

Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

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Code	K-1-EIB	1st – 4th sem.	6 CP
Course	Introduction to Biology Studies and Studies Management		
Faculty/Subject/Department	08/Biology/All institutes in the field of biology		
Module coordinator	Dean of Studies		
Lecturers	University teachers in Faculty 8		
Guidance	Cf. German version		
Classification	BSc (Biol) core curriculum and in-depth phase, 1 st semester-4 th semester		
Prerequisites	-		
Intake capacity	Small groups/lecturer		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • be able to deal with the ethical and practical problems of studies in biology • be able to examine their motivation for undertaking studies in biology and independently shape their personal and professional development • master instruments of time management, self-organisation and decision-making with respect to the planning and organisation of their studies • be able to work in a team-oriented manner by means of training in mentor groups • be able to use the methodological and conceptual principles of scientific information management in a targeted manner 		
Module content	<ul style="list-style-type: none"> • Learning and teaching methods in the course of studies • Methodology and ethics of scientific work, communication and presentation • demand-oriented interdisciplinary basics for the studies of Biology • Professional fields and perspectives for biologists • Methods for self-management and targeted work • Information management • Personal and professional development (mentoring) 		
Form(s) of instruction	Lectures (33%), seminars (67%)		
Total workload	180 hours = 6 ECTS credits		
Student workload	Attendance: Lectures 30 hours, Seminars (mentors) 60 hours	Preparation/revision: 90 hours	
Method of assessment	Class attendance requirements adhere to special and general regulations on assessment		
Module grading	No grading; module is passed if minimum attendance is fulfilled		
Form of module component retake exam	None		
Form of retake exam	None		
Frequency Duration in semesters	Every semester; 4 semesters; Winter + Summer semester		
Intake Capacity	145		
Language of instruction	German		

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Code	K-1-ALB	1 st sem.	6 CP
Course	General Biology		
Faculty/Subject/Department	08/Biology/Institute for General Zoology and Systematics		
Module coordinator	Cf. German version		
Classification	BSc(Biol), core curriculum, 1 st semester		
Prerequisites	-		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • obtain insight into the different basic forms and levels of organisation of organisms • have in-depth knowledge of cellular and subcellular components (biomolecules) • know the structural differences between prokaryotic and eukaryotic cells • understand cellular evolution by handling endosymbionts • have an in-depth knowledge of the cellular organelles in plant and animal cells • understand tissue structure and function • know techniques for light and electron microscopy and their resolution • be able to use a light microscope correctly in biological analyses • be able to use key characteristics of organisms for a simple phylogenetic analysis • be able to interpret data about organisms and present it in writing and orally • master the hypothetical-deductive concept and be able to interpret results correctly 		
Module content	<ul style="list-style-type: none"> • Introduction to the basics of biology • Introduction to microscopic analysis • Cell division • Cell structure of prokaryotes and eukaryotes • Description of cell types and organelles • Histology • Evolution of animal and plant forms • Presentation of animal and plant groups, palaeobotany and palaeozoology 		
Form(s) of instruction	Lectures (41%), laboratory (34%), group work/tutorials (17%), excursions (8%)		
Student workload	Attendance: Lectures 31 hours, Laboratory 24 hours, Group work/tutorials 6 hours, Excursions 7 hours	Preparation/revision: Lectures 43 hours, Laboratory 37 hours, Group work/tutorials 25 hours, Excursions 7 hours	
Total workload + Credits	180 hours = 6 Credits		
Method of assessment	Report (100%)		
Module grading	No grading; module is passed if minimum attendance is fulfilled		
Form of module component retake exam	None		
Form of retake exam	Report (100%)		
Intake capacity	145		
Language of instruction	German		
Frequency	44 weeks block in the winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	K-1-BOT	1 st sem.	6 CP
Course	General Botany		
Faculty/Subject/Department	08/Biology/Institute for Botany		
Module coordinator	Cf. German Version		
Classification	BSc(Biol), core curriculum, 1 st semester		
Prerequisites	None		
Intake capacity	145		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • know the principles of taxonomy/systematics and the principles of classification of the plant kingdom • have an overview of the classification and morphology of plant organisms • understand the relationship between selection pressure, evolution and diversity • have knowledge of the life cycle of plant organisms • know the evolutionary development of embryophytes with respect to photosynthesis, long-distance transport, consolidation, reproduction, ion uptake and traction • know the cell types of spermatophytes, particularly of the angiosperms • know the functions of each type of cell in an organism-related and physiological context • know the fundamental relationships between anatomy and function in angiosperms • obtain experience in the presentation of their observations in oral and written form 		
Module content	<ul style="list-style-type: none"> • Structure, classification and biology of fungi, protists, mosses, ferns, gymnosperms and angiosperms • Anatomy and morphology of spermatophytes • Cell wall, cell functions, seed germination, seedling, root, stele, parenchyma, collenchymas, sclerenchyma, primary meristem and apical growth, primary stem structure, secondary stem structure, leaf, phloem, stomata, flower, fertilisation, development of seeds and fruit in spermatophytes • Plant/fungi and algae/fungi symbiosis (mycorrhiza, lichens) • Relationships between structure and function in higher plants (principles of seed germination, geotropism, mineral uptake, xylem/phloem transport, photosynthesis, functions of stomata) • Interactions between light and photosynthesis, location and leaf structure • Further development of sexual reproduction and alternation of generations 		
Form(s) of instruction	Lectures (51%), exercise (49%)		
Total workload	180 hours = 6 Credits		
Student workload	Contact time Lectures 32 hours, Tutorial 32 hours,	Preparation/revision: Lectures 60 hours, Tutorial 56 hours	
Method of assessment	Exam (120 min.), reports		
Module grading	Exam (70 %), reports (30 %)		
Form of module component retake exam	None		
Form of retake exam	Oral exam (100 %)		
Language of instruction	German		
Frequency	Annually, 44 weeks block in the winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	K-1-GEN	1 st sem.	6 CP
Course	Genetics		
Faculty/Subject/Department	08/Biology/Institute for Genetics		
Module coordinator	Cf. German version		
Classification	BSc(Biol), core curriculum, 1 st semester		
Prerequisites	-		
Intake capacity	145		
Learning outcomes	<p>Students will</p> <ul style="list-style-type: none"> • have a basic knowledge of the mechanisms of heredity • have the ability to interpret family trees and calculate the probability of occurrence of a given genotype • be able to determine the order of genes from recombination frequencies • have a basic knowledge of the use of fundamental gene technologies • be able to specify important differences in molecular genetic processes in prokaryotes and eukaryotes <ul style="list-style-type: none"> • have knowledge of the genome structure in prokaryotes and eukaryotes • have knowledge of the structure of chromosomes and of of chromatin • have knowledge of cell cycle regulation • have knowledge of mutation events • have knowledge of the basic regulatory mechanisms during development • have knowledge of the basic regulatory mechanisms for antibody assembly • have a basic knowledge of gene defects in tumour development 		
Module content	<ul style="list-style-type: none"> • Mechanisms of heredity (cytogenetics) • Mechanisms of heredity (formal genetics) • Basic techniques of genetics • Fundamental structure of the genome in prokaryotes and eukaryotes • Structure of chromosomes and chromatin • Basic mechanisms of gene regulation in prokaryotes and eukaryotes • Regulation of the cell cycle • Gene alterations by mutation • Epigenetic mechanisms • Developmental genetics illustrated by genetic model systems • Genetic mechanisms causing antibody diversity • <u>Gene defects in tumour development</u> 		
Form(s) of instruction	Lectures (50%), laboratory (50%)		
Total workload	180 hours = 6 credits		
Student workload	Attendance: Lectures 29 hours, Laboratory 30 hours, Exam 1 hour	Preparation/revision: Lectures 30 hours, Laboratory 60 hours, Exam Preparation: 30	
Method of assessment	Exam (60 min)		
Module grading	Exam (100 %)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %)		
Language of instruction	German		
Frequency	Annually, 44 weeks block in the winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	K-1-CHV	1 st sem.	6 CP
Course	Chemistry 1		
Faculty/Subject/Department	08/ Biology/Institute for Chemistry		
Module coordinators	Cf. German version		
Classification	BSc (Biol), core curriculum, 1, semester		
Prerequisites	-		
Intake capacity	145		
Learning outcomes	<p>Students will</p> <ul style="list-style-type: none"> • master the basic concepts of chemistry, such as: the periodic system, formulae, units, stoichiometric calculation • understand the basic principles of inorganic (acids and bases, redox) and organic (functional groups) chemistry • have an overview of the material properties of elements and compounds, especially important main group elements • understand the basic principles of organic chemistry (functional groups, reactivity, nomenclature) • have basic knowledge of the most important chemical reactions in inorganic and organic chemistry 		
Module content	<ul style="list-style-type: none"> • Atomic and molecular structure, periodic system, elements in nature, introduction to selected s- and p-block elements, chemical bonds, reaction equations, stoichiometry • Properties of materials, solutions, mixtures, osmosis • Acid-base reaction, buffer systems, pH value • Redox reactions, redox potential, electrochemistry • Chemical equilibrium/thermodynamics/catalysis • Basic principles of spectroscopy • Organic molecules • Chemistry of functional groups and their fundamental reaction mechanisms, alkanes, alkenes, alkynes, ethers, aldehydes and ketones, carbonic acids and their derivatives, aromatic compounds, structures of selected natural substances (sugars, peptides, alkaloids, prostaglandins, nucleotides, steroids, vitamins) • Mechanisms of organic chemical reactions, basic principles of stereochemistry 		
Form(s) of instruction	Lectures (70%), tutorial (30%)		
Total workload	180 hours = 6 credits		
Student workload	Attendance: Lectures 60 hours, Tutorial 12 hours, Exam 2 hours	Preparation/revision: Lectures 60 hours, Tutorial 24 hours, Exam 22 hours	
Method of assessment	Exam (120 hours)		
Module grading	Exam (100%)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %)		
Language of instruction	German		
Frequency	Annually, 1 semester during term, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	K-1-CHP	1 st sem.	6 CP
Course	Chemistry 2		
Faculty/Subject/Department	08/Chemistry/Institute for Inorganic and Analytical Chemistry		
Module coordinator	Cf. German version		
Classification	BSc (Biol), core curriculum		
Prerequisites	Final exam for K-1-CHV (with at least 20% of the maximum score)		
Intake capacity	145		
Learning outcomes	<p>Students will</p> <ul style="list-style-type: none"> • have basic knowledge of chemistry in theory and practice • have basic skills in laboratory methods for wet chemistry • be proficient in the safe handling of chemicals • be capable of describing scientific observations in formal contexts • be able to perform basic chemical calculations • be capable of recognising the interdisciplinary relationships between chemistry and biology 		
Module content	<ul style="list-style-type: none"> • Acid-base reaction, buffer systems, pH value • Properties of materials, solutions, mixtures • Redox reactions, redox potential, electrochemistry • Chemical equilibrium/catalysis/reaction kinetics • Inorganic and organic assay reactions • Qualitative determination of inorganic and organic compounds • Basic reactions of classes of organic substances • Spatial structure of organic molecules, stereochemistry • Mechanisms of organic chemical reactions • <u>Important natural substances (carbohydrates, proteins and peptides, lipids)</u> 		
Form(s) of instruction	Laboratory (40%), tutorial (30%), seminars (20%)		
Total workload	180 hours = 6 credits		
Student workload	<p>Attendance:</p> <p>Laboratory 42 hours, Tutorial 28 hours, Seminars 14 hours, Exam 2 hours</p>	<p>Preparation/revision:</p> <p>Laboratory 22 hours, Tutorial 21 hours, Seminars 21 hours Exam 30</p>	
Prerequisites	All reports accepted		
Method of assessment	Exam (120 min)		
Module grading	Exam (120 min)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %)		
Language of instruction	German		
Frequency	Annually, 44 weeks block, winter semester		

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Code	K-2-BCM	2 nd sem.	6 CP
Course	Biochemistry/ Molecular Biology		
Faculty/Subject/Department	08/ Biology/Institute for Biochemistry		
Module coordinator	Cf. German version		
Classification	BSc(Biol), core curriculum, 2 nd semester		
Prerequisites	1 st semester		
Intake capacity	120		
Learning outcomes	<p>Students should:</p> <ul style="list-style-type: none"> be familiar with the important classes of substances (amino acids, proteins, carbohydrates, lipids, nucleic acids), their biochemical structure, properties and functions be familiar with the biosynthesis of biologically important macromolecules, learn to understand the main aspects of metabolism learn about important methods in biochemistry in theory and be able to implement them in practice (enzyme kinetics, chromatography, centrifugation, PCR) <p>Students will:</p> <ul style="list-style-type: none"> acquire a deeper knowledge of the systems of replication, transcription and translation learn details of the mechanisms of replication, transcription and translation in prokaryotes and eukaryotes become familiar with repair, recombination, RNA processing, protein folding and modification gain an overview of the procedures and results of comparative genome analysis (genomics) and gene expression analysis using microchip technologies and proteomics 		
Module content	<ul style="list-style-type: none"> Structure and properties of: <ul style="list-style-type: none"> amino acids, peptides and proteins sugars, oligosaccharides and polysaccharides fatty acids, neutral fats and phospholipids nucleotide bases, nucleotides and nucleic acids Principles of enzymatic catalysis Biosynthesis of proteins and nucleic acids Basics of metabolism and its regulation Biochemical methods (enzyme kinetics, gel electrophoresis for separation of proteins and nucleic acids, gel filtration, ion-exchange and affinity chromatography, electrophoresis, centrifugation, PCR): introduction to their theoretical basis and experimental use DNA replication in prokaryotes (bacteriophages) and eukaryotes (viruses); course of replication, involvement of various factors Function of various DNA polymerases in prokaryotes and eukaryotes DNA repair DNA recombination Transcription in prokaryotes and eukaryotes: course of transcription, functions of various RNA polymerases in eukaryotes RNA processing in prokaryotes and eukaryotes, structure of mRNA, RNA silencing Protein biosynthesis in prokaryotes and eukaryotes, participation of various factors, protein folding; post-translational modifications microchip technologies (oligonucleotide arrays, mutations and SNP analysis, expression profiling), proteome analysis 		
Form(s) of instruction	Lectures (47%), laboratory (17%), tutorials (36%)		
Total workload	180 hours = 6 ECTS Credits		
Student workload	Attendance: Lectures 30 hours, Laboratory 16 hours, Tutorials 20 hours, Exam 2 x 60 min	Preparation/revision: Lectures 54 hours, Laboratory 15 hours, Exam 45 hours	
Method of assessment	2 exams (60 min each)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %)		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	K-2-BEX	2 nd sem.	6 CP
Course	Identification Exercises and Excursions		
Faculty/Subject/Department	08/Biology/		
Module coordinator	Cf. German version		
Classification	BSc(Biol), core curriculum, 2 nd semester		
Prerequisites	1 st semester BSc Biology		
Intake capacity	145		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • learn to recognise the most important groups of terrestrial and aquatic organisms • deepen their knowledge of plant and animal morphology obtained in the zoological and botanical modules • learn how to handle binary keys • deal with the biodiversity of organisms • develop and deepen their understanding of morphological, functional and ecological relationships with respect to specific examples • develop social skills and the ability to work in groups by collaborating with other students 		
Module content	<ul style="list-style-type: none"> • Identification of the most important animal and plant groups in the laboratory and in the wild at various taxonomical levels • Handling various tools for taxonomic and systematic work <ul style="list-style-type: none"> • Insight into topics related to the protection of nature and species 		
Form(s) of instruction	Lectures (34%), tutorial (36%), excursions (30%)		
Total workload	180 hours = 6 ECTS Credits		
Student workload	Attendance: Lectures 22 hours, Tutorial 30 hours, Excursions 30 hours, Exam 2 hours (60 min/branch)	Preparation/revision: Lectures 39 hours, Tutorial 35 hours, Excursions 24 hours, Exam 15 hours	
Method of assessment	2 exams (60 min each), worksheets		
Module grading	Exam 1 (35 %), exam 2 (35 %), worksheets (30 %)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %) or oral exam (100 %); method of assessment will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	K-2-MIB	2nd sem.	6 CP
Course	Microbiology		
Faculty/Subject/Department	08/Biology/Institute for Microbiology and Molecular Biology		
Module coordinator	Cf. German Version		
Classification	BSc(Biol), core curriculum, 2 nd semester		
Prerequisites	1 st semester BSc Biology		
Intake capacity	145		
Learning outcomes	<p>Students will obtain basic knowledge of the following areas of microbiology:</p> <ul style="list-style-type: none"> • structure of microorganisms • microbial cell physiology • bacterial genetics • physiology of bacterial growth • microbial evolution and systematic <p>Students will obtain an overview</p> <ul style="list-style-type: none"> • of the diversity of microorganisms and their living environments • of the diversity of microbial metabolic pathways and recognise the consequence for global biochemical cycles and biotechnology use <p>Students will:</p> <ul style="list-style-type: none"> • obtain theoretical and practical skills in the culture and enrichment of microorganisms as well as in the methods of taxonomic classification • be able to classify and evaluate the theoretical and methodological knowledge obtained and present it to their fellow students in an understandable manner in seminar talks 		
