

**Modulhandbuch für den Studiengang Environmental and Resource Management
(universitäres Profil),
Bachelor of Science, Prüfungsordnung 2015**
Inhaltsverzeichnis

Total Account

41317 Bachelor Thesis	3
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Mandatory Modules

11110 Mathematics of Engineering I	5
11111 Mathematics of Engineering II	7
11212 Statistics	10
11645 Basic Soil Science	12
11647 Freshwater Conservation and Water Resource Management	15
11648 Sustainable Waste Management	17
11681 Atmosphere	19
13110 Basic Natural Sciences	21
41101 Introduction to Environmental and Resource Management	24
41102 Ecology	27
41105 Economics	30
41106 Biology	31
41107 Business Administration	32
41201 International Environmental Law	34
41202 Integrated Environmental Planning	36
41205 Sociology	39
41206 Economic and Social Instruments of Environmental and Resource Management	41
42203 Geosciences and Natural Resources	43
43201 Corporate Environmental Protection	46

Compulsory Elective Modules

12261 Ecological Excursion	48
12971 Operations Research for Environmental and Resource Management	50
13109 Philosophy of Technology and Nature	52
13234 Communication of Science and Technology	54
13245 Human Resource Management and Organizational Behaviour	55
13314 Instrumental Analysis and Physical Chemistry	57
13659 Sustainability and Digitalisation	58
13711 Colloquium Transdisciplinary Sustainability Research	59
13735 Biodiversity of Terrestrial Invertebrates	60
13737 Practical Course Aquatic Ecology	61

13822 Biodiversity of Terrestrial Arthropods	63
13955 Geomorphology	66
14153 Climate Change and Vegetation	69
14299 Advances in Biogeochemistry and Pedology	71
14496 Applied Biostatistics for Environmental Data	73
37101 Intercultural Competence	75
42205 Soil Protection and Management	76
44204 Environmental Biotechnologies	77
44408 Safety Technology	79
Erläuterungen	81

Module 41317 Bachelor Thesis

assign to: Total Account

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	41317	Mandatory

Modul Title	Bachelor Thesis Bachelor-Arbeit
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Dr. rer. nat. Bucher, Roman
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	On special announcement
Credits	12
Learning Outcome	The candidate shall provide evidence that he or she is able to recognize a problem involved in the respective subject and locate a solution thereof in a limited period of time and with defined means of help. He or she shall prove that he or she identifies the context of the field under examination, is able to place specific problems in context and master common methodology of the subject. The Bachelor thesis is a part of the examination by way of which the student shall prove that he or she is able to handle a particular task under guidance, working independently and successfully and can provide practical insights into the solution of the thesis' problem.
Contents	The Bachelor thesis can be practical as well as theoretical. It should relate the advanced standard of knowledge in the scientific field and normally deal with potential problems in the working life. The Bachelor thesis consists of the written work and its defence.
Recommended Prerequisites	None
Mandatory Prerequisites	Successful completion of the semester abroad, all mandatory modules according to Annex I of the study and examination regulations and an achievement of an overall minimum amount of 150 credit points.
Forms of Teaching and Proportion	Self organised studies - 360 hours
Teaching Materials and Literature	It depends on the individual subject. Corresponding materials will be named and provided by the supervisor.

Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	The grade of the Bachelor thesis results from the written thesis, which accounts for 75 percent, and its colloquium, which accounts for 25 percent.
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	The academic supervisor is responsible for the topic and content of the thesis.
Module Components	None
Components to be offered in the Current Semester	No assignment

Module 11110 Mathematics of Engineering I

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	11110	Mandatory

Modul Title	Mathematics of Engineering I Mathematik für Ingenieure I
Department	Faculty 1 - Mathematics, Computer Science, Physics, Electrical Engineering and Information Technology
Responsible Staff Member	Prof. Dr. rer. nat. habil. Fügenschuh, Armin
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	The course provides an introduction into mathematical reasoning and into the basic principles and techniques of analytic geometry and linear algebra. The presentation of the material is accompanied by problem sessions in which the students are taught to apply the learned topics. Objectives of the course are to enable the students to perform simple mathematical arguments, to verify the validity of simple mathematical relations, and to deal with and get routine with some fundamental tools of advanced mathematics in the areas of analytic geometry and linear algebra.
Contents	<p>Fundamentals: Kinds of mathematical statements and reasoning (direct proof, indirect proof, proof by complete induction), essential statements of combinatorics and sum formulas, set theory (relations and operations), definition and examples of mappings and functions, real numbers (working with inequalities and absolute values, infimum and supremum), b-adic expansions, complex numbers (Cartesian, polar, and Euler representation, number operations in these presentations, determination of roots).</p> <p>Analytic Geometry: Vectors in the plane and in space (representation, operations, scalar product, vector product, triple product), representation of lines (point-direction and two-point equation, distance formulas), planes (point-directions equation, three-points equation, Hesse normal form).</p> <p>Linear Algebra:</p>

