



# Internationaler Studiengang Technische und Angewandte Biologie ISTAB (B.Sc.)

Module Descriptions

## Module title: Animal and Plant Diversity I

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| <b>Module code 1.1</b> | <b>Semester 1</b> |
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| <b>Coordinator</b>                         | Prof. Dr. Dietmar Zacharias   |
| <b>Aims including key qualification</b>    | Understanding of principles of plant and animal body plans; connection of morphology and physiological function; gain insight into biodiversity. Student is able to work on a scientific level (investigation methods, documentation of the results, using scientific literature).  |
| <b>Contents</b>                            | Animal biodiversity: definition of „animal“, overview over selected phyla of animal kingdom (invertebrates); fundamental terms of systematic and taxonomy; evolution of metazoa; histogenesis, germ layers, symmetry and anatomical terms of location, development of coelom, metamerism. Practical courses: mollusca, crustacea and insecta (macrozoobenthos). |
| <b>Literature</b>                          | The current recommended reading is distributed at the beginning of the term.  |
| <b>Instructor</b>                          | Prof. Dr. Heiko Brunken, Prof. Dr. Dietmar Zacharias  |
| <b>Type</b>                                | Compulsory module   |
| <b>Teaching methods</b>                    | Seminar (2 hrs per week), Laboratory practical (2 hrs per week)   |
| <b>Learning methods</b>                    | Group work  |
| <b>Assessment</b>                          | Written assessment  |
| <b>Duration of assessment</b>              | 90 Minutes  |
| <b>Prerequisites</b>                       | none  |
| <b>Study system usability</b>              | Fundamental module in the first term.   |
| <b>Workload</b>                            | 4 + 8   |
| <b>Contact time</b>                        | 4 + 1   |
| <b>Self-study (hours)</b>                  | 8 (including guided exercises 1 hr per week)  |
| <b>ECTS points (credits)</b>               | 6   |
| <b>Frequency</b>                           | 15 lectures per academic year as a blocked seminar  |
| <b>Conditions for the award of credits</b> | Pass the assessment at least „sufficient“   |

## Module title: Chemistry of Life I

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| <b>Module code 1.2</b> | <b>Semester 1</b> |
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| Coordinator                         | Prof. Dr. Gerd Klöck   |
| Aims including key qualification    | Comprehension of basic principles of chemistry, chemistry of water and solutions, selected examples of organic reactions. Safety in the chemical laboratory. Chemical calculations (concentrations, dilutions, reactions, mass balances) |
| Contents                            | Lectures with practical exercises (calculations): Elements of life, water, solutions and salts, chemistry of simple carbon compounds, chemical calculations  |
| Literature                          | The current recommended reading is distributed at the beginning of the term.   |
| Instructor                          | Prof. Dr. Gerd Klöck   |
| Type                                | Compulsory module  |
| Teaching methods                    | Seminaristic tuition, Guided exercises   |
| Learning methods                    | Group work and exercises   |
| Assessment                          | Written assessment   |
| Duration of assessment              | 90 Minutes   |
| Prerequisites                       | -  |
| Study system usability              | -  |
| Workload                            | 4 + 8  |
| Contact time                        | 4 + 1  |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week)   |
| ECTS points (credits)               | 6  |
| Frequency                           | 15 lectures per academic year as a blocked seminar   |
| Conditions for the award of credits | Pass the assessment at least „sufficient“  |

## Module title: Introduction to Microbiology

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|------------------------|-------------------|
| <b>Module code 1.3</b> | <b>Semester 1</b> |
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| Coordinator                      | Prof. Dr. Tilman Achstetter   |
| Aims including key qualification | Appreciation of the importance of micro organisms (MOs incl. virus) as smallest beings to the biosphere, comprehension of positive and negative interactions with human beings, difficulty linked to the species concept, perception of MOs as model systems for an understanding of complex biological systems (populations, ecosystems, multicellular organisms); handling of MOs in the lab (like microscopy, working in sterile conditions); basic understanding for the methodology of scientific work (scientific problem, developing a scientific hypothesis, literature research, experiments as proof of hypothesis method scientific documentation)   |
| Contents                         | <p>Introduction: Position of micro organisms (MOs) (prokaryotes, eukaryotes, virus) among all living things, cell biology of prokaryotes and microbial eukaryotes, metabolism, materials cycle (like carbon c., nitrogen c., phosphate c.), capabilities and use of MOs, interactions between MOs and humans, detection, microbial growth and growth control.</p> <p>Laboratory practical: Handling of MOs (Bacteria, fungi); working in sterile conditions, microscopy; isolation, characterization and propagation, growth control, quantitative aspects (size estimation, life cell count), preparation of a meaningful scientific protocol</p> <p>Assignment: photo gallery and literature research on selected MOs</p> |
| Literature                       | The current recommended reading is distributed at the beginning of the term.  |
| Instructor                       | Prof. Dr. Tilman Achstetter, Prof. Dr. Gerd Klöck   |
| Type                             | Compulsory module   |
| Teaching methods                 | Seminar (2 hrs per week), Laboratory practical (2 hrs per week)   |
| Learning methods                 | Laboratory practical, Group work  |
| Assessment                       | Written assessment  |
| Duration of assessment           | 90 min  |
| Prerequisites                    | -   |
| Study system usability           | -   |
| Workload                         | 4 + 8 hrs per week  |
| Contact time                     | 4 + 1   |
| Self-study (hours)               | 8 (including guided exercises 1 hr per week)  |
| ECTS points (credits)            | 6   |
| Frequency                        | 15 lectures per academic year as a blocked seminar  |
| Conditions for the award of      | Pass the assessment at least „sufficient“   |