Module content	<ul style="list-style-type: none"> • Construction and structure of prokaryotic cells • Fundamentals of bacterial genetics • Basic principles of microbial metabolism • Growth physiology, regulation of bacterial growth • Overview of bacterial systematics and discussion of the most important Gram-positive and Gram-negative bacterial groups • Role of microorganisms in evolution • Overview of the Archaea domain • Overview of eukaryotic microorganisms • Practical handling of microorganisms: Practising basic sterile techniques • Methods for the propagation and culture of bacteria • Microscopic identification of microorganisms • Methods for quantifying microbial growth • Enrichment of microorganisms • Identification of microorganisms using physiological test reactions 		
Form(s) of instruction	Lectures (50 %), practical and theoretical exercises (50%)		
Total workload	180 hours = 6 ECTS Credits		
Student workload	Attendance: Lectures 30 hours, practical and theoretical exercises 40 hours,	Preparation/revision: Lectures 60 hours, Exercises/Review/Report 50 hours	
Method of assessment	Exam (60 min.); review/report		
Module grading	Exam (70%), Review/Report (30%)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %)		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	K-2-ZOO	2 nd sem.	6 CP
Course	Introduction to Animal Biology		
Faculty/Subject/Department	08/Biology/Institute for General Zoology and Systematics		
Module coordinator	Cf. German Version		
Classification	BSc(Biol), core curriculum, 2 nd semester		
Prerequisites	1 st semester, BSc Biology		
Intake capacity	120		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> gain a deeper insight into animal structure and function obtain knowledge about the origin, adaptation and functional morphology of animals have the capacity to apply basic zoological knowledge in an evolutionary, developmental biological, histological, animal physiological and animal ecological context recognise the specifics of animal structure and function compared to those of flora and microflora know the significance of various animal groups for humans (e.g. parasites, pollinators, food production) have skills in the preparation of animals as well as in the morphological classification and analysis of organ systems have a great respect for life and develop the ability to make ethical judgements know how to use biological and biomedical databases have a high cognitive competence (thinking in context, logical and abstract thought, conceptual thought) 		
Module content	<ul style="list-style-type: none"> Functional morphological preparation and analysis of animals and organ systems Analysis of phyla of the animal kingdom Development of important adaptive steps, such as the appearance of the Eumetazoa, bilateral symmetry, development of the coelom, deuterostomes and protostomes Basic techniques in zoology 		
Form(s) of instruction	Lectures (integrated part of the tutorial, 49%), tutorials (51%)		
Student workload	Attendance: Lectures 26 hours, Tutorial 44 hours, Exam 2 hours	Preparation/revision: Lectures 62 hours, Tutorial 48 hours	
Method of assessment	Exam (60 min.); report; exercises		
Module grading	Exam (60%), Report (20%), Tutorial assignments (20%)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %) or oral exam (100 %); method of assessment will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Code	A-3-ZEB	3 rd sem.	6 CP
Course	Cell Biology		
Faculty/Subject/Department	08/Biology		
Module coordinator:	Cf. German version		
Classification	BSc (Biol), in-depth phase, 3rd semester		
Prerequisites	Core curriculum		
Intake capacity	145		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> understand the cell as the basic unit of life recognise similarities and differences between prokaryotes and eukaryotes recognise cell organelles as the functional units of plant and animal cells and understand their function recognise the essential differences between plant and animal cells have an overview of the development and diversity of plant and animal cell types know the basic principles of the energy balance of the cell understand the mechanisms of communication between cells and within cell clusters or organs/tissues know the mechanisms of cell division, the cell cycle and cell death understand the defence mechanisms of single-cell and multicellular organisms against pathogens learn how to approach questions of cell biology by means of various experimental methods practice the processing, representation, critical interpretation and presentation of raw data collected by themselves from experiments in cell biology 		
Module content	<ul style="list-style-type: none"> (recapitulation of "core" knowledge from the module General Biology (1st semester): prokaryotes, eukaryotes, unicellular, multicellular) Division of labour in the cell: organelles in animal and plant cells Membranes as a way to create potential differences and concentration gradients (energy recovery, pumps, channels, transporters) Fundamentals of photosynthesis and respiration Compartmentalisation and transport processes (membranes, vesicles, exocytosis and endocytosis) Cytoskeleton for transport and internal strengthening of the cell Protein biosynthesis (ribosomes, ER, Golgi, trans-Golgi) cell cycle, cell division, cell death Membranes as barriers to the exterior and as sites of contact with neighbouring cells (intra/extracellular communication, signal transduction, matrix-cell interaction) Cell motility (single cells), cell mobility (cells in association) and intercellular matrix Defence mechanisms of cells and organisms in the plant and animal kingdoms Methods of cell biology; introduction to their theoretical principles and experimental implementation, as well as guidance on scientific data presentation 		
Form(s) of instruction	Lectures (51%), laboratory (49%)		
Total workload	180 hours = 6 ECTS-Credits		
Student workload	Attendance: Lectures 31 hours, Laboratory 35 hours, Exam 1 hour	Preparation/revision: Lectures 60 hours, Preparation of a review/report 54 hours	
Method of assessment	Exam (60 min.); review/report		
Module grading	Exam (50%), review/report (50%)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %)		
Language of instruction	German		
Frequency	Annually; 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	A-3-PPH	3 rd sem.	6 CP
Course	Plant Physiology		
Faculty/Subject/Department	08/Biology/Plant Physiology		
Module coordinator	Hughes		
Lecturers	Hughes, N.N., Zeidler		
Guidance	Forreiter		
Classification	BSc(Biol), in-depth phase, obligatory		
Prerequisites	Core curriculum		
Intake capacity	144		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have an overview of the physiology of higher plants • have knowledge of photosynthetic energy production and use • have an overview of important metabolic pathways and of the significance of compartmentalisation in plant cells • have an overview of the uptake, transport and fixation of C, N, S and P in plants • have an overview of osmotic phenomena and membrane physiology at the molecular level • have knowledge of the transport physiology of plants and understand the problems of water balance in land plants • have knowledge of phytohormones and regulatory mechanisms in plant development • understand the adaptation strategies of plants in response to changing environmental conditions • know the current status of plant genetic engineering and be able to discuss the related possibilities and risks competently. • have the ability to perform experiments in plant physiology collectively, present the results in an understandable manner and interpret them 		
Module content	<ul style="list-style-type: none"> • Plant cells (compartments and their functions) • Biomembrane systems, osmotic potential, turgor • Molecular channels, pumps and transporters, • Water balance, xylem transport, guard cells, gas exchanges • Phloem transport, pressure flow theory • Light reactions in photosynthesis: absorption and transfer of photons, reaction centres, splitting of water molecules and electron transport, production of ATP and NADPH • Carbon fixation and metabolism: Calvin cycle, photorespiration, C4 and CAM plants; carbohydrates • Uptake, transport, reduction and metabolism of nitrogen, sulphur and phosphorus • Respiration and catabolism, lipid metabolism • Developmental biology, phytohormones, photomorphogenesis, induction of flowering • Perception of and reaction to external stimuli • Adaptation and stress • Genetically altered plants 		
Form(s) of instruction	Lectures (55%), seminars (10%), laboratory work in small groups (35%)		
Total workload	180 hours = 6 ECTS-Credits		
Student workload	Attendance: Lectures 20 hours, Seminars/tutorials 8 hours, Laboratory 25 hours, Final exam 2 hours	Preparation/revision: Lectures 80 hours, Seminars 10 hours, Laboratory 37 hours	
Method of assessment	Exam (120 min.); exercises		
Module grading	Exam (50%), exercises (50%)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %)		
Language of instruction	German		
Frequency	Annually; 4 weeks block; winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	A-3-TPH		
Course	Introduction to Animal Physiology	3 rd sem.	6 CP
Faculty/Subject/Department	08/ Biology/Institute for Animal Physiology		
Module coordinator:	Cf. German version		
Classification	BSc(Biol), in-depth phase, 3rd semester		
Prerequisites	Core curriculum		
Intake capacity	145		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have a basic knowledge of comparative animal physiology. • have the ability to categorise and understand relevant issues in this field. • know the functions of selected organ systems in humans and animals. • have the ability to use, with discernment, important procedures for measurement and data capture. • know how to treat the raw data from an experiment and communicate the results to others in the form of a report. 		
Module content	<p>Lectures: Fundamentals of Animal Physiology (vegetative physiology, neurophysiology, sensory physiology, behaviour).</p> <p>Tutorial:</p> <ul style="list-style-type: none"> • Recording relevant respiratory parameters in land-based and aquatic animals. • Excretion and osmoregulation. • Biological membranes and compartments; resting potential; transport systems • Nerve conduction; refractory period, conduction velocity. • Functions of the vertebrate heart; influence of the autonomic nervous system and temperature • Physiology of hearing; physical principle, middle ear, inner ear; acoustic orientation in space • Light perception in vertebrates and invertebrates 		
Form(s) of instruction	Lectures (48%), tutorial in small groups (39%), colloquia (10%), exam (3%)		
Student workload	Attendance: Lectures 36 hours, Tutorial 28 hours, Seminar 7 hours,	Preparation/revision: Lectures 51 hours, Tutorial 55 hours Seminar 14 hours	
Total workload	180 hours = 6 ECTS credits		
Exam Prerequisites	Report passed		
Method of assessment	Exam (120 min.), exercises		
Module grading	Exam (70 %); Exercises (30 %)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %) or oral exam (100 %); method of assessment will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	A-3-MAS	3 rd sem.	6 CP
Course	Mathematics and Statistics for BBiolBiologists		
Faculty/Subject/Department	08/Biology/		
Module coordinator	Cf. German version		
Classification	BSc(Biol), in-depth phase, 3rd semester		
Prerequisites	Core curriculum		
Intake capacity	145		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> understand the main features of mathematical notation and algebra know the basic forms of important functions and be able to adapt them to data sets know simple procedures for mathematical modelling know important procedures for multivariate statistics and be able to apply them to biological data be able to perform extensive spreadsheet calculations on a PC 		
Module content	<ul style="list-style-type: none"> Adaptation of functions to measurement data Solving simple differential equations Modelling of biological processes Random numbers, probabilities, distributions, approximations Fundamental univariate and multivariate statistical tests Planning of experiments and important forms of experimental design Use of PC software (Excel and Statistica) 		
Form(s) of instruction	Lectures (78%), tutorial (22%)		
Total workload	180 hours = 6 ECTS credits		
Student workload	Attendance: Lectures/homeworks 30 hours, Tutorial 40 hours	Preparation/revision: Lectures/homework 110 hours	
Method of assessment	Exam (120 min.); exercises		
Module grading	Exam (70%), exercises (30%)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %) or oral exam (100 %); method of assessment will be announced at the beginning of the module		
Frequency	Annually; 2x2 weeks block, winter semester		
Language of instruction	German		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	A-3-PHY		
Course	Fundamentals of Physics for Biologists	2 nd /3 rd sem.	6 CP
Faculty/Subject/Department	FB08/Biology & FB07/Physics		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, 3rd semester		
Prerequisites	Core curriculum		
Intake capacity	145		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have knowledge of basic physical parameters, laws and methods • understand how to handle simple physical problems using mathematical methods • understand the physical principles of measurement methods used in biology • master the safe use of physical equipment, electricity and ionising radiation • master the construction and conduct of simple physical experiments • understand how to present measured results in graphs and interpret them 		
Module content	<p>Lectures on the</p> <ul style="list-style-type: none"> • Principles of mechanics, acoustics, thermodynamics, optics, electricity and magnetism Structure of matter, radiation and its interaction with matter • States of matter, solutions, osmotic pressure, hydrostatics of liquids and gases, gas mixtures, diffusion • Energy and entropy <p>Tutorial with a choice of simple experiments on:</p> <ul style="list-style-type: none"> • Mechanics, acoustics, thermodynamics, optics, electrodynamics, radiation, ionising radiation and its interaction with matter, states of matter, solutions, osmotic pressure, hydrostatics of liquids and gases, gas mixtures, diffusion, energy and entropy 		
Form(s) of instruction	Lectures (50%), laboratory (50%)		
Total workload	180 hours = 6 ECTS Credits		
Student workload	Attendance: Lectures 46 hours, Exam 1 hour, Attendance Laboratory 31hours	Preparation/revision of lectures: 44 hours in total. Preparation/revision: Reports 59 hours	
Exam prerequisites	successful performance of and reporting on experiments)		
Method of assessment	2 exams (60 min. each)		
Module grading	Exam on the lectures (50%) Exam on laboratory work (50%)		
Form of module component retake exam	None		
Language of instruction	German		
Frequency	Annually, 2 semesters, summer semester: lecture; winter semester: laboratory work for 2 weeks		

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Code	A-4-EWB	4 th sem.	6 CP
Course	Developmental Biology		
Faculty/Subject/Department	08/Biology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, 4th semester		
Prerequisites	3rd semester		
Intake capacity	145		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have an overview of descriptive, experimental and molecular developmental biology • have insight into gametogenesis and the role of the gametes in the establishment of axis during pattern formation • have knowledge of the processes of determination and differentiation • recognise the roles of exogenous and endogenous factors in "open" (plants) and "closed" (animals) development • have skills in the experimental analysis of developmental processes and in their evaluation/interpretation • recognise the role of regulatory mechanisms in development • be familiar with molecular analysis of genetic model organisms • know the applied aspects of developmental biology • have insight into the planning of hypothesis-oriented research (observation – hypothesis – experiment – gain in knowledge) 		
Module content	<ul style="list-style-type: none"> • Introduction to the analysis of animal and plant development • Analysis of cell samples from developmental stages, staining of differentiation products • Studies of mutants in developmental biology • Developmental factors in animals and plants (transcription factors, hormones, environmental factors such as light and temperature, etc.) • Analysis of the cell cycle • Apoptosis 		
Form(s) of instruction	Lectures (41%), laboratory (59%)		
Total workload	180 hours = 6 ECTS credits		
Student workload	Attendance: Lectures 25 hours, Laboratory 40 hours, Exam 1 hour	Preparation/revision: Lectures 48 hours, Laboratory/Report 67 hours, PC/Internet 20 hours	
Method of assessment	Exam (60 min.); report		
Module grading	Exam (60%), Report (40%)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %) or oral exam (100 %); method of assessment will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	A-4-PÖE	4 th sem.	6 CP
Course	Plant Ecology		
Faculty/Subject/Department	08/Biology/Institute for Plant Ecology		
Module coordinator	Cf. German version		
Classification	BSc(Biol), in-depth phase, 4th semester		
Prerequisites	3rd semester		
Intake capacity	145		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have an overview of the system "Plants and Environment" • have knowledge of the processes and expressions of the life of plants in their interactions with the environment • be able to describe the flows of energy and materials • know the essential methods in plant ecology and botanical science • understand the role of plant ecology in recognising and dealing with environmental problems 		
Module content	<ul style="list-style-type: none"> • The environment of plants (atmosphere, hydrosphere and pedosphere, their development and their significance for plants and the ecosystem) • radiation balance, carbo balance, water balance and mineral balance of plants • Plants under stress • Adaptation strategies of plants in their habitats • Laboratory and field methods in plant ecology • Vegetation science and indicator plants • Ecology of ecosystems (the ecosystem concept, processes at the level of the stand and the ecosystem, elemental cycles) • Global change ecology (climate changes and their possible causes, ecosystems as sources and sinks of greenhouse gases, the CO₂ problem) 		
Form(s) of instruction	Lectures (46%), laboratory (54%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: Lectures 26 hours, Laboratory 30 hours, Final module exams 2 hours	Preparation/revision: Lectures 20 hours, Laboratory 62 hours Exams: 40 hours	
Method of assessment	Exam (120 min.)		
