up to the vertebrates. Methods of animal preparation.

**Literature**

**Cell biology:**
- Stryer: Biochemie. Spektrum Akademischer Verlag, Heidelberg.
- Hirsch-Kauffmann, Schweiger: Biologie für Mediziner, Pharmazeuten und Chemiker, Thiemе Verlag, Stuttgart (neueste Auflage)

**Botany:**

**Zoology:**
- Wehner, R.; Gehring, W.: Zoologie, Thiemе Verlag (neueste Auflage).
- Campbell: Biologie, Spektrum Verlag, Heidelberg (neueste Auflage).

**Teaching and learning methods**

**Compulsory:**
- Cell Biology [Zellbiologie] (lecture), 1 credit hour [SWS], 2 credit points [LP]

**Elective (one of the lectures):**
- General Botanics [Allgemeine Botanik] (lecture), 2 credit hours [SWS], 4 credit points [LP]
- General Zoology [Allgemeine Zoologie] (lecture), 2 credit hours [SWS], 4 credit points [LP]

**Workload**

Attendance: 45 h  
Private study: 135 h  
Sum: 180 h

**Assessment**

The grade of the module will be the grade of the written exam. No prerequisites are necessary for exam registration

**Grading procedure**

The grade of the module will be the grade of the exam.

**Basis for**

Further modules in biology
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### Developmental Biology and Genetics for Non-Biologists

Modules referring to Compulsory Elective Modules II Applied Subject Biology

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<td>Cycle</td>
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<tr>
<td>Coordinator</td>
<td>Prof. Dr. Nils Johnsson</td>
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<td>Instructor(s)</td>
<td>Prof. Dr. Axel Brennicke, Prof. Dr. Nils Johnsson, Prof. Dr. Jan Tuckermann</td>
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#### Allocation of study programmes
- Computer Science BSc, application subject Biology;
- Computer Science MSc, application subject Biology;
- Mathematics BSc (subsidiary subject Biology);
- Mathematics MSc (subsidiary subject Biology);
- Psychology BSc, compulsory elective module

#### Recommended prerequisites
- Formally: Refer to the subject-specific examination regulations of the respective study course, in the version effective when taking up the study program.
- Contentually: None.

#### Learning objectives
Students who have successfully completed this module
- possess knowledge about fundamental processes (gene expressions, tissue- and organ differentiation) during ontogenesis of an organism.
- are familiar with the basics of classic and molecular genetics.

#### Syllabus
This module covers the following subject-specific contents:

**Lecture Developmental Biology:**
- Unicellularity – multicellularity
- Ovum and sperm, fertilization, cleavage, gastrulation, induction, differential gene expression, tissue formation, organogenesis, cell-cell identification
- Early embryonic development of C. elegans, urchin, newt and Drosophila
- Postembryonic development, metamorphosis, regeneration, age

**Lecture Genetics:**
• Molecular structure and construction of genetic information in prokaryotes and eukaryotes
• Transcription, translation, recombination, mutation, repair mechanisms
• Formal genetics
• Population genetics

**Literature**
- S.F. Gilbert: Developmental Biology, Sinauer Associates
- L. Wolpert: Entwicklungsbiologie, Spektrum Verlag

**Teaching and learning methods**
- Developmental Biology [Entwicklungsbiologie] (lecture), 2 credit hours [SWS], 3 credit points [LP]
- Genetics [Genetik] (lecture), 2 credit hours [SWS], 3 credit points [LP]

**Workload**
- Attendance: 60 h
- Private study: 120 h
- Sum: 180 h

**Assessment**
Credit points will be received by pass of written or oral (part) exams. The type of exams depends on the number of participants. Registration for these exams does not require evidence of course achievement.

**Grading procedure**
The grade is determined by the results of both module part exams, weighted according to the respective credit points.

**Basis for**
Further modules in biology
Genetic for Non-Biologists
Modules referring to Compulsory Elective Modules II Applied Subject Biology

Code 8207971764

ECTS credits 6

Attendance time 3

Language of instruction German

Duration 1

Cycle each Winter Semester

Coordinator Prof. Dr. Nils Johnsson

Instructor(s) Dr. Alexander Dünkler, Prof. Dr. Nils Johnsson

Allocation of study programmes
Computer Science BSc, application subject Biology;
Computer Science MSc, application subject Biology;
Mathematics BSc (subsidiary subject Biology);
Mathematics MSc (subsidiary subject Biology)

Recommended prerequisites
Formally: Refer to the subject-specific examination regulations of the respective study course, in the version effective when taking up the study program.

Contentually: Module Basics of Biology for Non-Biologists [Grundlagen der Biologie für Nicht-Biologen].

Learning objectives
Students who have successfully completed this module

• are familiar with the basics of classic and molecular genetics.
• master fundamental methods of genetic analyses.

Syllabus
This module covers the following subject-specific contents:

Lecture Genetics:

• Molecular structure and construction of genetic information in prokaryotes and eukaryotes
• Transcription, translation, recombination, mutation, repair mechanisms
• Formal genetics
• Population genetics

Basic Exercises in Genetics:
• Methods of classic and molecular genetics
• Organization of safety and health protection in the lab; introduction to essential safety aspects and protective measures for working in the lab

**Literature**

• Griffiths, Wessler, Lewontin, Caroll: Introduction to Genetic Analysis. Freemann 2008

**Teaching and learning methods**

• Genetics [Genetik] (lecture), 2 credit hours [SWS], 3 credit points [LP]
• Basic Exercises in Genetics [Genetische Grundübungen] (exercise), 2 credit hours [SWS], 3 credit points [LP]

**Workload**

| Attendance: 60 h |
| Private study: 120 h |
| Sum: 180 h |

**Assessment**

Oral or written exam

**Grading procedure**

The grade is determined from the result of the exam; non-biologists receive 3 credit points from the exercise.