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credits

## Module title: Chemistry of Life II

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| <b>Module code 1.4</b> | <b>Semester 1</b> |
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|-------------------------------------|--|
| Coordinator                         | Prof. Dr. Tilman Achstetter  |
| Aims including key qualification    | Understanding of the importance of chemistry as the basis of life, introduction to fundamental operations of (bio-) chemical lab work, appreciation for quality in the laboratory work (in the sense of <i>Good laboratory practice</i> , GLP) and safety in the lab, chemical calculus, scientific documentation  |
| Contents                            | <i>Laboratory practical:</i> Experimental work (under supervision), realisation of textbook elaborated procedures, preparation of solutions and buffers; weighing, reading of pH, photometry, titrimetry, simple chemical detection methods; handling and detection of biological components (amino acids, simple sugars, lipids) and biopolymers (polypeptides, polysaccharides, polynucleotides), validation of scientific measurements, ), preparation of a meaningful scientific protocol;<br>Assignment: Lab report |
| Literature                          | The current recommended reading is distributed at the beginning of the term.   |
| Instructor                          | Prof. Dr. Tilman Achstetter, Prof. Dr. habil. Gerd Klöck   |
| Type                                | Compulsory module  |
| Teaching methods                    | Laboratory practical (4 hrs per week)  |
| Learning methods                    | Laboratory practical, Group work   |
| Assessment                          | Written exam   |
| Duration of assessment              | 90 min   |
| Prerequisites                       | -  |
| Study system usability              | -  |
| Workload                            | 4 + 8 hrs per week   |
| Contact time                        | 4 + 1  |
| Self-study (hours)                  | 8  |
| ECTS points (credits)               | 6  |
| Frequency                           | 15 lectures per academic year as a blocked seminar   |
| Conditions for the award of credits | Pass the assessment at least „sufficient“  |

## Module title: Mathematics

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|------------------------|-------------------|
| <b>Module code 1.5</b> | <b>Semester 1</b> |
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| Coordinator                         | Prof. Dr. Heiko Brunken   |
| Aims including key qualification    | Acquisition of the mathematic and statistic bases required for the biology study. The teaching content is adapted to later applications during study and professional life.   |
| Contents                            | <p>Mathematics: Repetition of fundamental knowledge like fractional, exponential and differential arithmetic; lab calculations like dilution series and rule of proportions, ratio of mixtures.</p> <p>Statistics: sample, distributions, average value, median, standard deviation; zero hypothesis and alternative hypothesis, confidence level, significances; data types, simple statistic tests (e.g. Wilcoxon, Chi-quadrade, U-Test, correlation).</p> <p>Data processing: introduction into spreadsheets and data bases (Windows applications, Excel and Access).</p> <p>Guided exercises including computer exercises</p> |
| Literature                          | The current recommended reading is distributed at the beginning of the term.  |
| Instructor                          | Mr. Helmut Schottmüller   |
| Type                                | Compulsory module   |
| Teaching methods                    | Seminar   |
| Learning methods                    | Group work  |
| Assessment                          | Written exam  |
| Duration of assessment              | 90 Minutes  |
| Prerequisites                       |   |
| Study system usability              | Fundamental module in the first term.   |
| Workload                            | 4 + 8   |
| Contact time                        | 4 + 1   |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week)  |
| ECTS points (credits)               | 6   |
| Frequency                           | 15 lectures per academic year   |
| Conditions for the award of credits | Pass the assessment at least „sufficient“   |

## Module title: Animal and Plant Diversity II

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|------------------------|-------------------|
| <b>Module code 2.1</b> | <b>Semester 2</b> |
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|-------------------------------------|--|
| Coordinator                         | Prof. Dr. Heiko Brunken  |
| Aims including key qualification    | General overview on biodiversity of vertebrates and cormophytes, advanced knowledge of morphology, organisation principles and technical terms within classification and taxa identification; methods for investigation and species identification, preparation, preservation (collection and display) of botanical and zoological objects; competence in using technical literature within zoology and botany.  |
| Contents                            | <u>Animal biodiversity</u> : animal organization and evolution, morphological and ecological adaption; species identification of vertebrates; practical courses: fish biodiversity, field exercises in ornithology, preparation of mammals (cranium, bones). <u>Plant biodiversity</u> : ferns and spermatophytes; morphology and ecology of sexual reproduction (flower and fruit); mechanisms of sexual and vegetal proliferation and distribution; blueprints and characteristics of species-rich Central European plant families; species identification practice in the lab and in the field. <u>Module-related exercises</u> : excursions in ornithology including evaluation of field data, scientific herbarium. |
| Literature                          | The current recommended reading is distributed at the beginning of the term.   |
| Instructor                          | Prof. Dr. H. Brunken, Prof. Dr. D. Zacharias   |
| Type                                | Compulsory module  |
| Teaching methods                    | Seminar, Laboratory practical  |
| Learning methods                    | Group work   |
| Assessment                          | Written exam   |
| Duration of assessment              | 90 Minutes   |
| Prerequisites                       |  |
| Study system usability              | Fundamental module in the second term; consecutive to „Animal and Plant Diversity I“   |
| Workload                            | 4 + 8  |
| Contact time                        | 4 + 1  |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week)   |
| ECTS points (credits)               | 6  |
| Frequency                           | 15 lectures per academic year as a blocked seminar   |
| Conditions for the award of credits | Pass the assessment at least „sufficient“  |

## Module title: Environmental Biology I: Material and Energy Flow in Biological Systems

| Module code 2.2                     | Semester 2   |
|-------------------------------------|--|
| Coordinator                         | Prof. Dr. Dietmar Zacharias  |
| Aims including key qualification    | Competence in understanding systems, understanding of hierarchy of ecological systems (population up to biosphere), handling of scales (time, space) and working with scales, competence in understanding of processes (energy flow, material cycle) connected with applied questions (e.g. balancing). Basics of ecosystem analysis including theoretical concepts; selected methods of soil ecology.   |
| Contents                            | Ecosystem approach as basic element of Convention on Biodiversity of the United Nations (UN-CBD). Theory of the term ecosystem and resulting consequences for practical implementation. Biodiversity, interaction and processes of ecosystems and ecosystem services (energy flow, material cycle, hydrological balance). Balancing and concretion focussing on soil ecology and methods of soil ecology (soil classification, soil biology, mass and hydrological balance. Presentation and procurement of scientific correlations in seminaristic tuition and at field trips; landscape ecology.<br><u>Guided exercises:</u> working with literature as basis for presentations. |
| Literature                          | The current recommended reading is distributed at the beginning of the term.   |
| Instructor                          | Prof. Dr. H. Koehler, Prof. Dr. D. Zacharias, Prof. Dr. H. Brunken   |
| Type                                | Compulsory module  |
| Teaching methods                    | Seminaristic tuition   |
| Learning methods                    | Group work   |
| Assessment                          | Written exam   |
| Duration of assessment              | 90 Minutes   |
| Prerequisites                       | Basic knowledge in biodiversity, microbiology and chemistry  |
| Study system usability              | Fundamental module in the second term  |
| Workload                            | 4 + 8  |
| Contact time                        | 4 + 1  |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week)   |
| ECTS points (credits)               | 6  |
| Frequency                           | 15 lectures per academic year  |
| Conditions for the award of credits | Pass the assessment at least „sufficient“  |