Module grading	Exam (100%)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %)		
Language of instruction	German		
Frequency	Annually; 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	A-4-TOE	4 th sem.	6 CP
Course	Animal Ecology		
Faculty/Subject/Department	08/Biology/Institute for General Zoology and Systematics		
Module coordinator	Cf. German version		
Classification	BSc(Biol), in-depth phase, 4th semester		
Prerequisites	2 nd and 3 rd semester BSc		
Intake capacity	145		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have an overview of the system "Animals and Environment" • have knowledge of the processes and expressions of the life of animals in their interactions with the environment • have a deeper knowledge of ecophysiology as well as population ecology and synecology of animals • have an overview of the role of animals and of the relationships between various components of ecosystems • have a basic knowledge of biogeography • know selected terrestrial and freshwater systems • know important methods for the quantitative and qualitative recording of animal populations and societies, for the planning and conduct of experiments in animal ecology and for the evaluation of data sets on animal ecology • know the main approaches for the measurement of environmental factors and for niche analysis • understand the role of animal ecology in recognising and dealing with environmental problems 		
Module content	<ul style="list-style-type: none"> • Fundamentals of animal ecology (autecology, population ecology and synecology) • Field and laboratory methods in animal ecology • Overview of soil ecology, limnology and biogeography • Multivariate procedures in animal ecology and introduction to geostatistics • Fundamentals of recording environmental factors of relevance to animal ecology and evaluation of habitats 		
Form(s) of instruction	Lectures (36%), tutorial (64%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: Lectures 25 hours, Tutorial 56 hours,	Preparation/revision: Lectures 39 hours Tutorial 60 hours	
Method of assessment	Exam (60 min.), report, review		
Module grading	Exam (60%), Report (30%), Review (10%)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %)		
Language of instruction	German		
Frequency	Annually; 4 weeks block, summer semester		

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Code	A-OP-BBP	4 th sem.	6 CP
Course	Biological Work Placement		
Faculty/Subject/Department	08/Biology/Institute for Biology in co-operation with companies, businesses, government agencies and (scientific) establishments with an orientation to the life sciences or biomedical sciences		
Module coordinator	Cf. German version		
Classification	BSc(Biol), in-depth phase, option		
Prerequisites	Core curriculum		
Intake capacity	Individual application		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have a sound knowledge of the job profiles and requirements of biological professions • be able to apply for a work experience placement (in writing and orally) • have a sound knowledge of the use of biological expertise in various operational procedures • obtain practical work experience in a typical field of activity • be able to collaborate in the practical operations of the company/government agency/establishment • experience specific conditions of professional fields • become acquainted with the various levels of professional, organisational and social structures of the company/government agency/establishment • learn teamwork • build contacts for potential fields of activity • be able to evaluate, document and confidently present their experiences • be able to answer questions about the operational processes and discuss them satisfactorily • reflect on their work experience and draw conclusions with respect to the further planning of studies 		
Module content	<ul style="list-style-type: none"> • Researching professional fields/professional fields in research and teaching, industry and management as well as media • Requirements of the job market for academics • "How to apply" • Efficient planning of work routine • Collaboration in the workflow and special technologies of the company, government agency, establishment • Quality assurance and marketing of biological, biomedical or pharmacological products • Data protection and patent law • Training for the interview • Assessment of the interview • Presentation to a third party (report) 		
Form(s) of instruction	Seminars (19%), tutorial (81%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: Seminars 10 hours, Work placement 120 hours	Preparation/revision: Seminar: 25 hours Work placement: 25 hours	
Method of assessment	Seminar lecture; report		
Module grading	Seminar oral presentation (30%), Report (70%)		
Form of module component retake exam	None		
Form of retake exam	Seminar oral presentation (30 %), report (70 %)		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester, winter semester		

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Code	A-OP-AIM	4 th sem.	6 CP
Course	Immunology for Biologists (Introduction)		
Faculty/Subject/Department	08/Biology/Immunology; Institute for General Zoology and Systematics		
Module coordinator	Cf. German version		
Classification	BSc(Biol), in-depth phase, option, 4th semester		
Prerequisites	Core curriculum and in-depth phase		
Intake capacity	16		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have an overview of the evolutionary development of the immune system in the animal kingdom • know the different mechanisms by which humans and animals deal with various pathogens • be familiar with the mechanisms of the innate and adaptive immune systems • be able to categorise the significance of immunological processes in disease development • have an insight into the theory of immunological methodology • be able to apply basic immunological methods and techniques and the knowledge obtained from the lectures to selected experiments • master the recording, logging, documentation, evaluation and interpretation of original results from immunological experiments. Be able to discuss the results and critically assess them for errors. Be able to present individual results to the group. 		
Module content	<ul style="list-style-type: none"> • Evolution of the immune system • Function and performance of the immune system • Organisation of the immune system, immune cells • Innate immune system (complement, "pathogen recognition receptors", antimicrobial factors, coagulation) • Communication within the immune system (cytokines) • Presentation and recognition of "non-self" and "self" (MHC, NK cells) • The adaptive immune system (T lymphocytes: development, differentiation, activation; B lymphocytes: development, differentiation, activation and antibody production) • Antibody function: interaction of innate and adaptive immunity • Fundamentals of immunological memory and vaccination • Immunological methods in medicine and research (antibodies in diagnosis, therapy, research) • Methods in immunology (various methods for the preparation and characterisation of leukocyte populations in various starting materials (blood, tissues), positive and negative selection of leukocytes (affinity chromatography, complement lysis), preparation and determination of proteins (ELISA, Western blot,). 		
Form(s) of instruction	Lectures (51%), tutorial with seminars (49%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: Lectures 32 hours, Tutorial with seminars 40 hours, Rapid tests in parallel with the lectures 2 hours	Preparation/revision: Lectures 60 hours, Tutorial/seminars: Reports, presentations 43 hours	
Method of assessment	Tests, presentations, reports		
Module grading	Tests (50 %); presentation (20 %); report (30 %)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %)		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	A-OP-WTB	4 th sem.	6 CP
Course	Vertebrate Biology		
Faculty/Subject/Department	08/Biology/Institute for General Zoology and Systematics		
Module coordinator	Cf. German version		
Classification	BSc(Biol), in-depth phase, option, 4 th semester		
Prerequisites	Core curriculum		
Intake capacity	max. 25		
Learning outcomes	Students will: <ul style="list-style-type: none"> • have in-depth knowledge of vertebrate phylogeny • have in-depth knowledge of the anatomy of agnathan and gnathostome vertebrates • understand the role of pre-adaptation in the transition from water-based to land-based life • recognise the important differences between anamniotes and amniotes with respect to reproduction • have skills in preparation techniques 		
Module content	<ul style="list-style-type: none"> • Vertebrate phylogeny and biology • Functional-morphological analysis of vertebrates 		
Form(s) of instruction	Lectures (48%), laboratory (52%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: Lectures 25 hours, Laboratory 40 hours,	Preparation/revision: Lectures 60 hours, Laboratory 54 hours	
Method of assessment	Exam (60 min.), report		
	Exam (60%), Review (40%)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %) or oral exam (100 %); method of assessment will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	A-OP-HUB	4 th sem.	6 CP
Course	Human Biology		
Faculty/Subject/Department	08/Biology		
Module coordinator	Cf. German version		
Classification	BSc (Biol.), 4th semester (optional)		
Prerequisites	Core curriculum		
Intake capacity	20		
Learning outcomes	Students: <ul style="list-style-type: none"> • getting an overview about human evolution • learn about selected aspects of human anatomy and physiology as well as about human reproduction and ontogeny • obtain exemplified insights into the functional relationships between health and disease 		
Module content	<ul style="list-style-type: none"> • Human evolution • Human anatomy and physiology • Human reproduction and ontogeny • Health and disease 		
Form(s) of instruction	Attendance: Lectures: 34 hours Seminars: 12 hours Practical courses:	Preparation/revision: Lectures: 85 Seminar: 30 Practical courses: 10	
Student workload	Lectures (66%), seminars (23 %), tutorials (11%)		
Total workload	180 hours = 6 ECTS-credits		
Method of assessment	Exam (60 min.); seminar presentations		
Module grading	Written exam (65%), Seminar oral presentation (35 %)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %) or oral exam (100 %); method of assessment will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	A-OP-VTK	4 th sem.	6 CP
Course	Guide for the Care and Use of Laboratory Animals		
Faculty/Subject/Department	08/Biology/Institute for General Zoology and Systematics		
Module coordinator	Cf. German version		
Classification	BSc (Biol.), in-depth phase, optional module, 4 th semester		
Prerequisites	Core curriculum		
Intake capacity	16 Students		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • learn the legal basis (Animal Welfare Act, Federal Nature Conservation Act , Fauna and Flora Directive, Protection of Species Order) • obtain an overview of the conditions for an animal experiment: <ul style="list-style-type: none"> o Definition of animal experiments o Prerequisites for animal studies (scientific justification) o Required knowledge (available resources (equipment, personnel), supervision, housing, medical care, justifiability of pain and death, record keeping obligations) o Required skills (professional aptitude, training) o Planning (biometry) • learn literature search and presentation 		
Module content	<ul style="list-style-type: none"> • Assessment of animal facilities • Planning an animal experiment • Handling and contact with experimental and wild animals in laboratory and outdoors • Visit to the animal facilities • Techniques for publications and presentations 		
Form(s) of instruction	Lectures (17%), seminars (10%), tutorial (73%)		
Total workload	180 hours = 6 ECTS-Credits		
Student workload	Attendance (70 hours): Lectures: 10 hours, Seminars: 8 hours, Tutorial: 52 hours	Preparation/revision: Lectures: 20 hours, Seminars: 10 hours, Tutorial: 80 hours	
Method of assessment	Exam (60 min.); seminar presentation		
Module grading	Exam (70%) and seminar presentation (30%)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %) or oral exam (100 %); method of assessment will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	A-OP-EBS	4 th sem.	6 CP
Course	Introduction to Bioinformatics and Systems Biology		
Faculty/Subject/Department	08/Biology		
Module coordinator	N.N. (W3 Professor for Systems Biology)		
Lecturers	N.N. (W3 Professor for Systems Biology)		
Guidance	N.N. (W3 Professor for Systems Biology)		
Classification	BSc(Biol), in-depth phase, option		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	max. 20		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • receive an overview of the biological and IT principles of bioinformatics and systems biology • deal with practical methods and techniques for the analysis and management of relevant data • gain experience in using bioinformatics databases • receive an overview of current trends and problems in bioinformatics and systems biology • gain experience in the discerning selection of bioinformatics and systems biology applications for problem solving and testing of hypotheses • have practical experience in bioinformatics and systems biology for the presentation of the <u>bachelor's thesis and for entry into professional life</u> 		
Module content	<ul style="list-style-type: none"> • biological principles of bioinformatics and systems biology (genomics, proteomics, transcriptomics) • IT principles of bioinformatics and systems biology (fundamental data structures and algorithms, statistical models, data mining) • Bioinformatics databases • Software development platforms in bioinformatics • Essentials of molecular systems biology • Principles of high-throughput data analysis • Fundamental principles of simulation and modelling 		
Form(s) of instruction	Lectures (43%), tutorials (29%), seminar (28%)		
Student workload	Attendance: Lectures 26 hours, Tutorials 39 hours, Seminar 76 hours,	Preparation/revision: Lectures 52 hours, Tutorials 13 hours, Colloquia/Exam 43 hours	
Method of assessment	Exam (60 min.); seminar presentation		
Module grading	Exam (60%), seminar presentation (40%)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %) or oral exam (100 %); method of assessment will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	A-OP-MTG	4 th sem.	6 CP
Course	Molecular Tumor Genetics		
Faculty/Subject/Department	08/Biology		
Module coordinator	Cf. German Version		
Lecturers	Cf. German Version		
Guidance	Cf. German Version		
Classification	BSc(Biol), in-depth phase, option		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	max. 20		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • receive an overview of the biological and IT principles of bioinformatics and systems biology • deal with practical methods and techniques for the analysis and management of relevant data • gain experience in using bioinformatics databases • receive an overview of current trends and problems in bioinformatics and systems biology • gain experience in the discerning selection of bioinformatics and systems biology applications for problem solving and testing of hypotheses • have practical experience in bioinformatics and systems biology for the presentation of the bachelor's thesis and for entry into professional life 		