**Basis for**

Further modules in biology
# Methods of Neuroscience for Non-Biologists

Modules referring to Compulsory Elective Modules II Applied Subject Biology

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<td>Instructor(s)</td>
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<td>Recommended prerequisites</td>
<td>Formally: Refer to the subject-specific examination regulations of the respective study course, in the version effective when taking up the study program. Contentually: Animal Physiology for Computer Science and Mathematics [Tierphysiologie für Informatik und Mathematik].</td>
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| Learning objectives | Students who have successfully completed this module  
  • have solid knowledge of the classic and molecular bases of neurobiology.  
  • can apply basic analytical techniques to examine physiological processes in animals.  
  • can work in a team and are able to present their results in a protocol (lab journal). |
| Syllabus      | This module covers the following subject-specific contents:  
  • Simulation of neuronal activity (simulation environment madSim), experiments in electromyography and neurography, simple neuronal coordinations and reflexes, sensory mechanisms und processing, psychoacoustics; all aspects are examined in humans, electric fish, stick insects and earthworms; legal regulations for animal experiments in the lab |
Literature
- Faller: Der Körper des Menschen (Thieme Verlag), 2008
- Gerthsen, Kneser, Vogel: Physik (Springer Verlag), 2001
- Schmidt, Thews: Physiologie des Menschen (Springer Verlag), 2005
- Schmidt: Neuro- und Sinnesphysiologie, Heidelberger Taschenbücher (Springer Verlag), 1998
- Wehner, Gehring: Zoologie (Thieme Verlag), 2007

Teaching and learning methods
- Neurobiology [Neurobiologie] (exercise+tutorial), 4+1 credit hours [SWS], 5+1 credit points [LP]

Workload
- Attendance: 75 h
- Private study: 105 h
- Sum: 180 h

Assessment
- Attested reports as prerequisite for an oral exam

Grading procedure
- The module grade is determined from the result of the oral exam.

Basis for
- Further modules in biology
Ecology for Non-Biologists
Modules referring to Compulsory Elective Modules II Applied Subject Biology

Code 8207975036

ECTS credits 6

Attendance time 4

Language of instruction No English version available yet

Duration 1

Cycle each Summer Semester

Coordinator No English version available yet

Instructor(s) No English version available yet

Allocation of study programmes No English version available yet

Recommended prerequisites No English version available yet

Learning objectives No English version available yet

Syllabus No English version available yet

Literature No English version available yet

Teaching and learning methods No English version available yet

Workload No English version available yet

Assessment The credit points will be awarded once the written exam has been passed. No prerequisites are necessary for exam registration.

Grading procedure The grade of the module will be the grade of the exam.
Basis for

No English version available yet
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<tr>
<td><strong>Instructor(s)</strong></td>
<td>Prof. Dr. Harald Wolf, Dr. Tamás Röszer, Prof. Dr. Maja Vujic</td>
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**Allocation of study programmes**
- Computer Science BSc, application subject Biology;
- Computer Science MSc, application subject Biology;
- Mathematics BSc (subsidiary subject Biology);
- Mathematics MSc (subsidiary subject Biology)

**Recommended prerequisites**
- Formally: Refer to the subject-specific examination regulations of the respective study course, in the version effective when taking up the study program.
- Contentually: Module Basics in Biology for Computer Science and Mathematics [Grundlagen der Biologie für Informatik und Mathematik].

**Learning objectives**
- Students who have successfully completed this module
  - have good knowledge of neuro-, sensory-, muscle and metabolic physiology, including endocrinology and immune defense.
  - have good knowledge concerning circulation, respiration, osmoregulation and excretion, homeostasis, temperature regulation, defense mechanisms (immune system) and hormones.
  - know the structure and function of important cell types in the muscular and nervous system.
  - have well-founded basic knowledge of important sensory systems, the sensory and motor control by the nervous system, the function of muscles and other effector organs.
  - have basic knowledge of the developing processes in the nervous system.
  - are confident with the muscle and nervous system in vertebrates and selected invertebrates.
**Syllabus**

This module covers the following subject-specific contents:

- Structure of nerve cell and glia, function of cell types
- Structure of the nervous system, network concept, brain
- Development of nervous system and cell junctions
- Bases of (nerve) cell function: membrane potential, action potential, synaptic transmission
- Major sensory systems and their functional bases: olfaction, mechanosensory properties including hearing, visual systems
- Muscle cell and musculature, motor control and control circuits (closed loop)
- Basic principles and metabolic processes of respiration, excretion, osmoregulation, ion regulation, muscle biochemistry, digestion, thermoregulation
- Homeostasis
- Defense mechanisms (immune system), hormones

**Literature**

- Wehner, R., Gehring, W.: Zoologie, Stuttgart, Thieme-Verlag
- Eckert, R., Randall, D.: Tierphysiologie, Stuttgart, Thieme-Verlag
- Murphy, K.: Immunobiology

**Teaching and learning methods**

- Animal Physiology [Tierphysiologie] (lecture), 4 credit hours [SWS], 6 credit points [LP] (two contentual parts, each 3 credit points: metabolic physiology, neurobiology)

**Workload**

- Attendance: 60 h
- Private study: 120 h
- Sum: 180 h

**Assessment**

Two examination alternatives: Either two written module part exams about the two lecture parts, or an oral exam about the entire lecture.

**Grading procedure**

The grade is determined from the results of the written module part exams, weighed by credit points, or it is determined from the result of the oral module exam.

**Basis for**

Further modules in biology
### Environment Ecology

Modules referring to Compulsory Elective Modules II Applied Subject Biology

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