## Module title: Introduction to Formal and Molecular Genetics

| Module code 2.3                     | Semester 2  |
|-------------------------------------|---|
| Coordinator                         | Prof. Dr. Tilman Achstetter   |
| Aims including key qualification    | Understanding of the basics of inheritance, of the interrelationship of phenotype and genotype; development of the capacity to abstraction using the Mendelian rules; appreciation of the molecular basis of genetics, of the importance of the dynamic equilibrium between stability and change (evolution) of the genetic material; introduction to a scientific argumentation looking at key experiments   |
| Contents                            | <u>Formal Genetics</u> : Mendelian rules (model organisms), genes and alleles, meaning of mutation(s), cell cycle (structure of eukaryotic chromosomes, mitosis, meiosis), introduction to human genetics; <u>Molecular Genetics</u> : constituents and structure of hereditary material (DNA/RNA, chromosomal organisation), replication, mechanisms of mutation and repair, transcription, translation; mechanisms of lateral gene transfer;<br><i>Assignment</i> : Reviewing an original publication (essay) |
| Literature                          | The current recommended reading is distributed at the beginning of the term.  |
| Instructor                          | Prof. Dr. T. Achstetter   |
| Type                                | Compulsory module   |
| Teaching methods                    | Seminar (4 hrs per week)  |
| Learning methods                    | Group work  |
| Assessment                          | Written exam  |
| Duration of assessment              | 90 min  |
| Prerequisites                       | successful participation at modules 1.2 „Chemistry of life I” and 1.4 “Chemistry of life II” (Pass the assessments)   |
| Study system usability              | -   |
| Workload                            | 4 + 8   |
| Contact time                        | 4 + 1   |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week)  |
| ECTS points (credits)               | 6   |
| Frequency                           | 15 lectures per academic year as a blocked seminar  |
| Conditions for the award of credits | Pass the assessment at least „sufficient“   |

## Module title: Biotechnology I: Biochemistry and Cell Biology

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|------------------------|-------------------|
| <b>Module code 2.4</b> | <b>Semester 2</b> |
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| Coordinator                      | Prof. Dr. Gerd Klöck  |
| Aims including key qualification | Comprehension of the basic principles of biochemical reactions and the links between biochemistry and cell biology.<br>Basic understanding of self-organisation in biochemistry cell biology (membranes, proteins). Insight in the principles of evolution of eukaryotic cells (endosymbiosis, evolution of mitochondria and chloroplasts). Comprehension of the scientific method. |
| Contents                         | Lectures with exercises: water, lipids, carbohydrates, proteins, membranes, selected cell types, methods of cell biology, cytoskeleton, energy metabolism, cell motility, intra- and trans-cellular transport, cell division, signal transduction.  |
| Literature                       | The current recommended reading is distributed at the beginning of the term.  |
| Instructor                       | Prof. Dr. rer. nat. habil. Gerd Klöck   |
| Type                             | Compulsory module   |
| Teaching methods                 | Seminar (4 hrs per week)  |
| Learning methods                 | Group work and exercises  |
| Assessment                       | Written exam  |
| Duration of assessment           | 90 Minutes  |
| Prerequisites                    | -   |
| Study system usability           | -   |
| Workload                         | 4 + 8   |
| Contact time                     | 4 + 1   |
| Self-study (hours)               | 8 (including guided exercises, 1 hr per week)   |

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| ECTS points (credits)               | 6  |
| Frequency                           | 15 lectures per academic year as a blocked seminar |
| Conditions for the award of credits | Pass the assessment at least „sufficient“          |

## Module title: English

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|------------------------|-------------------|
| <b>Module code 2.5</b> | <b>Semester 2</b> |
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| Coordinator                         | Prof. Dr. Heiko Brunken   |
| Aims including key qualification    | This course aims to enable the students to generally communicate in English, especially in the professional life and in an academic environment (application for admission to university or an internship).<br>Gain of language and cultural abilities, basic understanding for English technical terms |
| Contents                            | Language laboratory   |
| Literature                          | The current recommended reading is distributed at the beginning of the term.  |
| Instructor                          | Mrs. Daniela Heßlinger  |
| Type                                | Compulsory module   |
| Teaching methods                    | Language exercises  |
| Learning methods                    | Group work  |
| Assessment                          | Paper   |
| Duration of assessment              | 90 Minutes  |
| Prerequisites                       |   |
| Study system usability              | Fundamental module in the second term   |
| Workload                            | 4 + 8   |
| Contact time                        | 4   |
| Self-study (hours)                  | 8   |
| ECTS points (credits)               | 6   |
| Frequency                           | 15 lectures per academic year   |
| Conditions for the award of credits | Pass the assessment at least „sufficient“   |

## Module title: Biotechnology II: Introduction to Biochemical Engineering – Upstream Processes

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|------------------------|-------------------|
| <b>Module code 3.1</b> | <b>Semester 3</b> |
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| Coordinator                         | Prof. Dr. Gerd Klöck  |
| Aims including key qualification    | This course aims to comprehension of basic concepts in modern biotechnology. It focuses on the upstream processing aspects of biotechnology and will allow students to be aware of how cell based products are manufactured and commercialised. The central theme of this course is to provide students with knowledge and understanding of quality assurance and control.  |
| Contents                            | Lectures: Selected biotechnological processes, culture of bacteria, yeast, microalgae, and mammalian cells, basic concepts of bioreactors, examples: production of GFP in <i>E.coli</i> , production of microalgae, monoclonal antibodies in mammalian cells. Quality control in bio processing<br>Laboratory: Production of GFP in <i>E.coli</i> , fermentation, $K_{La}$ , OTR, validation of analytical methods. |
| Literature                          | The current recommended reading is distributed at the beginning of the term.  |
| Instructor                          | Prof. Dr. rer. nat. habil. Gerd Klöck   |
| Type                                | Compulsory module   |
| Teaching methods                    | Seminar (2 hrs per week), Laboratory practical (2 hrs per week)   |
| Learning methods                    | Group work and exercises  |
| Assessment                          | Written exam  |
| Duration of assessment              | 90 Minutes  |
| Prerequisites                       | -   |
| Study system usability              | -   |
| Workload                            | 4 + 8   |
| Contact time                        | 4 + 1   |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week)  |
| ECTS points (credits)               | 6   |
| Frequency                           | 15 lectures per academic year as a blocked seminar  |
| Conditions for the award of credits | Pass the assessment at least „sufficient“   |