Module content	<ul style="list-style-type: none"> • biological principles of bioinformatics and systems biology (genomics, proteomics, transcriptomics) • IT principles of bioinformatics and systems biology (fundamental data structures and algorithms, statistical models, data mining) • Bioinformatics databases • Software development platforms in bioinformatics • Essentials of molecular systems biology • Principles of high-throughput data analysis • Fundamental principles of simulation and modelling 		
Form(s) of instruction	Lectures (43%), tutorials (29%), seminar (28%)		
Student workload	Attendance: Lectures 26 hours, Tutorials 39 hours, Seminar 76 hours,	Preparation/revision: Lectures 52 hours, Tutorials 13 hours, Colloquia/Exam 43 hours	
Method of assessment	Exam (60 min.); seminar presentation		
Module grading	Exam (60%), seminar presentation (40%)		
Form of module component retake exam	None		
Form of retake exam	Exam (100 %) or oral exam (100 %); method of assessment will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Code	A-WP-VOR	4 th sem.	6 CP
Course	Preparation for Advanced Studies		
Faculty/Subject/Department	08/Biology/		
Module coordinator	Cf. German version		
Classification	BSc(Biol), in-depth phase, 4th semester, elective		
Prerequisites	Core curriculum, development studies		
Intake capacity	120		
Learning outcomes	Students will: <ul style="list-style-type: none"> • Learn to integrate knowledge from the core and further advanced studies • Obtain an in-depth overview of the field on which they are focusing • Produce written material in a scientific context • Independent treatment of scientific topics 		
Module content	<ul style="list-style-type: none"> • Preparation of topics from the specialisation • Recapitulation of module content from the core and postgraduate studies • Processing and cross-linking of scientific content 		
Form(s) of instruction	Independent processing of knowledge, recapitulation of material learned (100%)		
Total workload	180 hours = 6 ECTS-Credits		
Student workload	Discussion 4 hours, independent review (also in teams) 176 hours		
Method of assessment	Presentation or report; will be announced at the beginning of the module		
Module grading	Presentation (100%) or report (100%)		
Form of module component retake exam	None		
Form of retake exam	Presentation or report; will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		
Capacity of the course	145		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-BC-BCH	5 th /6 th sem.	6 CP
Course	Biochemistry II		
Faculty/Subject/Department	08/Biology/Institute for Biochemistry		
Module coordinator	Cf. German version		
Classification	BSc (Biol), Advanced studies, specialisation in Biochemistry, 5th/6th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	no restrictions		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> become familiar in detail with the structure (constitution, configuration and conformation) of biopolymers and their building blocks develop in-depth understanding of the various mechanisms of enzymatic catalysis get to know the course of the important catabolic and anabolic metabolic pathways and their regulation understand the mechanisms of material transport and signal transduction at a detailed molecular level be familiar with the specific metabolic activities of single cells and tissues 		
Module content	<ul style="list-style-type: none"> Biochemical evolution Structure and function of proteins and nucleic acids <i>in detail</i> Enzyme modes of action, enzyme mechanisms, enzyme kinetics, regulation of enzymes Structure and function of carbohydrates <i>in detail</i> Structure and function of lipids <i>in detail</i> Membranes, membrane transport Signal transduction Carbohydrate metabolism (glycolysis, gluconeogenesis, glycogen metabolism, pentose phosphate cycle) Bioenergetics (citric acid cycle, oxidative phosphorylation) Protein turnover and amino acid metabolism Lipid metabolism (fat degradation, β-oxidation, synthesis of fatty acids, phospholipids and cholesterol) Nucleotide metabolism 		
Form(s) of instruction	Lectures (72%), seminars (28%)		
Total workload	180 hours = 6 ECTS-Credits		
Student workload	Attendance: Lectures 51 hours, Seminars 10 hours	Preparation/revision: Lectures 79 hours, Seminars 40 hours	
Method of assessment	Exam (120 min.); seminar presentation		
Module grading	Exam (70%), seminar presentation (30%)		
Form of module component retake exam	None		
Form of retake exam	Exam (70%), seminar presentation (30%)		
Language of instruction	German, English		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-BD-FMP	5 th sem.	6 CP
Course	Research Methods of Project Evaluation		
Faculty/Subject/Department	08/Biology/Institute for Biology Education		
Module coordinator	Cf. German version		
Classification	BSc (Biol), Advanced studies, specialisation in Biology Teaching, 5th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	15		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have an overview of empirical research methods in biology teaching • know the standards for psychological methods • master methods for the construction and evaluation of questionnaires • be able to use tools such as evaluation programs and method using video documentation • be able to construct, validate and evaluate specialised tests • have in-depth insight into selected subject areas of research into biology teaching • be able to perform an evaluation or a project or teaching as part of a team 		
Module content	<ul style="list-style-type: none"> • Topic areas of research methods • Project evaluation • Design and methodology of research on biology teaching • Quantitative methods of data collection: tests, questionnaires, observations • Construction and evaluation of questionnaires • Qualitative data evaluation 		
Form(s) of instruction	Seminars (81%), tutorial in small groups (19%)		
Student workload	Attendance: Seminars 30 hours, Tutorial 35 hours	Preparation/revision: Seminar/presentation 115 hours	
Method of assessment	Written report , seminar presentation		
Module grading	Report (70%); seminar presentation (30%)		
Form of module component retake exam	None		
Form of retake exam	Report (70%); seminar presentation (30%)		
Language of instruction	German		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-BD-MBW	5 th sem.	6CP
Course	Teaching and Media Coverage in Biosciences		
Faculty/Subject/Department	08/Biology/Institute for Biology Education		
Module coordinator	Cf. German version		
Classification	BSc (Biol), Advanced studies, specialisation in Biology Teaching, 5th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	15		
Learning outcomes	Students will: <ul style="list-style-type: none"> • recognise the possibilities and limitations of various media • know the principles of visualisation of content in the biological sciences and how this is used • know and master the possibilities of information and knowledge acquisition • be able to produce lectures and presentations 		
Module content	<ul style="list-style-type: none"> • Theory and methodology of teaching in the life sciences • Theory of visualisation and communication • Media pedagogies • Efficacy of methods and media • Rhetoric and presentation 		
Form(s) of instruction	Seminars (47%), work placement (53%)		
Student workload	Attendance: Seminars 50 hours, Work placement 20 hours	Preparation/revision: Seminars 35 hours, Project work 75 hours	
Method of assessment	Presentation, portfolio		
Module grading	Presentation (50%), portfolio (50%)		
Form of module component retake exam	None		
Form of retake exam	Presentation (50%), portfolio (50%)		
Language of instruction	German		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-BD-ÖÜB	6 th sem.	3 CP
Course	Public Relations and Environmental Education		
Faculty/Subject/Department	08/Biology/Institute for Biology Education		
Module coordinator	Cf. German version		
Classification	BSc (Biol), Advanced studies, specialisation in Biology Teaching, 6th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	15		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • obtain an overview of the history and current status of environmental education • be able to reflect on and evaluate the state of research in environmental education on the bases of selected examples • have a basic knowledge of the methodology of environmental education in selected examples • have an overview of the principles of communication with various target groups • receive a theoretical and practical introduction to the methods of public relations work • know and be able to use essential concepts of media relations (with practical exercises) • have tested the planning and implementation of projects and campaigns • receive an introduction into the practice of argumentation and presentation 		
Module content	<ul style="list-style-type: none"> • Theory and practice of environmental education • Establishments for environmental education in Germany • Empirical findings on environmental action • Educational aspects of methods of habitat analysis • Theory and methods of public relations (target group, media, measures) • Specialist journalism (scientific journalism) • Methods for moderation, mediation and presentation 		
Form(s) of instruction	Seminars with exercises (50%), excursions (50%)		
Student workload	Attendance: Seminars 15 hours, Project 15 hours,	Preparation/revision: Seminars 30 hours, Project 30 hours	
Method of assessment	Presentation, exam (60 min.), portfolio		
Module grading	Presentation (30%), exam (30%), Portfolio (40%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%) ; will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 2 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-BO-DIP	5 th sem.	6 CP
Course	Diversity in Plants		
Faculty/Subject/Department	08/Biology/Institute for Botany		
Module coordinator	Cf. German version		
Classification	BSC (Biol), Advanced studies, specialisation: Botany, 6th semester		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	20		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • understand the principles of botanical taxonomy and methodology, which result in classification • recognise the essential morphological, anatomical and physiological differences between algae and plants • have an overview of the taxa of eukaryotic algae and plants • possess an understanding of the interplay between structure, function and environmental conditions • understand the relationships between stress (biotic/abiotic factors) and evolution • have an insight into the gradual evolution of land-based plants on the basis of the topic areas: attachment and consolidation, photosynthesis, reproduction • be able to differentiate between the taxa of algae, bryophytes (liverworts, hornworts, mosses), ferns and relatives of ferns (fork ferns, club mosses, horsetails, ferns) and spermatophytes (gymnosperms, angiosperms) and to list the differences between them 		
Module content	<p>Morphology and microscopic processing as well as experiments to demonstrate the activities of</p> <ul style="list-style-type: none"> • algae • bryophytes • ferns and their relatives • gymnosperms • angiosperms 		
Form(s) of instruction	Lectures (33%), tutorial (34%), seminars (33%),		
Student workload	Attendance: Lectures 24 hours, Tutorial 32 hours, Seminar 16 hours	Preparation/revision: Lectures 36 hours, Tutorial/report 30 hours, Seminars/review 42 hours	
Method of assessment	Seminar presentation		
Module grading	Seminar presentation (100%)		
Form of module component retake exam	None		
Form of retake exam	Oral exam (100%)		
Language of instruction	German		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-BO-MEP	5ht sem.	3 CP
Course	Molecular Evolution of Plants		
Faculty/Subject/Department	08/Biology/Institute for Botany/Working Group Developmental Biology of Plants		
Module coordinator	Cf. German version		
Classification	BSC (Biol), Advanced studies, specialisation: Botany; 5th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	18		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • be able to differentiate between various types of mutations and gene alterations in an evolutionary context • have in-depth knowledge of plant molecular evolution • master the handling of raw DNA sequence data • have in-depth knowledge of the principles of sequence databases and databases searches • master the use of plant-specific meta-databases • have theoretical and practical knowledge in the creation of simple phylogenetic reconstructions • learn about acquiring and using literature • be able to deliver and critically evaluate scientific lectures • acquire social skills through working in small groups 		
Module content	<ul style="list-style-type: none"> • Mutations, genome alterations • Molecular evolution of plants • Mutation rates and substitution patterns • DNA sequence analysis • Phylogenetic reconstructions • Evolution of plant transcription factors 		
Form(s) of instruction	Lectures (33%), seminar (33%), tutorial (33%)		
Total workload	90 hours = 3 ECTS-credits		
Student workload	Attendance: Lectures 10 hours, Seminar 15 hours Tutorial 15 hours	Preparation/revision: Lectures 20 hours, Seminar 15 hours, Tutorial 15 hours	
Method of assessment	Seminar presentation		
Module grading	Seminar presentation (100%)		
Form of module component retake exam	None		
Form of retake exam	Seminar presentation (100%)		
Language of instruction	German, English		
Frequency	Annually, 2 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-BO-ZEP	5 th sem.	6 CP
Course	Cell Biology and Developmental Biology of Plants		
Faculty/Subject/Department	08/Biology/Institute for Botany/ Working Group Developmental Biology of Plants		
Module coordinator	Cf. German version		
Classification	BSc (Biol), advanced studies, specialisation: Botany, 5th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	16		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> - master the essential aspects of reproductive development in plants - recognise the molecular basis of selected developmental processes in plants - have in-depth knowledge of the model system <i>Arabidopsis thaliana</i> <ul style="list-style-type: none"> • be able to explain the mechanisms of plant cell differentiation processes using selected examples • have an overview of the range of methods relevant for the analysis of developmental processes • be capable of performing searches of the plant developmental biology literature independently and of analysing it critically • be able to communicate scientific facts professionally and correctly 		
Module content	<ul style="list-style-type: none"> • Molecular mechanisms and classical mutants of leaf and flower development in <i>Arabidopsis thaliana</i> and other flowering plants • <i>Arabidopsis thaliana</i> as a model system in plant molecular biology, especially with respect to available resources (databases, mutant lines, ecotypes) • Methods in plant developmental biology, cell and molecular biology in <i>Arabidopsis thaliana</i> (e.g. in vivo location of proteins by means of fluorescence microscopy; analysis of classical development mutants; expression analysis, microscopic processing of mutants, promotor analysis) • Seminar presentation on classical publications in plant cell and developmental biology 		
Form(s) of instruction	Lectures (27%), tutorial (43%), seminar (31%),		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: Lectures 16 hours Tutorial 45 hours Seminar 15 hours	Preparation/revision: Lectures and Tutorial 64 hours Seminars 40 hours	
Method of assessment	Seminar presentation; oral exam (15-30 min.)		
Module grading	Seminar presentation (30%), Oral examination (70%)		
Form of module component retake exam	None		
Form of retake exam	Seminar presentation (30%), Oral examination (70%)		
Language of instruction	German		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-BP-EBP	5 th sem.	6 CP
Course	Introduction to Biophilosophy		
Faculty/Subject/Department	08/Biology/Chair of Philosophy of Life Science		
Module coordinator	Cf. German version		
Classification	BSc (Biol), advanced studies , specialisation in Biophilosophy, 5th semester, elective		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	18		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • obtain an orientational overview of the subject • develop awareness of problems associated with the significance of the Darwinian theory of evolution in scientific and non-scientific contexts • obtain an exemplified insight into the current state of evolutionary theory formation • deal with the naturalisation of the condition humana • express biophilosophical positions in writing 		
Module content	<ul style="list-style-type: none"> • Scientific theoretical and sociopolitical aspects of the theory of evolution • The "special position" of humans among living beings: speech, intelligence, intentionality, culture. • Philosophical anthropology in the light of sociobiology, evolutionary psychology, behavioural ecology • Determinism, Naturalism • Evolutionary epistemology, ethics, aesthetics 		
Form(s) of instruction	Lectures (42%), seminars (52%), Tutorials (6%)		
Total workload	180 hours = 6 ECTS-Credits		
Student workload	Attendance: Lectures 30 hours, Seminars 29 hours, Tutorial 1 hour,	Preparation/revision: Lectures 45 hours, Seminars 65 hours Tutorial 10 hours	
Prerequisites	Essay		
Method of assessment	Exam (60 min.); presentation		
Module grading	Exam (50%), presentation (50%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%) ; will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-BP-SOZ	5 th sem.	6 CP
Course	Sociobiology		
Faculty/Subject/Department	08/Biology/ Chair of Philosophy of Life Science		
Module coordinator	Cf. German version		
Classification	BSc (Biol), advanced studies, specialisation in Biophilosophy, 5th semester, elective		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	18		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • obtain an overview of empirical findings and theoretical principles of animal and human sociobiology • develop a critical awareness of problems concerning the comparison of animals and humans • express themselves in writing on research problems in sociobiology • be able to take a position on questions of the utilisation of biological knowledge in social discourse • acquire basic knowledge in dealing with the statistics programme SPSS 		
Module content	<ul style="list-style-type: none"> • Introduction to sociobiological theory • Nature-Culture interconnection • adaptations, exaptations, by-products • Evolution of social life • Conditional behavioural strategies, game theory • Functional logistics of adaptive strategies in social co-operation and competition, sexuality and reproduction • Life History Theory • Fundamentals of statistical analysis and programming with SPSS 		
Form(s) of instruction	Lectures (38%), seminars (51%), Tutorials (11%)		
Total workload	180 hours = 6 ECTS-Credits		
Student workload	Attendance: Lectures 28 hours, Seminars 30 hours, Tutorial 10 hour,	Preparation/revision: Lectures 41 hours, Seminars 61 hours Tutorial 10 hours	
Prerequisites	Essay		
Method of assessment	Exam (60 min.), presentation		
Module grading	Exam (50%); presentation (50%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%) ; will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-BP-WTH	5 th sem.	3 CP
Course	Theory of Science		
Faculty/Subject/Department	08/Biology/ Chair of Philosophy of Life Science		
Module coordinator	Cf. German version		
Classification	BSc (Biol), advanced studies, specialisation in Biophilosophy, 5th semester, elective		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	18		
Learning outcomes	Students will: <ul style="list-style-type: none"> • gain an overview of epistemological, ontological and methodological problems of scientific theory • learn to reflect critically on the principles of their own specialist field • learn to assess the quality of scientific experimental design and methodology 		
Module content	<ul style="list-style-type: none"> • Introduction to epistemology • The special position of biology in science • Naturalism, realism, constructivism, reduction and emergence • Induction and deduction • The philosophy of science according to Karl Popper, Thomas Kuhn and Paul Feyerabend • The relationship of evolutionary epistemology to evolutionary philosophy of science • The scientific status of the Darwinian theory of evolution 		
Form(s) of instruction	Lectures (44%), seminars (56%)		
Student workload	Attendance: Lectures 15 hours, Seminars 15 hours,	Preparation/revision: Lectures 25 hours, Seminars 35 hours	
Method of assessment	Exam (45 min.), presentation		
Module grading	Exam (44%), presentation (56%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%) ; will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 2 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-EB-EEB	5th sem.	6 CP
Course	Evolutionary Aspects of Developmental Biology		
Faculty/Subject/Department	08/Biology/Institute for General and Special Zoology and Institute for Botany		
Module coordinator	Cf. German version		
Classification	BSc (Biol), advanced studies, specialisation in Developmental Biology, 5th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	15		
Learning outcomes	Students will: <ul style="list-style-type: none"> • learn the relationships between ontogenesis and phylogenesis • interpret larval and adult patterns in the light of evolution • recognise conserved developmental genes and their role in evolution • be able to communicate evo-devo results in a satisfactory manner 		
Module content	<ul style="list-style-type: none"> • Analysis of life cycles with consideration of larval and adult organs • Analysis of the anatomy of twin species and closely related species • Analysis of the genesis of skeletal elements from the view point of evolutionary biology • Evolution of plant reproductive organs • Role of conserved developmental genes • Online database searches 		
Form(s) of instruction	Lectures (33%), tutorial (50%), seminars (17%),		
Total workload	180 hours = 6 ECTS-Credits		
Student workload	Attendance: Lectures: 21 hours, Tutorial: 40 hours, Seminar: 10 hours,	Preparation/revision: Lectures: 40 hours Tutorial: 50 hours Seminar: 19 hours	
Method of assessment	Exam (60 min.), presentation		
Module grading	Exam (50%), seminars (50%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%) ; will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually , 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-GE-IRF	5th sem.	9 CP
Course	Interaction of Regulation Factors		
Faculty/Subject/Department	08/Biology/Institute for Genetics		
Module coordinator	Cf. German version		
Classification	BSc (Biol), Advanced studies, specialisation in Genetics, 5th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	16		
Learning outcomes	Students will: <ul style="list-style-type: none"> • have in-depth knowledge of the structure of regulatory factors • have in-depth knowledge of the function of regulatory factors • have in-depth knowledge of the modification of regulatory factors • have the skills to evaluate the interaction of regulatory factors • have the skills to perform homology comparisons 		
Module content	<ul style="list-style-type: none"> • Purification and isolation of regulatory factors • Identification of different modifications of regulatory factors • Gene bank searches for interacting modules (laboratory) • Gene bank searches for interacting modules (computer) • Detection of protein-protein interactions 		
Form(s) of instruction	Lectures (33%), tutorial (43%), seminars (24%)		
Total workload	270 hours = 9 ECTS-credits		
Student workload	Attendance: Lectures 30 hours, Tutorial incl. PC/Internet 45 hours, Colloquia 15 hours	Preparation/revision: Lectures 60 hours, Tutorial incl. PC/Internet 70 hours, Seminar 50 hours	
Method of assessment	Seminar presentation, exam (90 min.)		
Module grading	Seminar presentation (30%), exam (70%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%) ; will be announced at the beginning of the module		
Language of instruction	German, English		
Frequency	Annually, 6 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-IM-SAI	5 th sem.	6 CP
Course	Special Aspects of Immunology		
Faculty/Subject/Department	08/Biology/Immunology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), Advanced studies, specialisation in Immunology, 5th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	16 (or 32)		
Learning outcomes	<p>Students should:</p> <ul style="list-style-type: none"> • receive a detailed insight into the evolutionary development of the immune system in the animal kingdom. • acquire in-depth knowledge of the different mechanisms, by which plants, animals and humans deal with various pathogens. • obtain a comprehensive insight into invertebrate immunology • gain in-depth knowledge of special aspects of immunology (immunodeficiencies, etc.) • by means of examples, be able to assess and explain the role of the immune system in the development and maintenance of diseases • fully understand the molecular structure and function of key molecules of the immune system (antigen receptors, Fc receptors, KIRs, etc.) • learn to elaborate on specific topics, using the current international journal literature, and to lecture on them to an audience 		
Module content	<ul style="list-style-type: none"> • Short introduction to general immunology (recapitulation) • Evolution of the immune system (How does diversity develop?) • Detailed comparison of invertebrate and vertebrate immunology • How are bacteria (extra- and intra-cellular) recognised and combated? • How are viruses recognised and combated? • How are large pathogens recognised and combated? • How does the innate immune system inform the adaptive immune system (dendritic cells as the transition, the immunoproteasome, MHC loading, presentation of peptides and lipids)? • How are signals generated and integrated (immunological synapse, signal transduction by multi-chain immune receptors /TCR; BCR, FcR) • How is tolerance created? (central and peripheral tolerance, prenatal and neonatal immunology) • Why do people have allergic responses to substances (hygiene theory)? • How are tumours recognised, combated and, if necessary, treated? • What happens in autoimmune diseases? How can these be treated? • What are chronic inflammatory diseases? Can the immune system be used in their treatment? • Acquired immunodeficiencies (HIV -> AIDS) and their treatment 		
Form(s) of instruction	Lectures (73%), seminars with presentations (27%)		
Total workload	180 hours=6 ECTS-credits		
Student workload	Attendance: Lecture: 51 hours Seminar: 15 hours	Preparation: Lecture: 80 hours Seminar: 34 hours	
Method of assessment	<ul style="list-style-type: none"> • Up to 16 students: Tests (180 min.); Seminar presentation • Up to 32 students: seminar presentation 		
Module grading	<ul style="list-style-type: none"> • Up to 16 students: Tests (60%), seminar presentation (40 %) • 17 – 32 students: exam (60%), seminar presentation (40%) 		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%); will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-MI-ASY	5 th sem.	6 CP
Course	Applied and Systematic Microbiology		
Faculty/Subject/Department	08/Biology/Institute for Microbiology and Molecular Biology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), Advanced studies, specialisation in Microbiology, 5th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	16		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • be proficient in methods for the enrichment and cultivation of micro-organisms and in the safe handling of micro-organisms • learn different strategies for creating axenic cultures in theory and in practice • be able to use procedures for the classification/identification of micro-organisms independently • be proficient in the use and maintenance of databases • be familiar with methods for the bulk culture of micro-organisms and their use in biotechnological procedures, with practical examples 		
Module content	<ul style="list-style-type: none"> • Enrichment of micro-organisms from environmental samples • Obtaining pure cultures from enrichments • Physiological characterisation of own isolates • Identification of own isolates by means of rDNA sequencing and computer-assisted sequence comparisons • Identification of type strains using classical taxonomic and molecular methods • Creating plasmid restriction maps • Culture methods for micro-organisms, with special reference to fermentation procedures • Use of micro-organisms for the production of substances • Enrichment of fermentation products 		
Form(s) of instruction	Lectures (16%), seminar (21%), tutorial (63%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: Lectures 9 hours, Tutorial 60 hours, Seminars 8 hours	Preparation/revision: Lectures 20 hours, Tutorial 53 hours, Seminars 30 hours	
Method of assessment	Exam (60 min.), review/report		
Module grading	Exam (30%), review/report (70%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%)		
Language of instruction	German		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-MI-BTC	5th sem.	3 CP
Course	Applied Microbiology and Biotechnology		
Faculty/Subject/Department	08/Biology/Institute for Microbiology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), Advanced studies, specialisation in Microbiology, 6th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	16		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have insight into the numerous uses of micro-organisms by humans • understand microbial metabolic processes as the basis for obtaining useful products • have knowledge of the use of microbial physiology as applied to industry, agriculture and management of the environment • have insight into the practical applications of microbial processes for biotechnological uses and an understanding of their technical implementation (professional orientation/management strategies) • be able to deal with issues in biotechnology, select appropriate methods and classify and evaluate the results • be able to apply molecular-biological and microbiological knowledge to safety- and production-related aspects (problem structuring) 		
Module content	<ul style="list-style-type: none"> • Food biotechnology • Production of industrial products with the aid of micro-organisms • Principles of fermentation technology/ process technology • Biotransformation • Micro-organisms in wastewater treatment and in bioleaching • Biofuels • Fundamentals of genetic engineering • Overexpression of proteins in prokaryotes and eukaryotes • Green genetic engineering • Safety aspects of handling genetically modified organisms • Ethical aspects of the use of genetic engineering • Knowledge of the targeted use of micro-organisms in mining and waste disposal • Micro-organisms in agriculture • Biological warfare agents • Diagnosis of bacterial pathogens 		
Form(s) of instruction	Lectures (43%), excursions (26%), seminar (31%)		
Total workload	90 hours = 3 ECTS-credits		
Student workload	Attendance: Lectures: 14 hours, Excursions: 23 hours, Seminar: 4	Preparation/revision: Lectures 25 hours, Seminar: 24	
Method of assessment	Exam (60 min.); seminar presentation		
Module grading	Exam (70%), seminar presentation (30%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (90 min.)		
Language of instruction	German		
Frequency	Annually, 2 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-MI-MIB	5th sem.	6 CP
Course	Microbiology II		
Faculty/Subject/Department	08/Biology/Institute for Microbiology and Molecular Biology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), Advanced studies, specialisation in Microbiology, 5th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	16 for BSc + 8 (also serves as an adapter module for the MSc)		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> gain insight into early evolution, the preconditions for the development of life and the role of micro-organisms in evolution obtain in-depth knowledge of bacterial metabolism and understanding of its importance in global material cycles be familiar with the principles of the regulation of microbial metabolism recognise the most important types of microbial communities and gain an understanding of the molecular basis for the adaptation of micro-organisms to various habitats gain knowledge of bacterial cell physiology understand the mechanisms underlying the pathogenicity and virulence of microbial pathogens gain a basic knowledge of the pathogen-host interaction on the basis of selected examples of viruses and bacteria that are pathogenic to animals and plants be able to classify and evaluate the theoretical knowledge gained, as well as to present, in an understandable manner, the results of current research in seminar presentations to their fellow students 		
Module content	<ul style="list-style-type: none"> Development of micro-organisms in early evolution Adaptation of microbial metabolism to substrate availability Special microbial metabolism Role of micro-organisms in global material cycles Microbial communities Physiological and morphological adaptation of micro-organisms to their environment Cell division and cell cycle in micro-organisms Differentiation in micro-organisms Introduction to epidemiology and mechanisms of pathogenicity Examples of pathogenic bacteria Introduction to virology Micro-organisms and viruses, which are pathogenic to plants 		
Form(s) of instruction	Lectures (44%), Tutorial (12%), seminars (44%),		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: Lectures 27 hours Tutorial 21 hours Seminars 26 hours	Preparation/revision: Lectures 53 hours, Seminar 53 hours	
Method of assessment	Exam (60 min.), seminar presentation		
Module grading	Exam (70%), seminar presentations (30%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%)		
Language of instruction	German, English		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-NS-1	5 th sem	6 CP
Course	Biological Principles of Nature Conservation, Environmental Legislation and Conservation Education		
Faculty/Subject/Department	08/Biology/Institute for General Zoology and Systematics		
Module coordinator	Cf. German version		
Classification	BSc (Biol), Advanced studies, specialisation in Nature Conservation, 5th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	20		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • understand the essential problems and approaches of scientific nature conservation • be familiar with freshwater and terrestrial habitats, their communities and their mass balance • have an overview of the anthropogenic pressures of ecosystems • deal with aspects of the protection of organisms and habitats • know the basics of habitat restoration • learn selected conventions, guidelines, laws, ordinances and regulatory provisions in the areas of nature conservation and environmental protection • deal with the problems of implementing environmental legislation in the area of tension that is the public stage • learn how to acquire, use, analyse and interpret legal publications • know the essential approaches and methods of conservation education • gain knowledge concerning the educational communication of the aims of nature conservation • discuss practical examples of conservation education 		
Module content	<ul style="list-style-type: none"> • Characteristics of ecosystems and nature reserves • Vegetation as a habitat, soil and location, land under water as a location factor • Trophic and saprobic status • Restoration of degraded aquatic and terrestrial habitats • Fundamentals of nature conservation legislation • Uses: conventions, guidelines, laws, ordinances, regulatory provisions • Using legal publications • Essential approaches and methods of conservation education • Theory and practice of conservation education 		