## Module title: Environmental Biology II: Applied Botany

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|------------------------|-------------------|
| <b>Module code 3.2</b> | <b>Semester 3</b> |
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| Coordinator                      | Prof. Dr. Dietmar Zacharias  |
| Aims including key qualification | Acquirement of botanical expert knowledge. Students are able to use that knowledge in context of scientific and applied questions. Understanding of analysis and assessment methods; library competence. Recognition of anthropogenic influence on biodiversity and ecosystems and therewith connected change of the biosphere.  |
| Contents                         | Theoretical module with elements at out-of-university learning locations (e. g. visiting Leibniz Institute of Plant Genetics and Crop Plant Research (IPK) in Gatersleben), seminaristic tuition and student presentations. Basics of botanical systematic, taxonomy, chorology and vegetation ecology (population biology, phytocoenosis, habitat key factors, shifts in vegetation type), basics of paleobotany (vegetation as a not static system); basics of biology of agricultural and horticultural crops connected with principles of physiology of plants (evolution, domestication, metabolism, production of plants as a basis for human life). Botanical analyse and assessment methods linked with applied questions: Recording and classification of flora and vegetation, plants as bio indicator, preservation of genetic diversity as a basis for sustainable land use (connected with implementation of international conventions (CBD, EU Habitats Directive). <u>Module-related exercises</u> : working with primary literature, preparing presentations |
| Literature                       | The current recommended reading is distributed at the beginning of the term.   |
| Instructor                       |  |
| Type                             | Compulsory module  |
| Teaching methods                 | Seminar, guided exercises  |
| Learning methods                 | Group work   |
| Assessment                       | Written exam   |
| Duration of assessment           | 90 Minutes   |
| Prerequisites                    | Basic knowledge in botany from the first academic year   |
| Study system usability           | Fundamental module in the second academic year   |
| Workload                         | 4 + 1  |
| Contact time                     | 4 Seminar (equals to 60 hrs per term)  |
| Self-study (hours)               | 8 (including guided exercises 1 hr per week)   |
| ECTS points (credits)            | 6  |
| Frequency                        | 15 lectures per academic year as a blocked seminar   |
| Conditions for the award of      | Pass the assessment at least „sufficient“  |

credits

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## Module title: Environmental Biology III: Applied Zoology

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|------------------------|-------------------|
| <b>Module code 3.3</b> | <b>Semester 3</b> |
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| Coordinator                         | Prof. Dr. Heiko Brunken   |
| Aims including key qualification    | Advanced concepts, terms and ideas in zoological systematic and taxonomy, ecology, ethology and physiology; how to distinguish between ultimate and proximate causes in zoology. Application of zoological based knowledge in relevant professional experience. Basics of zoological surveying and mapping in the field including evaluation of data; competence in scientific literature and database query.   |
| Contents                            | Basics of zoological systematic and taxonomy against the background of international Convention on Biodiversity; basics in animal ecology (population ecology, competition, predation, parasitism, mutualism), basics in ethology and socio-biology; basics in animal physiology (homoeostasis, neurobiology, sensory physiology). Methods of faunistic field surveys and data evaluation applied to professional experience: animals as bio indicators (fishes and macro invertebrates as quality components within European Water Framework Directive) and target species in nature conservation with the focus on EU Habitats Directive (mammals, avifauna, amphibians, dragonflies); keeping animals in zoological gardens, the role of zoological museums. |
| Literature                          | The current recommended reading is distributed at the beginning of the term.  |
| Instructor                          | Prof. Dr. H. Brunken  |
| Type                                | Compulsory module   |
| Teaching methods                    | Seminar   |
| Learning methods                    | Group work  |
| Assessment                          | Oral examination  |
| Duration of assessment              | 20 Minutes  |
| Prerequisites                       | Basic knowledge in zoology from the first academic year   |
| Study system usability              | Fundamental module in the second academic year  |
| Workload                            | 4 + 8   |
| Contact time                        | 4 + 1   |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week)  |
| ECTS points (credits)               | 6   |
| Frequency                           | 15 lectures per academic year as a blocked seminar  |
| Conditions for the award of credits | Pass the assessment at least „sufficient“   |



## Module title: Biotechnology III: Molecular Biology and Immunology

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|------------------------|-------------------|
| <b>Module code 3.4</b> | <b>Semester 3</b> |
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| Coordinator                         | Prof. Dr. Tilman Achstetter  |
| Aims including key qualification    | Comprehension of cause-effect linkages of molecular, cellular and physiological processes.<br>Understanding of the relationship between the macroscopic phenotype and the underlying molecular and cellular processes; inside into two central fields of modern biology (Molecular Biology and Immunology)<br>Acquisition of competences for advanced studies in these special fields  |
| Contents                            | Molecular biology: Introduction to architecture and regulation of genes, to structure and function in promoters (cis and trans acting factors of the transcription machinery, comparison of gene expression in pro- and eukaryotes), selected examples;<br>Immunology: central concepts of immunology, the two immune systems in humans, components of innate and acquired immunity, antigen-antibody, antigen-presenting cells, HLA, B-cell development, genes and antibody production, T-cells, viruses<br>Guided exercises: Questions addressing the content, writing an essay about a selected theme, bibliography and analysis of selected examples of the literature |
| Literature                          | The current recommended reading is distributed at the beginning of the term.   |
| Instructor                          | Prof. Dr. Tilman Achstetter, Prof. Dr. habil. Gerd Klöck   |
| Type                                | Compulsory module  |
| Teaching methods                    | Seminar (4 hrs per week)   |
| Learning methods                    | Group work   |
| Assessment                          | Written exam   |
| Duration of assessment              | 90 min   |
| Prerequisites                       | -  |
| Study system usability              | -  |
| Workload                            | 4 + 8  |
| Contact time                        | 4 + 1  |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week)   |
| ECTS points (credits)               | 6  |
| Frequency                           | 15 lectures per academic year as a blocked seminar   |
| Conditions for the award of credits | Pass the assessment at least „sufficient“  |

## Module title: English and Project Management

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|------------------------|-------------------|
| <b>Module code 3.5</b> | <b>Semester 3</b> |
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|-------------------------------------|---|
| Coordinator                         | Prof. Dr. Gerd Klöck  |
| Aims including key qualification    | Comprehension of the principles and practical experience in project organisation and management.<br>Ability to manage small projects (organisation of a symposium, or biological data mining) in English.   |
| Contents                            | Project management (Lecture and practical exercises): Basic principles of project organisation and management, selected examples in project work (Achstetter, Klöck: Biologen in der Industrie, Spektrum, 2009). Examples of project work in teams, preparation of feasibility studies on selected products. Organisation of a scientific symposium (in collaboration with Hanze University Groningen).<br>English: Language course, biological literature, discussion, journal club. |
| Literature                          | The current recommended reading is distributed at the beginning of the term.  |
| Instructor                          | Prof. Dr. rer. nat. habil. Gerd Klöck (PM), Frau Heßlinger (EN)   |
| Type                                | Compulsory module   |
| Teaching methods                    | Seminar (2 hrs per week), Project (2 hrs per week), completely in English   |
| Learning methods                    | Group work and exercises  |
| Assessment                          | Paper   |
| Duration of assessment              | 90 Minutes  |
| Prerequisites                       | -   |
| Study system usability              | -   |
| Workload                            | 4 + 8   |
| Contact time                        | 4 + 1   |
| Self-study (hours)                  | 8   |
| ECTS points (credits)               | 6   |
| Frequency                           | 15 lectures per academic year   |
| Conditions for the award of credits | Pass the assessment at least „sufficient“   |

## Module title: Environmental Biology IV: Fundamentals of Ecosystems

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|------------------------|-------------------|
| <b>Module code 4.1</b> | <b>Semester 4</b> |
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| Coordinator                      | Prof. Dr. Dietmar Zacharias  |
| Aims including key qualification | Students gain insight into complexity of ecosystems connected to key factors of the systems (including human influence). Overview over the most important habitat types of central Europe und selected tropical ecosystems. Standard analysis and assessment methods of biotopes and biotic communities which are relevant in professional experience focussing on landscape management; library competence. Enlarge competence in critical examination with specific environmental issues controlling ecosystems set as a goal.   |
| Contents                         | European (main focus on Northwest Germany) and Non-European (main focus on Brazil and Oman) ecosystems. Introduction into elements of habitats, measuring of environmental parameters, flora and fauna of lowland of Northwest Germany: stagnant water, running water, woodland, grassland, peat land, urban systems, coast. Exemplarily comparison with (sub)tropical ecosystems (Brazil, Oman). Focus is on questions of biodiversity, land use and resource protection. Deepening analysis and assessment methods of ecosystems connected to applied problems. Basics for water renaturation.<br><u>Guided exercises:</u> Working with literature, essays dealing with topics of the module |
| Literature                       | The current recommended reading is distributed at the beginning of the term.   |
| Instructor                       | Prof. Dr. H. Brunken, Prof. Dr. D. Zacharias   |
| Type                             | Compulsory module  |
| Teaching methods                 | Seminar  |
| Learning methods                 | Group work   |
| Assessment                       | Written exam   |
| Duration of assessment           | 90 Minutes   |
| Prerequisites                    | Basic knowledge in Environmental biology from the first academic year  |
| Study system usability           | Fundamental module in environmental biology in the forth term, prerequisite for module 4.3 "Ecosystems Field work"   |
| Workload                         | 4 + 8  |
| Contact time                     | 4 + 1  |
| Self-study (hours)               | 8 (including guided exercises 1 hr per week)   |
| ECTS points (credits)            | 6  |
| Frequency                        | 15 lectures per academic year as a blocked seminar   |

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Conditions for the award of  
credits

Pass the assessment at least „sufficient“

## Module title: Biotechnology IV: Industrial Microbiology

|                 |            |
|-----------------|------------|
| Module code 4.2 | Semester 4 |
|-----------------|------------|

|                                     |  |
|-------------------------------------|--|
| Coordinator                         | Prof. Dr. Tilman Achstetter  |
| Aims including key qualification    | Understanding of possibilities and limits of the use of micro organisms in industrial production; development of essential skills in molecular biology as a prerequisite for the optimization of microbial strains; raising the awareness of safety issues (GMOs); scientific documentation  |
| Contents                            | <i>Theoretical part:</i> Particular metabolic capacities of micro organisms and their use of in particular in the field of „white“ and „red“ biotechnology; selected examples of cell and enzyme-based industrial processes (screening and production of antibiotics, production and use of amino acids, organic acids, vitamins; industrial enzymes); <i>Laboratory practical:</i> Bacterial competence, transformation (relevant parameters), plasmid isolation, DNA quantification, handling of restriction enzymes, agarose gel electrophoresis; scientific documentation<br>Guided exercises: Gene and sequence analysis, database mining |
| Literature                          | The current recommended reading is distributed at the beginning of the term.   |
| Instructor                          | Prof. Dr. Tilman Achstetter  |
| Type                                | Compulsory module  |
| Teaching methods                    | Seminar (2 hrs per week), Laboratory practical (2 hrs per week)  |
| Learning methods                    | Laboratory practical, Group work   |
| Assessment                          | Written exam   |
| Duration of assessment              | 90 min   |
| Prerequisites                       | Successful participation at module 2.3 Introduction to formal and molecular genetics (Pass the exam)   |
| Study system usability              | -  |
| Workload                            | 4 + 8  |
| Contact time                        | 4 + 1  |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week)   |
| ECTS points (credits)               | 6  |
| Frequency                           | 15 lectures per academic year as a blocked seminar   |
| Conditions for the award of credits | Pass the assessment at least „sufficient“  |

## Module title: Environmental Biology V: Ecosystems Field Work

|                        |                   |
|------------------------|-------------------|
| <b>Module code 4.3</b> | <b>Semester 4</b> |
|------------------------|-------------------|

|                                     |   |
|-------------------------------------|---|
| Coordinator                         | Prof. Dr. Heiko Brunken   |
| Aims including key qualification    | Planning and realization of ecological surveys in the field; investigation and evaluation of natural habitats; measurement and interpretation of physico-chemical parameters in the environment; understanding of key principles of ecology (e.g. zonation, ecological cycles, energy flow); connecting theoretical insights with practical requirements; basic knowledge about landscape management (sustainable land use, nature conservation, landscape planning) against the background of complete demands on natural resources. |
| Contents                            | Investigation of ecosystem characteristics (species, habitats, key factors) of north German biotopes. Main focus running waters: macrozoobenthos, physico-chemical parameters, biological water quality assessment, river morphology, fish biodiversity, river restoration, catchment basin management. Main focus deciduous woodland: vegetation, flora, structure and biomass composition, mapping methods; main focus: grassland vegetation, management.   |
| Literature                          | The current recommended reading is distributed at the beginning of the term.  |
| Instructor                          | Prof. Dr. Heiko Brunken, Prof. Dr. Dietmar Zacharias  |
| Type                                | Compulsory module   |
| Teaching methods                    | Laboratory practical (field work)   |
| Learning methods                    | Group work  |
| Assessment                          | Paper   |
| Duration of assessment              | 30 Minutes  |
| Prerequisites                       | Basic knowledge in biodiversity of native flora and fauna; successful participation at module 4.1 Fundamentals of Ecosystems  |
| Study system usability              | Fundamental module in environmental biology in the fourth term  |
| Workload                            | 4 + 8   |
| Contact time                        | 4 + 1   |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week)  |
| ECTS points (credits)               | 6   |
| Frequency                           | 15 lectures per academic year as a blocked seminar  |
| Conditions for the award of credits | Pass the assessment at least „sufficient“   |