Form(s) of instruction	Lectures (34%), Tutorial (48%), Tutorials (21%),		
Total workload	180 hours = 6 ECTS-credits		
Student workload	<p>Attendance:</p> <p>Lectures 21 hours</p> <p>Tutorial (Übung) 52 hours</p> <p>Tutorials (Tutorium) 17 hours</p>	<p>Preparation/revision:</p> <p>Lectures 40hours</p> <p>Tutorial 30 hours</p> <p>Tutorials 20 hours</p>	
Method of assessment	Exam (60 min.); reviews, reports and presentations		
Module grading	Exam (30%), Reviews, reports, and presentations (70%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%) ; will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-NS-2	5 th sem.	6 CP
Course	Special Excursion Nature Conversation		
Faculty/Subject/Department	08/Biology/Institute for General Zoology and Systematics		
Module coordinator	Cf. German version		
Classification	BSc (Biol), Advanced studies, specialisation in Nature Conservation, 5th semester, elective		
Prerequisites	BSc (Biol) module V-NS-1(Fundamentals of Nature Conservation)		
Intake capacity	20		
Learning outcomes	Students will: <ul style="list-style-type: none"> • become familiar with important institutions that are active in nature conservation • deal with questions in applied nature conservation • recognise the significance of Red List species for nature conservation • develop awareness of the problems arising from the conflict between nature conservation and agriculture • have in-depth knowledge of practical measures for the protection of species and the environment • gain the necessary skills to produce an appropriate bachelor's thesis 		
V-NS-BGN and V-NS-BIG module contents	<ul style="list-style-type: none"> • Institutions for nature conservation • Practical nature conservation • Areas of conflict in nature conservation 		
Form(s) of instruction	Excursions (76%), tutorials (22%)		
Total workload	90 hours = 3 ECTS-credits		
Student workload	Attendance: Excursions 40 hours Tutorials 10 hours	Preparation/revision: Excursions 30 hours Tutorials 10 hours	
Method of assessment	Final reports, review		
Module grading	Report (20%) Review (80%)		
Form of module component retake exam	None		
Form of retake exam	Report (20%) Review (80%)		
Language of instruction	German		
Frequency	Annually, 2 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-OE-ATÖ	5 th sem.	6 CP
Course	Techniques in Ecology		
Faculty/Subject/Department	08/Biology/Institute for General Zoology and Systematics and Institute for Plant Ecology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), Advanced studies, specialisation in Ecology, 5th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	2x20		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> learn the techniques used in research on ecosystems, populations and synecology be able to use essential methods for the quantitative and qualitative recording of populations and societies, for the planning and conduct of ecological experiments and for the evaluation of ecological data sets learn the techniques used to quantify energy cycles and elemental cycles on an ecosystem level master the essential procedures for the measurement of environmental factors and for niche analysis learn key interdisciplinary techniques (measurement procedures, geostatistics, modelling, molecular biology) be able to use and evaluate, in a problem-oriented manner, techniques and assessment methods used in ecology gain the necessary skills to produce an appropriate bachelor's thesis have the ability to use, with discernment, important methods for measurement and data capture. know how to treat the raw data from an experiment and communicate the results to others in the form of a report. be able to read and interpret the English-language literature of the field 		
Module content	<ul style="list-style-type: none"> Selected techniques used in ecology (research on populations and synecology as well as on ecosystems) Ecological field and laboratory work Structure and function of communities Soil ecological processes Ecological consequences of climate change Use of multivariate procedures and geostatistics Principles of modelling in ecosystem research Procedures for recording relevant environmental factors and habitat assessment 		
Form(s) of instruction	Lectures (44%), tutorial (46%), excursion (10%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload	<p>Attendance</p> <p>Lectures 20 hours, Tutorial 32 hours Excursions 8 hours</p>	<p>Preparation/revision:</p> <p>Lectures 60 hours, Tutorial 60 hours, Excursion 10 hours</p>	
Method of assessment	Reports and reviews, seminar presentations or oral exam (20 min)		
	Reports and reviews (70%), seminar presentation of project or oral examination (30%)		
Form of module component retake exam	None		
Form of retake exam	Reports and reviews (70%), seminar presentation of project or oral examination (30%)		
Language of instruction	German/English		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-PP-EGP	5 th sem.	9 CP
Course	Experimental Foundations of Plant Physiology		
Faculty/Subject/Department	08/Biology/Plant Physiology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), Advanced studies, specialisation in Plant Physiology, 5 th semester, obligatory		
Prerequisites	Core curriculum, in-depth phase		
Intake capacity	16		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have in-depth knowledge of current molecular plant physiology • acquire mediation skills through the supervision of student experiments in module A-3-PPH • be able to categorise and answer questions concerning topics in plant physiology and molecular biology and also be able to explain the answers • have an overview of the use of genetic, biochemical and molecular biological techniques as well as network-based information sources to solve questions in plant physiology • possess the practical competence for scientific laboratory work to produce their bachelor's thesis • acquire teamwork skills through the independent performance of experiments in a small group • be able to present the results of laboratory work in a scientifically correct manner 		
Module content	<ul style="list-style-type: none"> • Collaboration in module A-3-PPH (organisation of student experiments, supervision of students during colloquia, in the laboratory and during the completion of tasks in the workbook) • Experimental methods in molecular plant physiology (e.g. analysis of genomic DNA by means of PCR, cloning and sequence analysis; analysis of protein patterns in various cell compartments by means of SDS-PAGE and Western-Blot) • Use of molecular biological software and Internet resources • Reading and presenting the English-language scientific literature 		
Form(s) of instruction	Lectures (9%), assistance in module A-3-PPH (8%), work placement (33%)		
Total workload	270 hours = 9 ECTS-credits		
Student workload	Attendance: Work placement: 60 hours Assistance: 104 hours Lecture: 14 hours	Preparation/revision: Work placement: 16 hours Assistance: 30 hours Lecture: 46 hours	
Method of assessment	Presentation, report		
Module grading	Presentation (50%), review (50%)		
Form of module component retake exam	None		
Form of retake exam	Oral exam (100%)		
Language of instruction	German		
Frequency	Annually, 6 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-TP-MEM	5 th sem.	9 CP
Course	Membrane and Transport Physiology		
Faculty/Subject/Department	08/ Biology/Institute for Animal Physiology		
Module coordinator	Cf. German version		
Classification	BSc (Biol.), in-depth studies, specialisation Animal Physiology, obligatory		
Prerequisites	Core curriculum, advanced studies		
Intake capacity	22		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • deal intensively with special topic groups in physiology • learn to mediate physiological content and be able autonomously to create and perform basic physiological experiments • be familiar with the structure of cell membranes and biomembranes • learn to recognise the significance of cell membranes for cells • acquire an insight into cell structure and the function of cell compartments and organelles • have knowledge of cellular transport processes • learn to recognise the function of ion transport proteins • learn the function of Epithelia and their impact on body homeostasis • acquire an insight into the methods with which it is possible to investigate cellular transport processes 		
Module content	<ul style="list-style-type: none"> • Assistance during physiological experiments (A-3-TPH) • Training in subject-specific methods and demonstrations, including • transepithelial Ussing chamber experiments • microelectrode recordings on oocytes of <i>Xenopus laevis</i> • Use of the Nernst equation to calculate reversal potentials • Study of the primary literature on subject-specific topics • Cellular mechanisms for maintaining the body homeostasis 		
Form(s) of instruction	Teaching assistance (44%), lectures (12%), seminars (22%), (Exercises) in small working groups (22%)		
Total workload	270 hours = 9 ECTS-credits		
Student workload	<p>Attendance: 90 hours</p> <ul style="list-style-type: none"> • Assistance 40 hours • Lectures 10 hours • Seminar 24 hours • Tutorial 20 hours 	<p>Preparation/revision: 90 hours</p> <ul style="list-style-type: none"> • Assistance 60 hours • Lectures 20 hours • Seminar 40 hours • Tutorial 40 hours 	
Method of assessment	Exam (60 min.); presentation		
Module grading	Exam (40%), presentation (60%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%) will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 6 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-TP-MVK	5 th sem.	6 CP
Course	Mechanisms of Behaviour Coordination and Learning Behaviour		
Faculty/Subject/Department	08/Biology/Central Biotechnology Unit		
Module coordinator:	Cf. German version		
Classification	B.Sc, in-depth phase, specialisation Animal Physiology, 5th Semester		
Prerequisites	Core curriculum, advanced studies		
Intake capacity	20		
Learning outcomes:	<p>Students should:</p> <ul style="list-style-type: none"> distinguish between inherited and acquired behaviour learn laboratory and field methods used in behavioural research obtain in-depth knowledge of the mechanisms of behaviour co-ordination and particularly of learning behaviour and memory development be able to categorise and explain animal and human behaviour on the basis of ethological methods and theories learn from films to observe and interpret experiments on learning behaviour 		
Module content:	<ul style="list-style-type: none"> Classification of behaviour, particularly acquired versus inherited co-ordination of behaviour chains with the involvement of acquired and inherited trigger mechanisms endogenous and exogenous factors of behaviour control and regulation Neuroethology (pattern generators and sensory feedback) Behavioural endocrinology (behaviour control, sexual determination) Regulation of population density by stress hormones Paradigms of learning behaviour: habituation, sensitisation, imprinting classical conditioning, operant conditioning Learning by imitation and learning as insight; adaptation and learning in the social context; extinction and forgetting; species-specific learning performance Maturation processes, juvenile adaptations and changes in functions during ontogenesis in comparison to learning processes Laboratory experiments on the mechanisms of learning and memory development; short- and long-term memory: interventional and correlative methods of investigation; biochemical mechanisms of memory development compared to those of neuronal differentiation and regeneration Analysis of behavioural adaptation from the viewpoint of comparative behavioural research, behaviourism and sociobiology Behaviour co-ordination through social facilitation, social inhibition and communication in animal societies, from the view point of various behavioural theories; signal falsification and mimicry 		
Form(s) of instruction	Lectures (65%), seminars with films (35%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: lectures (39 hours), seminars (21 hours) Preparation/revision: lectures (78 hours), seminars (42 hours)		
Method of assessment	Exam (60 min.); presentations		
Module grading	Exam (67%), presentations (33%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%) will be announced at the beginning of the module		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-TP-NEU	5 th sem.	6 CP
Course	Neurobiology		
Faculty/Subject/Department	08/ Biology/Institute for Animal Physiology		
Module coordinator	Cf. German version		
Classification	BSc(Biol), in-depth studies, specialisation in Animal Physiology, 5th semester		
Prerequisites	Fundamentals of Animal Physiology		
Intake capacity	16		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have extended knowledge of the structure and function of the nervous system • have extended knowledge of the structure and function of the sensory organs • have extended knowledge of human and animal behaviour • have methodological skills in recording electrical potentials, in representing nerve cells and in quantitative behavioural biology • be able to conduct neurobiological experiments in a team and to interpret and present the results 		
Module content	<ul style="list-style-type: none"> • Physiology of nerve cells and sensory organs • Anatomy and histology of the nervous system • Anatomy and histology of various sensory organs • Behavioural Physiology, learning and memory • Development of the nervous system • Techniques of Neurobiology • Interpretation and presentation of experimental results 		
Form(s) of instruction	Lectures (50%), practical work in small groups (50%)		
Total workload	180 hours = 6 ECTS-Credits		
Student workload	Attendance: Lectures (28 hours), Tutorial (40 hours)	Preparation: Lecture (62hours), Tutorial (50 hours)	
Method of assessment	Reports; Exam (60 min.)		
Module grading	Reports (40%), Exam (60%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%) will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-ZB-AZK	5th / 6th sem.	6 CP
Course	Working with Cell Cultures		
Module coordinator:	Cf. German version		
Faculty/Subject/Department	08/ Biology/Institute for General Zoology and Developmental Biology, Institute for Immunology, Institute for Botany		
Classification	BSC (Biol), in-depth phase, specialisation: Cell Biology, 5th-6th semester, obligatory		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	16		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • Have an overview of basic methods and techniques for working with cell cultures (animal and plant organisms) • have experience of basic work with cell cultures • know processes for separating cells and techniques for labelling cells • recognise physiological changes in cultured cells • be able to understand and communicate techniques and results from cell biology • be able to identify, document and discuss results from complex experimental set-ups and subtle cellular changes • understand methods for working with cell cultures and be able to communicate these to others • be able to categorise and evaluate the relevance of results obtained in vitro, with respect to their biological message 		
Module content	<ul style="list-style-type: none"> • Preconditions and preparations for sterile work (equipment, media production, sterilisation procedures, work guidelines, controls of cell culture purity, contamination problems etc.) • Setting up primary cultures, callus cultures • Maintenance of cell line cultures • Working with hybridoma cultures • Alteration of cell cultures (transfection etc.) • Conducting experiments in cell physiology (including phagocytosis, cell division, adhesion, motility, apoptosis) • Methods for cell separation • Methods for labelling cells • Literature and Internet searches, • Presentation and discussion about methods of work and research results in cell biology 		
Form(s) of instruction	Lectures (22%), seminars (24%), practical work in small groups (54%)		
Total workload	180 hours = 6 ECTS-Credits		
Student workload	Attendance: Lectures 15 hours, Tutorial 36 hours, Seminars 12 hours	Preparation/revision: Lectures 25 hours, Tutorial 60 hours, Seminars 32 hours, F=1.85 hours	
Method of assessment	Report; seminar presentation		
Module grading			
Form of module component retake exam	None		
Form of retake exam	Report (50%), seminar presentation (50%)		
Language of instruction	German		
Frequency	Annually, duration: please see notice board, winter and summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-ZO-ASZ	5th sem.	3 CP
Course	Work Assistant in Zoology		
Faculty/Subject/Department	08/Biology/Institute for General and Special Zoology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Zoology, obligatory		
Prerequisites	Core curriculum, Advanced studies, V-ZO-MMT		
Intake capacity	min. 3 / max. 15		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have in-depth knowledge of zoological model organisms (structure, function, physiology, evolution) • have in-depth knowledge of essential zoological facts (peritoneal cavity, symmetries, reproductive strategies etc.) • be able to present their knowledge credibly and explain it clearly • be able to categorise and answer questions concerning topics in zoology and also be able to explain the answers • master a basic knowledge of the use of modern media in teaching and public relations 		
Module content	<ul style="list-style-type: none"> • Basic knowledge for teaching the subject • Recapitulation of zoological model organisms • Phylogeny of selected animal organisms • Example preparations • Training in experimental set-up (microscope, etc.) • Training in scientific/correct popular scientific terminology (zoology) • Demonstration of training to a third party • Media technology (video, projector/CD/DVD, optical instruments and computers), on-screen presentations 		
Form(s) of instruction	Tutorial (36%), seminars (64 %)		
Total workload	90 hours = 3 ECTS-Credits		
Student workload	Attendance: Tutorial: 12 hours, Seminar: 20 hours	Preparation/revision: Tutorial: 20 hours Seminar: 38 hours	
Method of assessment	Seminar presentation		
Module grading	Oral presentation (100%)		
Form of module component retake exam	None		
Form of retake exam	Seminar presentation (100%)		
Language of instruction	German		
Frequency	Annually, 2 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-ZO-MMT	5th sem.	6 CP
Course	Micro- and Macroevolution		
Faculty/Subject/Department	08/Biology/Institute for General and Special Zoology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Zoology, Developmental Biology, 5th semester, obligatory		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	25		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have in-depth knowledge of macro- and micro-evolutionary processes in the animal kingdom • deal with the problems of the concept of species and variability in characteristics • learn the basic principles of intraspecific differentiation • master the essential procedures of phylogenetic analysis • recognise important molecular mechanisms of pattern formation and homeostasis, which have been conserved in the animal kingdom • learn the relationship between evolution, phylogeny and taxonomy • be able to use and evaluate, in a problem-oriented manner, important techniques and evaluation methods • be familiar with testing hypotheses • can deal critically, on the basis of publications and internet searches, with competing hypotheses concerning animal development and evolution • can discuss arguments in evolutionary biology objectively in forums with fellow students 		
Module content	<ul style="list-style-type: none"> • Selected techniques in evolutionary biology • Darwinism and classification systems • Ecotypes, dimorphisms, stage differentiation, development of synonymy, rules for nomenclature • Homologues/analouges, lines of development, • Morphology and adaptive differentiation • Phylogeny and phylogeography • Complex systems of macro- and micro-evolution • Complex micro- and macro-evolutionary biological systems • Hox genes, paralogous/orthologous genes • Types of cleavage 		
Form(s) of instruction	Lectures (40%), seminars (20%), tutorial with work in small groups (40%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: Lectures 24 hours, Tutorial 48 hours, Seminars 6 hours	Preparation/revision: Lectures 48 hours, Tutorial: 24 hours, Seminar: 30 hours	
Method of assessment	Report, seminar presentation		
Module grading	Report (70%), Oral presentation (30%)		
Form of module component retake exam	None		
Form of retake exam	Report (70%), Oral presentation (30%)		
Language of instruction	German		
Frequency	Annually, 4 weeks block, winter semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-BC-BNS	6th sem.	3 CP
Course	Biochemistry of Nucleic Acids		
Faculty/Subject/Department	08/Biology/Institute for Biochemistry		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Biochemistry, 6th semester, elective		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	16		
Learning outcomes	Students will: <ul style="list-style-type: none"> • become familiar with the enzymology of enzymes, which interact with DNA • know methods for investigating macromolecular interactions, particularly protein-DNA and protein-protein interactions • be able to deal with the relevant primary and secondary English-language literature 		
Module content	<ul style="list-style-type: none"> • Enzymology of non-specific nucleases (e.g. nucleases, which degrade nucleic acids during apoptosis) • Protein-protein interactions of nucleases and their inhibitors • Enzymology of restriction endonucleases • Enzymology of homing endonucleases • Enzymology of mismatch repair • Topographic analysis of multiprotein complexes 		
Form(s) of instruction	Tutorial (82%), seminars (18%)		
Total workload	90 hours = 3 ECTS-Credits		
Student workload	Attendance: Tutorial 52 hours Seminar 8 hours	Preparation/revision: Tutorial 22 hours Seminar 8 hours	
Method of assessment	Report		
Module grading	Report (100%)		
Form of module component retake exam	None		
Form of retake exam	Report (100%)		
Language of instruction	German, English		
Frequency	Annually, 2 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-BC-MBC	5 th / 6 th sem.	6 CP
Course	Methods of Biochemistry		
Faculty/Subject/Department	08/Biology/Institute for Biochemistry		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Biochemistry, 5th/6th semester, obligatory		
Prerequisites	Core curriculum, advanced studies, module V-BC-BCH- Biochemistry II		
Intake capacity	20		
Learning outcomes	Students will: <ul style="list-style-type: none"> • be familiar with essential biochemical methods in theory and, in the case of selected methods using complex equipment, also in practice 		
Module content	<ul style="list-style-type: none"> • Biochemical literature and literature searches • General laboratory practice, laboratory safety • Sample preparation (methods for digestion, solubilisation of proteins, DNA and protein precipitation, dialysis, ultrafiltration, concentration) • Centrifugation (sedimentation, gradient centrifugation, analytical and preparative ultracentrifugation) • Chromatography (thin layer chromatography, column chromatography, FPLC, HPLC) • Electrophoresis (PAGE, SDS-PAGE, IEF, 2D electrophoresis, agarose gel electrophoresis, FIGE, staining techniques, capillary electrophoresis) • Spectroscopy (UV/VIS, fluorescence, light scattering, chemiluminescence, ORD, CD, IR, AAS, MS) • Radioactivity (isotopes, types of radiation, labelling, scintillation counter, β-counter, Area counter, imaging, radiation protection, alternative methods) • Immunological methods (antibodies, ELISA, RIA, immunoprecipitation, blotting procedures, FACS) • Enzyme kinetics (Michaelis-Menten kinetics, active site titration, dependence on pH, temperature and other factors, types of inhibition) • Interaction studies (equilibrium dialysis, spectroscopic techniques, cross-linking, protection from modification, footprinting, gel filtration, coprecipitation, nitrocellulose filter binding, gel shift assay, BIAcore, FCS) • Protein analysis (amino acid composition, protein folding and stability, peptide mapping, modification, protein determination, peptide synthesis) • Nucleic acid analysis (PCR, RT-PCR, mapping, sequencing, hybridisation, modification, duplex stability, SSCP, DNA synthesis) 		
Form(s) of instruction	Lectures (34%), tutorial (66%)		
Total workload	180 hours = 6 ECTS-Credits		
Student workload	Attendance: Lectures 21 hours, Tutorial 44 hours,	Preparation/revision: Lectures 40 hours, Tutorial 75 hours	
Method of assessment	Exam (60 min.); reports		
Module grading	Exam (50%), Reports (50%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%) will be announced at the beginning of the module		
Language of instruction	German, English		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

	V-EB-EWB	6th sem.	3 CP
Course	Seminar on Current Issues of Developmental Biology		
Faculty/Subject/Department	08/Biology/Institute for General and Special Zoology and and Institute for Botany		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Developmental Biology, 6th semester, obligatory		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	20		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • obtain a deeper insight into current topics in developmental biology • be able to analyse the literature on one of these topics • develop a written draft clearly presenting the essential content of the topic • prepare an oral presentation on this topic, which will be discussed with the teacher • be able to deliver the oral presentation to fellow students • discuss the scientific results with each other and with the tutor • discuss the form and quality of the presentation with each other and with the tutor • produce a report of notes taken during all presentations 		
Module content	<ul style="list-style-type: none"> • Searches of literature databases and library holdings • "How I read scientific literature" (publications and accompanying documentation) • Preparation of a draft of a lecture for teaching purposes • Preparation of scientific presentations with various media (board, video, overhead projector, PowerPoint, etc.) • Various forms of presentation will be practised • Interpretation and discussion of scientific data • Preparation of abstracts 		
Form(s) of instruction	Seminars (100%)		
Total workload	90 hours = 3 ECTS-Credits		
Student workload	Attendance: Seminars 30 hours	Preparation/revision: Seminars 60 hours	
Method of assessment	Seminar presentation; report		
Module grading	Presentation (50%), report of notes on presentations (50%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%) will be announced at the beginning of the module		
Language of instruction	English		
Frequency	Annually, 2 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-EB-EXE	6th sem.	6 CP
Course	Experimental Embryology		
Faculty/Subject/Department	08/Biology/Institute for General and Special Zoology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Developmental Biology, 6th semester, obligatory		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	16		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> learn to formulate questions for experimental work from observations of developmental processes learn how to transform a question in development biology into a working hypothesis test the working hypothesis by experimental intervention into the development of embryos learn how to interpret the results of their work be familiar with various developmental phenomena (cleavage, gastrulation, organogenesis, induction, etc.) 		
Module content	<ul style="list-style-type: none"> Time-lapse analysis of development (cell lineage) 3D reconstruction of embryos (induction analysis) Experimental manipulation of cleavage parameters (plasma distribution) with mycopharmaceuticals and centrifugation Experimental manipulation Documentation of developmental results Cell labelling and signal transduction 		
Form(s) of instruction	Lectures (42%), tutorial (48%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: Lectures 25 hours, Tutorial 40 hours,	Preparation/revision: Lectures 50 hours, Tutorial 65 hours	
Method of assessment	Report (100%)		
Module grading	Report (100%)		
Form of module component retake exam	None		
Form of retake exam	Report (100%)		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-GE-FGE	6 th sem.	6 CP
Course	Functional Genomics		
Faculty/Subject/Department	08/Biology/Institute for Genetics		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Genetics, 6th semester, obligatory		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	16		
Learning outcomes	Students will: <ul style="list-style-type: none"> • have knowledge of eukaryotic gene functions • have knowledge of molecular genetic methods • have knowledge of cytogenetic methods • learn to interpret experimental results critically 		
Module content	<ul style="list-style-type: none"> • Performance of DNA cloning • Working with cell cultures • DNA transfection with RNAi constructs • Assessment of gene activity by means of <ul style="list-style-type: none"> o RNA analysis o protein analysis o enzymatic analysis o cytological analysis (fluorescence) 		
Form(s) of instruction	Lectures (50%), Tutorials (50%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: Lectures 30 hours, Tutorial 30 hours,	Preparation/revision: Lectures 60 hours, Tutorial 60 hours	
Method of assessment	Exam (60 min.); report		
Module grading	Exam (50%), Report (50%)		
Form of module component retake exam	None		
Form of retake exam	Oral exam (100%)		
Language of instruction	German, English		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-IM-SMI	6th sem.	9 CP
Course	Special Aspects of Immunology		
Faculty/Subject/Department	08/Biology/Immunology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Immunology, 6th semester, obligatory		
Prerequisites	Core curriculum, Advanced studies, participation in module V-IM-SAI		
Intake capacity	16		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> understand the theoretical background of general and special immunological techniques acquire insight into the relevance of immunological techniques and detection procedures in clinical diagnosis, therapy and research learn the practice of immunology and apply the knowledge from the lectures to selected experiments, some lasting several days. learn how to record, log, document, evaluate and interpret original results. discuss the results obtained as compared to the expected results and perform a critical evaluation of errors. present the results to the group in terms of their biological relationship and their relevance for the understanding of basic immunological principles 		
Module content	<ul style="list-style-type: none"> Preparation of blood cell populations from body fluids (e.g. lymphocytes, PMNL, haemocytes, coelomocytes) Flow cytometry Macrophages and their activation Characterisation of T-cell subpopulations T-cell activation, activation by antigen receptors Immunosuppression Mixed lymphocyte cultures Detection of cytokines by bioassays, ELISA, flow cytometer Acquisition and purification of antibodies from hybridoma supernatants Analysis of antibodies, analysis using antibodies (Western Blot, Immunoprecipitation) Apoptosis versus necrosis Function and structure of cytokine receptors, receptor trafficking Acquisition and differentiation of myeloid precursor cells Phagocytosis assays Assays of blood cell motility and adhesion 		
Form(s) of instruction	Seminars (18%), tutorial in small groups (82%)		
Total workload	270 hours = 9 ECTS-credits		
Student workload	Attendance: Seminars 16 hours, Tutorial 84 hours,	Preparation/revision: Seminar/presentation 32 hours, Tutorial/Report 138 hours	
Method of assessment	Report, seminar presentation; oral exam (15 min.)		
Module grading	Reports (80%), presentation (10%), Oral exam (10%)		
Form of module component retake exam	None		
Form of retake exam	Written exam (100%) or oral exam (100%) will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 6 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-NS-3	6th sem.	6 CP
Course	Landscape Planning and Landscape Development		
Faculty/Subject/Department	08/Biology/Institute for General and Special Zoology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Nature Conservation, 6th semester, elective		
Prerequisites	BSc (Biol) module V-NS-1 (Fundamentals of Nature Conservation) and VN-S-2 (Nature Conservation Excursions)		
Intake capacity	20		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • be able to assess a selected part of the landscape in terms of nature conservation • master the ecological and landscape architectural basics for the construction of designs for re-establishment and use • know the basics for creating a management and development plan • have a great respect for life and develop the ability to make ethical judgements • have a high level of co-ordination and be able to set priorities 		
Module content	<ul style="list-style-type: none"> • Assessment of landscapes in terms of nature conservation • Construction of designs for re-establishment and use • Fundamentals of landscape architecture and landscaping measures • Creation of management and development plans 		
Form(s) of instruction	Lectures (11%), tutorial (67%), seminars (17%),		
Student workload	Attendance: Lectures 11 hours Tutorial with excursion 60 hours Seminar 17 hours	Preparation/revision: Lectures 24hours Tutorial 55 hours Seminars 10 hours	
Method of assessment	Portfolio; exam (60min.)		
Module grading	Portfolio (80%); exam (20%)		
Form of module component retake exam	None		
Form of retake exam	Portfolio (80%); exam (20%)		
Language of instruction	German/English		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-PÖ-ASP	6 th sem.	3 CP
Course	Work as Assistant in Plant Ecology		
Faculty/Subject/Department	08/Biology/Institute for Plant Ecology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Ecology, 6th semester, obligatory		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	20		
Learning outcomes	Students will: <ul style="list-style-type: none"> • have in-depth knowledge of the system "Plants and Environment" • have in-depth knowledge of the processes and expressions of the life of plants in their interactions with the environment • master the essential laboratory and field methods of plant ecology • be able to present their knowledge credibly and explain it clearly • be able to categorise and answer questions concerning ecological topics and also be able to explain the answers • learn social skills 		
Module content	<ul style="list-style-type: none"> • Basic knowledge for teaching the subject • Recapitulation of the system "Plants and Environment" • Training in ecological methods • Media techniques • Demonstration of training to a third party 		
Form(s) of instruction	Seminars (44%), tutorial (56%)		
Total workload	90 hours = 3 ECTS-Credits		
Student workload	Attendance: Seminars 40 hours, Tutorial 10 hours	Preparation/revision: Tutorial Seminar 40 hours	
Method of assessment	Seminar presentation		
Module grading	Seminar presentations (100%)		
Form of module component retake exam	None		
Form of retake exam	Seminar presentations (100%)		
Language of instruction	German		
Frequency	Annually, 6 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-PÖ-UMO	6 th sem.	6 CP
Course	Environmental Monitoring		
Faculty/Subject/Department	08/Biology/Institute for Plant Ecology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Ecology, 6th semester, elective		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	20		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> know the methodological approaches for recording and evaluation of the material burden on the environment understand the advantages and disadvantages of environmental monitoring networks in the context of ecosystem research have in-depth knowledge of the methods of deriving limit values be able to identify, quantify and assess pressures on the environment have a basic knowledge of environmental monitoring for production of the bachelor's theses 		
Module content	<ul style="list-style-type: none"> Air pollutants (gases, aerosols, deposition components of the air content) Characterisation of the soil as medium for plant growth Methods for quantifying the load of pollutants Transfer of pollutants (air/phytosphere, soil/water/plants) Substance-related biomonitoring (active, passive; indicators of accumulation/reaction) Climate biomonitoring (plant phenology) Measuring networks for observation of the environment (national/international, sectoral/ecosystem) Land inventory of emissions/pollution levels/effects Limit, target and reference values (national/international) Ecological assessment of the effects of climate change 		
Form(s) of instruction	Lectures (24%), seminars (12%), tutorial (60%), excursion (4%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: Lectures 14 hours, Seminars 7 hours, Tutorial 32 hours, Excursion 7 hours	Preparation/revision: Lectures 30 hours, Seminars 15 hours, Tutorial 75 hours	
Method of assessment	Seminar presentation; report		
Module grading	Presentation (40%), Report (60%)		
Form of module component retake exam	None		
Form of retake exam	Presentation (40%), Report (60%)		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-OE-BDF	6th sem.	6 CP
Course	Biodiversity & Identification Exercise		
Faculty/Subject/Department	08/Biology/Institute for General and Special Zoology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Animal Ecology, 6th semester, elective		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	20		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • master the dimensions of the biodiversity of organisms (from gene to ecosystem) • deal with the problems of the crisis of biodiversity • obtain in-depth knowledge of the diversity of native animal groups on the basis of selected examples • learn essential methods for biodiversity research (incl. molecular ecology) • master basic analytical procedures for biodiversity research • know simple simulation models for the spatial analysis of biodiversity • know the influence of the level of scale on biodiversity (α-, β- and γ-diversity) • know the importance of scientific collections • be able to use and communicate their knowledge and develop it further in a collective manner 		
Module content	<ul style="list-style-type: none"> • Fundamentals of biodiversity research • Advanced taxonomic techniques • Biodiversity modelling • The value and maintenance of scientific collections • Problem-oriented work in small groups • Scientific evaluation of data from multiple analyses • Techniques for publications and presentations 		
Form(s) of instruction	Lectures (17%), tutorial (54%), excursions (13%), seminar (16%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload	Attendance: Lectures 12 hours, Tutorial 55 hours, Excursions 18 hours, Seminars 5 hours	Preparation/revision: Lectures 18 hours, Tutorial 42 hours, Excursions 5 hours, Seminars presentation 25 hours	
Method of assessment	Reports, Seminar presentations; Reviews		
Module grading	Reports (20%), Seminar presentation (30%), Review (50%)		
Form of module component retake exam	None		
Form of retake exam	Reports (20%), Seminar presentation (30%), Review (50%)		
Language of instruction	German		
Frequency	Annually, 4 weeks block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-OE-BOD	6th sem.	3 CP
Course	Soil Ecology		
Faculty/Subject/Department	08/Biology/Institute for General and Special Zoology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Animal Ecology, 6th semester, obligatory		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	20		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have an overview of the major animal groups forming the native soil fauna and their ecological requirements • understand the function and performance of soil organisms in the soil ecosystem • have an overview of essential laboratory methods for soil ecology • know the procedures for the quantitative recording of soil fauna • know the basics of the determination of abiotic soil conditions • deal with essential procedures in soil microbiology • understand the relationships between soil functions and ecosystem functions • have a basic knowledge of soil ecology for production of the bachelor's theses (planning, evaluation and documentation of experiments). 		