## Module title: Biotechnology V: Introduction to Biochemical Engineering – Downstream Processes

|                        |                   |
|------------------------|-------------------|
| <b>Module code 4.4</b> | <b>Semester 4</b> |
|------------------------|-------------------|

|                                     |  |
|-------------------------------------|--|
| Coordinator                         | Prof. Dr. Gerd Klöck   |
| Aims including key qualification    | This course aims to comprehension of basic concepts in downstream processing. It focuses on the purification aspects of biotechnology and will allow students to be aware of how protein based products are manufactured and commercialised. The central theme of this course is to provide students with knowledge and understanding of quality assurance and control |
| Contents                            | Lecture: Unit operations, product capture and purification, regulatory requirements and quality, validation and qualification, chromatography, membrane processes, his-Tag technology, exercises “in silico” (Protlab simulation).<br>Laboratory: Purification of lysozyme, GFP or similar proteins, validation of analytical methods, quality control                 |
| Literature                          | The current recommended reading is distributed at the beginning of the term.   |
| Instructor                          | Prof. Dr. rer. nat. habil. Gerd Klöck  |
| Type                                | Compulsory module  |
| Teaching methods                    | Seminar (2 hrs per week), Laboratory practical (2 hrs per week)  |
| Learning methods                    | Group work and exercises   |
| Assessment                          | Written exam or paper  |
| Duration of assessment              | 90 Minutes   |
| Prerequisites                       | -  |
| Study system usability              | -  |
| Workload                            | 4 + 8  |
| Contact time                        | 4 + 1  |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week)   |
| ECTS points (credits)               | 6  |
| Frequency                           | 15 lectures per academic year as a blocked seminar   |
| Conditions for the award of credits | Pass the assessment at least „sufficient“  |

## Module title: Environmental Microbiology

|                 |            |
|-----------------|------------|
| Module code 4.5 | Semester 4 |
|-----------------|------------|

|                                  |   |
|----------------------------------|---|
| Coordinator                      | Prof. Dr. Bernd Mahro   |
| Aims including key qualification | <p>The module shall enable the students :</p> <ul style="list-style-type: none"><li><input type="checkbox"/>-To distinguish the diverse microbial forms of energy metabolism and to describe their major principles</li><li><input type="checkbox"/>-To calculate and assess the potential stoichiometric energy yield (free energy) of microbial transformations</li><li><input type="checkbox"/>-To identify technical and ecological habitats and processes which are based on microbial transformations and to describe their functional principles</li><li><input type="checkbox"/>-To identify and describe experimental methods which can be used to measure microbial metabolism and to assess their applicability, significance and validity</li></ul>   |
| Contents                         | <ul style="list-style-type: none"><li>-Ecological aspects of biomass degradation in soil and water; microbial habitats and communities; detection methods for microorganisms in the field</li><li>-Degradation of biopolymers, exo-enzymes, principles of energy metabolism and energy storage, calculation of <math>\Delta G</math></li><li>-Biochemistry of aerobic respiration processes, methods to measure microbial respiration, technical use and application of aerobic microbial respiration processes in the field and in bioreactors</li><li>-Biochemistry of pollutant degradation, role of environmental factors, bioavailability as key issue</li><li>-Anaerobic biotopes: anaerobic respiration processes (denitrification, desulfurication, microbial iron oxidation), fermentation, acetogenesis and methanogenesis, biogas technology, methods to monitor anaerobic transformation processes</li><li>-Chemolithotrophy: biochemistry, technical significance and use (e.g. bio corrosion, bioleaching)</li><li>-Phototrophic energy metabolism of microorganisms, microbial N<sub>2</sub>-fixation</li><li>-Contribution of microbial transformation to the natural cycling of elements, forms of microbial symbiosis, humification</li></ul> |
| Literature                       | The current recommended reading is distributed at the beginning of the term.  |
| Instructor                       | Prof. Dr. Bernd Mahro   |
| Type                             | Compulsory module   |
| Teaching methods                 | Seminaristic tuition  |
| Learning methods                 | Group work  |
| Assessment                       | Written exam  |
| Duration of assessment           | Written exam, duration 90 min, short paper 10-15 min  |
| Prerequisites                    | basic knowledge in chemistry and microbiology from the first  |



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|                                     |  |
|-------------------------------------|--|
|                                     | academic year                                |
| Study system usability              | -  |
| Workload                            | 4 + 8  |
| Contact time                        | 4 + 1  |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week) |
| ECTS points (credits)               | 6  |
| Frequency                           | 15 lectures per academic year                |
| Conditions for the award of credits | Pass the assessment at least „sufficient“    |

## Module title: Preparation for Study Abroad

|                        |                   |
|------------------------|-------------------|
| <b>Module code 5.1</b> | <b>Semester 5</b> |
|------------------------|-------------------|

|                                     |   |
|-------------------------------------|---|
| Coordinator                         | Prof. Dr. Tilman Achstetter   |
| Aims including key qualification    | Self-dependent planning and organisation of a stay abroad of several months' duration; active training, in particular language wise (English language course) for a successful intercultural communication, but also for study and research (scientific terminology); application of various communication techniques in English; self competence: self-dependent investigations and reflections addressing the study program, cultural and social environment abroad, feedback of the self-assessment, training of the individual ability to judge |
| Contents                            | Training of the capacity for a conversation in English in order to collect and exchange information about countries and cultures (possible destinations abroad), but also about studies and internships abroad during discussions with ISTAB students having completed their year abroad and presenting their projects; discussions with external representatives like staff colleagues from partner universities   |
| Literature                          | The current recommended reading is distributed at the beginning of the term.  |
| Instructor                          | Prof. Dr. Tilman Achstetter, Prof. Dr. Heiko Brunken, Prof. Dr. habil. Gerd Klöck,<br>Prof. Dr. Dietmar Zacharias; NN   |
| Type                                | Compulsory module   |
| Teaching methods                    | Seminar (4 hrs per week)  |
| Learning methods                    | Group work  |
| Assessment                          | Written exam  |
| Duration of assessment              | 20 min  |
| Prerequisites                       | -   |
| Study system usability              | -   |
| Workload                            | 4 + 8   |
| Contact time                        | 4   |
| Self-study (hours)                  | 8   |
| ECTS points (credits)               | 6   |
| Frequency                           | 15 lectures per academic year   |
| Conditions for the award of credits | Pass the assessment at least „sufficient“   |

## Module title: Evaluation and Presentation of Study Abroad and Practical Placement Abroad

|                        |                   |
|------------------------|-------------------|
| <b>Module code 6.5</b> | <b>Semester 6</b> |
|------------------------|-------------------|

|                                  |  |
|----------------------------------|--|
| Coordinator                      | Prof. Dr. Dietmar Zacharias  |
| Aims including key qualification | Competence in self-critical reflexion, presentation, evaluation and discussion of own experiences students have made during their study year abroad in a country with a new culture and language. Competence in communication about scientific, organisational, cultural and social topics in English. Impression of own ability to judge. Containment of presentation techniques.   |
| Contents                         | Critical description and discussion of the own study semester and practical semester abroad in English by two presentations in front of an audience of ISTAB-students, members of staff of the university and external guests. In this report about the study semester the locality and the completed courses should be reflected critically to advise younger ISTAB-students for their planning of the study year abroad. The report about the practical semester should contain the description of the institution and give a scientific report about the own project the students were involved in (methods, results, discussion). <u>Guided exercises:</u> Enlargement of the ISTAB-database with detailed information about universities and practical placements abroad where ISTAB-students already had been. |
| Literature                       | The current recommended reading is distributed at the beginning of the term.   |
| Instructor                       | Prof. Dr. Tilman Achstetter, Prof. Dr. Heiko Brunken, Prof. Dr. habil. Gerd Klöck, Prof. Dr. Dietmar Zacharias   |
| Type                             | Compulsory module  |
| Teaching methods                 | Seminaristic tuition (4 hrs per week)  |
| Learning methods                 | Group work   |
| Assessment                       | Presentation   |
| Duration of assessment           | 20 Minutes   |
| Prerequisites                    | -  |
| Study system usability           | -  |
| Workload                         | 4 + 8  |
| Contact time                     | 4 + 1  |
| Self-study (hours)               | 8  |
| ECTS points (credits)            | 6  |
| Frequency                        | 15 lectures per academic year  |
| Conditions for the award of      | Pass the assessment at least „sufficient“  |

credits

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## Module title: Project I Concept and Design

|                        |                   |
|------------------------|-------------------|
| <b>Module code 7.1</b> | <b>Semester 7</b> |
|------------------------|-------------------|

|                                  |  |
|----------------------------------|--|
| Coordinator                      | Prof. Dr. Dietmar Zacharias  |
| Aims including key qualification | Acquirement of job-orientated skills of project management (content, time management, steps and cost). Competence in communication with principals and project partners und in self-critical check-up and revision of the own draft plan. Acquisition of corporate way of thinking and additionally of capacity for teamwork, conflict resolution, skills to moderate, to present and for leadership.  |
| Contents                         | This module is a basis for module Project II Laboratory and Field Studies. According to the main focus area there is offered a project dealing with industrial biology (Achstetter & Klöck, 2005: Übungsfirma im Labor – eine praxisnahe Ausbildungsform für angehende Biotechnologen. Biospektrum 5, 645), and another one dealing with environmental biology (Brunken & Zacharias, 2005: Studienschwerpunkt Umweltbiologie an der Hochschule Bremen. Mitteilungen aus der NNA, 16.1, 26-28). In these projects external partners are included and the topics are closely related with questions of practical experience. <u>Module-related exercises</u> : self-study guided by intensive discussion with university lecturers |
| Literature                       | The current recommended reading is distributed at the beginning of the term.   |
| Instructor                       | Prof. Dr. Tilman Achstetter, Prof. Dr. Heiko Brunken, Prof. Dr. habil. Gerd Klöck,<br>Prof. Dr. Dietmar Zacharias  |
| Type                             | Compulsory module  |
| Teaching methods                 | Project (4 hrs per week), held in English in the option Industrial Biology   |
| Learning methods                 | Laboratory practical, Group work   |
| Assessment                       | Presentation (generally held in English)   |
| Duration of assessment           | 45 Minutes   |
| Prerequisites                    | -  |
| Study system usability           | -  |
| Workload                         | 4 + 8  |
| Contact time                     | 4 + 1  |
| Self-study (hours)               | 8 (including guided exercises 1 hr per week)   |
| ECTS points (credits)            | 6  |
| Frequency                        | 15 lectures per academic year as a blocked seminar   |
| Conditions for the award of      | Pass the assessment at least „sufficient“  |

credits

## Module title: Project II Laboratory and Field Studies

|                        |                   |
|------------------------|-------------------|
| <b>Module code 7.2</b> | <b>Semester 7</b> |
|------------------------|-------------------|

|                                     |   |
|-------------------------------------|---|
| Coordinator                         | Prof. Dr. Gerd Klöck  |
| Aims including key qualification    | The aim of this course is job-oriented training in “real life situations” for the option Industrial Biology (Achstetter, Klöck: Biologen in der Industrie, Spektrum, 2009). The course is taught in English. This will especially improve intercultural and interdisciplinary communication competencies of the students.   |
| Contents                            | <p>The module is closely related to the preceding module (Project 1). Students work in small, more or less autonomous groups. Work packages and time table have been compiled in the preceding module and will be used to progress with the individual tasks.</p> <p>The students will make use of the analytical methods that have been validated in module 7.6.</p> <p>Project work and presentation of results will be performed according to scientific standards. This includes formulation of hypotheses on the basis of literature and database research, as well as the use of professional project management tools (project plans, time tables, etc.)</p> |
| Literature                          | The current recommended reading is distributed at the beginning of the term.  |
| Instructor                          | Prof. Dr. Tilman Achstetter, Prof. Dr. Heiko Brunken, Prof. Dr. habil. Gerd Klöck,<br>Prof. Dr. Dietmar Zacharias   |
| Type                                | Compulsory module   |
| Teaching methods                    | Project (4 hrs per week), held in English in the option Industrial Biology  |
| Learning methods                    | Laboratory practical, Group work  |
| Assessment                          | Paper (in English)  |
| Duration of assessment              | 45 Minutes  |
| Prerequisites                       | -   |
| Study system usability              | -   |
| Workload                            | 4 + 8   |
| Contact time                        | 4 + 1   |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week)  |
| ECTS points (credits)               | 6   |
| Frequency                           | 15 lectures per academic year as a blocked seminar  |
| Conditions for the award of credits | Pass the assessment at least „sufficient“   |