Module content	<ul style="list-style-type: none"> • Quantitative procedures in soil zoology and soil microbiology • Location, soil, edaphon • Soil functions • Techniques in soil ecology • Stochastic planning of experiments • Microcosms, gas chromatography • Indices for soil evaluation • Evaluation techniques 		
Form(s) of instruction	Seminars (56%), tutorial (36%), demonstrations (8%),		
Total workload	90 hours = 3 ECTS-Credits		
Student workload	Attendance: Seminars 25 hours, Tutorial 12 hours, Demonstrations 8 hours	Preparation/revision: Tutorial 25 hours, Seminars 20 hours	
Method of assessment	Reports , Seminar presentation, Review		
Module grading	Reports (20%), Seminar presentation (30%), Review (50%)		
Form of module component retake exam	None		
Form of retake exam	Reports (20%), Seminar presentation (30%), Review (50%)		
Language of instruction	German		
Frequency	Annually, 2 week block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-PP-PBP	6th sem.	6 CP
Course	Photobiology of Plants		
Faculty/Subject/Department	08/Biology/Institute for General Botany and Plant Physiology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Plant Physiology, obligatory		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	16		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have basic knowledge of radiation biophysics • have in-depth knowledge of plant photosynthesis • have an overview of the effects of light and UV radiation on plant physiology • have an overview of plant photoreceptors, their molecular structure and signal transduction • have the skills to use light-physiological techniques • acquire experience with scientific methods of work (electronic resources, English-language scientific literature, presentation of concepts and results) • have a basic knowledge for production of the bachelor's theses 		
Module content	<ul style="list-style-type: none"> • Light: photons and waves; optics; quantity and spectral distribution; light in the natural environment, spectral radiometry • Photoreceptors: photon uptake, extinction, UV-Vis spectrophotometry, quantum yield, fluorescence, energy transfer, effect spectroscopy • Photosynthesis: structure and function of the photo system; gas exchange, CO₂ fixation and intermediate metabolism; origin, adaptation and protection system of the photosynthetic apparatus • Photomorphogenesis and movement reactions to light • Injurious effects of light and UV radiation; protective pigments; photolyases • Plant photoreceptors and their signal system • Light perception in the natural environment • Advanced microscopy • Final presentations 		
Form(s) of instruction	Lectures (50%), Laboratory work in small groups (50%)		
Total workload	180 hours = 6 ECTS-Credits		
Student workload	Attendance: Lectures 30 hours, Laboratory work in small groups 60 hours,	Preparation/revision: Lectures 60 hours, Laboratory work in small groups 30 hours	
Method of assessment	Exam (120 min.); presentation		
Module grading	Exam (60%), presentation (40%)		
Form of module component retake exam	None		
Form of retake exam	Exam (60%), presentation (40%)		
Language of instruction	German		
Frequency	Annually, 4 week block, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-ZB-MMM	
Course	Modern Microscopic Methods	
Faculty/Subject/Department	08/Biology/Institute for General Zoology and Developmental Biology, Institute for Botany	
Module coordinator	Cf. German version	
Classification	BSc (Biol), in-depth phase, specialisation in Cell Biology, 6th semester, elective	
Prerequisites	Core curriculum, Advanced studies	
Intake capacity	16	
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have in-depth knowledge of the theory and practical use of various types of microscopes • acquire knowledge of various fixing and preparation techniques for histological sections • have an overview of the procedures and the physical and chemical relationships of various classical histological staining techniques • acquire knowledge about the detection of various substances • learn in detail the basics of immunohistochemistry and other labelling techniques • acquire knowledge of various fluorescence-based techniques • have in-depth knowledge of cells and tissues in animals and plants • be able to perform comparative evaluations of histological sections (from light and electron microscopy), to document them and to compared them in oral and written discussions 	
Module content	<ul style="list-style-type: none"> • Light microscopy (transmitted light, phase contrast and differential-interference microscopy) • Electron microscopy (theory) • Fluorescence microscopy (light microscope, confocal laser scanning microscope) • Chemical fixatives • paraffin and plastic-embedded sections, cryosections • Physical/physicochemical stains (haematoxylin, trichrome and other stains) • Histochemical detection (detection of chitin, sugars, neurotransmitters and other substances) • Direct and indirect immunohistochemistry, enhancing procedures, cross-reactions and artefactual reactions antibodies • Properties of fluorochromes, labelling procedures • Vertebrate and invertebrate tissues and plant tissues • Photographic techniques, image processing 	
Form(s) of instruction	Lectures (20%), seminars (14%), Tutorial in small groups (66%)	
Student workload	Attendance: Lectures 35 hours, Seminars 6 hours, Tutorial 70 hours	Preparation/revision: Lectures 20 hours Seminars 32 Tutorial 107
Method of assessment	Report, presentation	
Module grading	Report/presentation (60%), presentation (40%)	
Form of module component retake exam	None	
Form of retake exam	Report/presentation (60%), presentation (40%)	
Language of instruction	German	
Frequency	Annually, 4 + 2 week blocks, summer semester	

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-ZO-ENT	6th sem.	6 CP
Course	Entomology		
Module coordinator:	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Zoology, 6th semester, elective		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	min. 4 / max. 16		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • acquire in-depth knowledge of the physiology, biochemistry and pathology of insects • have an overview of applied entomology (pest management) • acquire an overview of the phylogeny of insects • have knowledge of insects as model organisms in fundamental research • gain experience in scientific, educational and public-related methods of working. 		
Module content	<ul style="list-style-type: none"> • External and internal anatomy of insects • Practical preparations • Analysis of anatomical/histological preparations • Performance of physiological experiments <ul style="list-style-type: none"> o on moulting and metamorphosis o on chemoreception o on behaviour and co-ordination o on reproduction • Model experiments on insect pathology (nematodes, <i>Bacillus thuringiensis</i>, baculoviruses, ichneumon flies) • Case-oriented analysis of an insect-caused disaster and discussion of control strategies • Theoretical knowledge about the practice of apiculture • Insect models in fundamental research (genetics, development, immunology, chemocology and other areas) on the basis of current knowledge • Literature and Internet searches, • Presentation of concepts and results by means of seminar presentations and posters 		
Form(s) of instruction	Lectures (23%), seminars (53%), Tutorial with work in small groups (24%)		
Student workload	Attendance: Lectures 16 hours, Tutorial 45 hours, Seminars 5 hours,	Preparation/revision: Lectures 25 hours, Tutorial 50 hours, Seminars 39 hours	
Total workload	180 hours = 6 ECTS credits		
Method of assessment	Exam with preparation, Report/poster, Seminar presentation		
Module grading	Exam with preparation (20%), Report/poster (60%), Seminar presentation (20%)		
Form of module component retake exam	None		
Form of retake exam	Exam with preparation (20%), Report/poster (60%), Seminar presentation (20%)		
Language of instruction	German, English		
Frequency	Annually, 4 week blocks, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-ZO-STK	6th sem.	6 CP
Course	Mammalogy		
Faculty/Subject/Department	08/Biology/Institute for General and Special Zoology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Zoology, 6th semester, elective		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	max. 16		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • acquire in-depth knowledge of the biology, functional morphology and physiology of mammals • have an overview of the evolution and the system of recent mammals • acquire an insight into mammalian adaptation to various habitats • have knowledge about legal foundations of animal experiments in open land • have knowledge of bats and small mammals as model organisms in fundamental research • gain experience in scientific, educational and public-related methods of working. 		
Module content	<ul style="list-style-type: none"> • Mammalian anatomy • Analysis of anatomical preparations • Performance of laboratory and field experiments <ul style="list-style-type: none"> o on energy metabolism o on heat regulation o on food acquisition • Case-oriented analysis of the influence of the prey spectrum and habitat structure on the presence of bats • Literature and Internet searches on the reproductive biology, food acquisition, metabolic physiology of mammals • Presentation of concepts and results by means of seminar presentations 		
Form(s) of instruction	Lectures (20%), seminars (10%), tutorial (70%)		
Total workload	180 hours = 6 ECTS-credits		
Student workload F=1.6	Attendance (68 hours): Lectures 12 hours, Seminars 8 hours, Tutorial 48 hours	Preparation/revision (112 hours): Lectures 24 hours, Seminars: 10 hours Tutorial: 78 hours	
Method of assessment	Seminar presentation; report		
Module grading	Presentation (30%), Report (70%)		
Form of module component retake exam	None		
Form of retake exam	Seminar presentation (30%), Report (70%)		
Language of instruction	German		
Frequency	Annually, 4 week blocks, summer semester		

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Please note that only the German version of the modules is official and legally binding. The English version is for informative purposes only.

Code	V-EX-EBI	6th sem.	3 CP
Course	Developmental Biology Excursion to Helgoland or Banyuls		
Module coordinator:	Cf. German version		
Classification	BSc (Biol), in-depth phase, specialisation in Team Work/Excursions, 6th semester, elective		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	min. 10 / max. 19 or 24 (depending on location and acceptance of bookings)		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have an overview of the diversity of development in marine organisms • acquire an overview of the role of larvae in plankton • acquire knowledge about the developmental physiology of marine organisms in experiments • understand mechanisms of reproduction and handling of gametes • experience living organisms in their natural habitat (collecting activity) • be able to perform selected experiments in small groups • be able to analyse the causality of developmental parameters • gain experience with modern techniques for documentation and presentation 		
Module content	<ul style="list-style-type: none"> • Reproductive biology of model organisms • Preparation and harvesting of gametes • Analysis and documentation of normal development • Experimental analysis of developmental parameters • Production of presentation materials and presentation of group work • Production of embryological tools 		
Form(s) of instruction	Lectures (17%), Tutorial with work in small groups (66%), seminars (17%)		
Total workload	90 hours = 3 ECTS-Credits		
Student workload	Attendance: Lectures 10 hours, Tutorial 45 hours, Seminars 5 hours	Preparation/revision: Lectures 5 hours Tutorial 15 hours, Seminars 10 hours	
Method of assessment	Report, Seminar presentation		
Module grading	Report (50%), Seminar presentation (50%)		
Form of module component retake exam	None		
Form of retake exam	Report (50%), Seminar presentation (50%)		
Language of instruction	German		
Frequency	Annually, 2 week blocks, summer semester		

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Code	V-EX-MAR	6th sem.	3 CP
Course	Marine Biology Field Trip to Helgoland		
Module coordinator:	Cf. German version		
Lecturers	Trenczek		
Guidance	Trenczek		
Classification	BSc (Biol), in-depth phase, specialisation in Team Work/Excursions, 6th semester, elective		
Prerequisites	Core curriculum, Advanced studies		
Intake capacity	min. 10 / max. 15 or 18 (depending on acceptance of booking)		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have an overview of the adaptation of marine organisms to life in rocky tidal flats • acquire an overview of marine organisms and birds of the North Sea • have knowledge of the physiological performance of marine organisms • acquire an overview of the effects of geophysical parameters on the water balance of the sea and the associated ecological relationships • experience living organisms in their natural habitat • be able to conduct selected projects in small groups • gain experience with modern techniques for documentation and presentation 		
Module content:	<ul style="list-style-type: none"> • Determination of various groups of marine animals including plankton • Practical preparations • Physiological experiments on electrolyte balance, osmoregulation, filtration, influence of salinity, temperature and tides on physiological processes, etc. • Analysis of the population distribution of marine communities (bivalves, crustaceans) • Production of presentation materials (computer system in the AWI classroom) and presentation of group work 		
Form(s) of instruction	Lectures (17%), Tutorial with work in small groups (66%), seminars (17%)		
Total workload	90 hours = 3 ECTS-credits		
Student workload	Attendance: Lectures 10 hours, Tutorial 45 hours Seminars 5 hours	Preparation/revision: Lectures 5 hours Tutorial 45 hours Seminar 10 hours	
Method of assessment	Report; Seminar presentation		
Module grading	Report (50%), Seminar presentation (50%)		
Form of module component retake exam	None		
Form of retake exam	Report (50%), Seminar presentation (50%)		
Language of instruction	German		
Frequency	Annually, 2 week blocks, summer semester		

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Code	V-AT-ALL	6th sem.	3 CP
Course	Work as Assistant and Teamwork		
Faculty/Subject/Department	08/Biology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase, 6 th semester		
Prerequisites	Core curriculum, advanced studies		
Intake capacity	Subject-specific (see current notice)		
Learning outcomes	<p>Students will:</p> <ul style="list-style-type: none"> • have in-depth knowledge in a specific subject area • master the essential methods of their subject • be able to present their knowledge credibly and explain it clearly • be able to categorise and answer questions concerning topics in their subject and also be able to explain the answers • master a basic knowledge of the use of modern media in teaching and public relations • learn social skills 		
Module content	<ul style="list-style-type: none"> • Basic knowledge for teaching the subject • Subject-specific recapitulation • Training in subject-specific methods • Training in scientific/correct popular scientific terminology • Media technology (video, projector/CD/DVD, optical instruments and computers) • Demonstration of training to a third party 		
Form(s) of instruction	Tutorial (44%), seminars (56%)		
Student workload	Attendance: Seminars 40 hours, Tutorial 10 hours	Preparation/revision: Tutorial 10 hours Seminars 40 hours	
Method of assessment	Seminar presentation or report; will be announced at the beginning of the module		
Module grading	No grades. Module is passed if seminar presentation or report is accepted		
Form of module component retake exam	None		
Form of retake exam	Seminar presentation (100 %) or report (100%); will be announced at the beginning of the module		
Language of instruction	German		
Frequency	Annually, 2 week blocks, summer semester		

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Code	V-TH-XXX	6th sem.	12 CP
Course	Bachelor's thesis		
Faculty/Subject/Department	08/Biology		
Module coordinator	Cf. German version		
Classification	BSc (Biol), in-depth phase		
Prerequisites	Core curriculum, advanced studies, obligatory specialist modules in the advanced studies phase		
Intake capacity			
Learning outcomes	Students should: <ul style="list-style-type: none"> • possess the skills, on the basis of an actual task from a field of biological activity, to use scientific methods • present their results as a scientific work 		
Module content	<ul style="list-style-type: none"> • Drafting a plan of work, • Introduction to the literature, • Development of methods for measurement and evaluation, performance and evaluation, discussion of the results, • Production of the thesis • Full-time instruction on scientific work in a scientific team 		
Form(s) of instruction	scientific work		
Total workload	360 hours = 12 ECTS-Credits		
Student workload	Scientific work 360 hours		
Method of assessment	Writing of the thesis		
Form of module component retake exam	None		
Form of retake exam	According to § 34 (2) AIB		
Language of instruction	German or English (Thesis title: German and English)		
Frequency	Winter semester, summer semester, 8 weeks block, preferably in the 6th semester		