**Module title: Elective module (see modules 7.6 and 7.7)**

|                        |                   |
|------------------------|-------------------|
| <b>Module code 7.3</b> | <b>Semester 7</b> |
|------------------------|-------------------|



## Module title: Bachelor Thesis

|                              |                   |
|------------------------------|-------------------|
| <b>Module code 7.4 / 7.5</b> | <b>Semester 7</b> |
|------------------------------|-------------------|

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|-------------------------------------|--|
| Coordinator                         | Prof. Dr. Tilman Achstetter  |
| Aims including key qualification    | Competence for a scientific argumentation and documentation within a predefined frame with respect of the timing and the format<br>Demonstration of an in depth understanding for the methods of scientific work (scientific question, formulation of hypotheses, bibliography, experimental design as proof of concept (hypothesis), differentiation between hypothesis and theory), scientific documentation |
| Contents                            | Self-dependent preparation of a scientific report (thesis) based on in depth bibliographic studies, comparative background analyses and own experimental results: form and content fulfil the requirements of scientific traceability of argumentation and reproducibility of experimental results   |
| Literature                          | The current recommended reading is distributed at the beginning of the term.   |
| Instructor                          | Prof. Dr. Tilman Achstetter, Prof. Dr. Heiko Brunken, Prof. Dr. habil. Gerd Klöck,<br>Prof. Dr. Dietmar Zacharias  |
| Type                                | Compulsory module  |
| Teaching methods                    | Project (Thesis), held in English in the option Industrial Biology   |
| Learning methods                    | Group work   |
| Assessment                          | Thesis including public presentation (defence)   |
| Duration of assessment              | 30 Minutes   |
| Prerequisites                       | successful presentation at modules 1.1 – 1.5, 2.1 – 2-5, 3.1 – 3.5, 4.1 – 4.5, 5.1 – 5.5, 6.1 – 6.5, 7.1 – 7.3 und 7.6 or 7.7 (depending on the selected option)   |
| Study system usability              | -  |
| Workload                            | 4 + 8  |
| Contact time                        | 4  |
| Self-study (hours)                  | 8  |
| ECTS points (credits)               | 12   |
| Frequency                           | 2 x 15 lectures per academic year as a blocked seminar   |
| Conditions for the award of credits | Pass the assessment at least „sufficient“  |

## Module title: Biotechnology VI Methods of Industrial Microbiology and Biochemical Engineering

|                        |                   |
|------------------------|-------------------|
| <b>Module code 7.6</b> | <b>Semester 7</b> |
|------------------------|-------------------|

|                                     |  |
|-------------------------------------|--|
| Coordinator                         | Prof. Dr. Gerd Klöck   |
| Aims including key qualification    | Comprehension and practical training in selection, as well as validation and qualification processes in the biotechnology laboratory. By working in small teams on job-related problems, the students acquire competences in many aspects of working in an industrial environment (team work, self competence, communication, project management etc.). Since the module is taught in English, students also strengthen their intercultural and communication competences. |
| Contents                            | The aim of this module is to establish and validate the crucial methods for the project work in modules Project 1 and 2. Based on scientific literature, methods will be evaluated independently in small teams. The goal is to establish a SOP for each method.   |
| Literature                          | The current recommended reading is distributed at the beginning of the term.   |
| Instructor                          | Prof. Dr. rer. nat. habil. Gerd Klöck, Prof. Dr. Tilman Achstetter   |
| Type                                | Elective module (in English)   |
| Teaching methods                    | Laboratory practical (4 hrs per week), held in English   |
| Learning methods                    | Laboratory practical, Group work   |
| Assessment                          | Oral assessment  |
| Duration of assessment              | 30 Minutes, in English   |
| Prerequisites                       | Pass the modules 3.1, 4.2 and 4.4.   |
| Study system usability              | -  |
| Workload                            | 4 + 8  |
| Contact time                        | 4 + 1  |
| Self-study (hours)                  | 8 (including guided exercises 1 hr per week)   |
| ECTS points (credits)               | 6  |
| Frequency                           | 15 lectures per academic year as a blocked seminar   |
| Conditions for the award of credits | Pass the assessment at least „sufficient“  |

## Module title: Environmental Biology VI: Applied Nature Conservation

|                        |                   |
|------------------------|-------------------|
| <b>Module code 7.7</b> | <b>Semester 7</b> |
|------------------------|-------------------|

|                                  |   |
|----------------------------------|---|
| Coordinator                      | Prof. Dr. Heiko Brunken, Prof. Dr. Dietmar Zacharias  |
| Aims including key qualification | Until now acquired knowledge about species and habitat diversity is being connected with current problems of environmental conservation and nature protection; handling of ongoing social issues against the background of legal national and international norms, in particular EU Habitats Directive and EU Water Framework Directive. The students are becoming acquainted with current problems and solutions in nature conservation especially in the Bremen metropolitan region. Dealing with concrete examples they are getting knowledge about the complex interactions of the region's stakeholders, e.g. environmental authorities, NGOs, consultants of landscape planning. One of the main objectives is to strengthen the connections between theoretical knowledge and relevant professional experience, including the presence of external contributors. To get competence in application of suitable methods students will work with Geographical Information Systems (GIS) in theory and practice. |
| Contents                         | Main topics to be taught: monitoring of species and habitats, sustainable land use, legal norms in the field of environmental conservation and nature protection, landscape restoration, designation of protected areas, environmental education.   |
| Literature                       | The current recommended reading is distributed at the beginning of the term.  |
| Instructor                       | Prof. Dr. H. Brunken, Prof. Dr. D. Zacharias  |
| Type                             | Elective module   |
| Teaching methods                 | Seminaristic tuition with practical part  |
| Learning methods                 | Group work  |
| Assessment                       | Presentation  |
| Duration of assessment           | 30 Minutes  |
| Prerequisites                    | Basic knowledge on ecosystems, flora, fauna and management of ecosystems  |
| Study system usability           | Module in the option Environmental Biology  |
| Workload                         | 4 + 8   |
| Contact time                     | 4 + 1   |
| Self-study (hours)               | 8 (including guided exercises 1 hr per week)  |
| ECTS points (credits)            | 6   |
| Frequency                        | 15 lectures per academic year as a blocked seminar  |

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Conditions for the award of  
credits

Pass the assessment at least „sufficient“