Vectors and matrices (representation and operations, systems of linear equations (representation and solvability), Gauss algorithm, rank of a matrix, linear dependence and independence of vectors, representation of the solution set of a homogeneous and inhomogeneous system of linear equations by linearly independent solutions of the homogeneous system, LU factorization by Gauss algorithm and solution of systems of linear equations by that, determinant of a matrix (definition, computation via Gauss algorithm and Laplace expansion), inverse matrix (existence and computation via Gauss algorithm), orthogonal vectors and matrices (definitions, properties, Gram-Schmidt procedure), QR factorization of a matrix and the solution of systems of linear equations by that, linear mappings (definition, orthogonal mappings and their geometrical properties), eigenvalues and eigenvectors (definition, computation, results on existence of linear independent eigenvectors), diagonalization of matrices (principal axes transformation and its application to quadratic equations), definiteness properties of matrices (definition and verification via computation of eigenvalues).

Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 4 hours per week per semester Exercise - 2 hours per week per semester Self organised studies - 90 hours
Teaching Materials and Literature	<ul style="list-style-type: none"> • Leon, S.: Linear Algebra with Applications, 5th ed., Yourdon Press, Englewood Cliffs, 1998
Module Examination	Prerequisite + Final Module Examination (MAP)
Assessment Mode for Module Examination	<p>Prerequisite:</p> <ul style="list-style-type: none"> • Successful completion of exercise sheets <p>Final module examination:</p> <ul style="list-style-type: none"> • Written examination, 90 min.
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	<ul style="list-style-type: none"> • Study programme Environmental and Resource Management B. Sc.: Mandatory module "B2".
Module Components	<ul style="list-style-type: none"> • Lecture Mathematics of Engineering I • Exercise Mathematics of Engineering I • Tutorial Mathematics of Engineering I • Examination Mathematics of Engineering I
Components to be offered in the Current Semester	130791 Examination Mathematics of Engineering I - Wiederholung

Module 11111 Mathematics of Engineering II

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	11111	Mandatory

Modul Title	Mathematics of Engineering II Mathematik für Ingenieure II
Department	Faculty 1 - Mathematics, Computer Science, Physics, Electrical Engineering and Information Technology
Responsible Staff Member	Prof. Dr. rer. nat. habil. Fügenschuh, Armin
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	The course provides an introduction into the basic principles and techniques of calculus of one and several variables. The presentation of the material is accompanied by problem sessions in which the students are taught to apply and to get routine with the learned methods. Objectives of the course are to enable the students to carry out simple mathematical arguments, to verify the validity of simple mathematical relations, and to perform and employ fundamental techniques in the area of calculus.
Contents	Calculus of functions of one variable: Sequences of real numbers (definition, limit, convergence and divergence, operations with limits, monotonic sequences, improper limits), series of real numbers (definition, limit, convergence and divergence, limits of functions (definition, operations), continuity of a function (definition, examples), properties of continuous functions (existence of minimizers and maximizers, monotonic function, inverse function), power series (definition and theorem on convergence and divergence, computation of convergence radius), elementary functions (definition and basic properties of polynomials, rational functions, exponential function and natural logarithm, general power function and general logarithm, trigonometric functions and their inverses, hyperbolic functions and their inverses), derivative of a function (definition, product rule, ratio rule, chain rule, differentiation rule for inverse function), applications of differentiation (rule of de l'Hospital, mean value theorem, relation with monotonicity, first and second order optimality conditions for local minimizers and maximizers, Taylor's theorem, Taylor's series, secant and Newton's method for the determination of a root of a

function), integration of functions (definite integral with rules, mean value theorem of integration, indefinite integral, relation between definite and indefinite integral, partial integration, integration by substitution, improper integrals, integration and differentiation of power series).

Calculus of functions of several variables:

Sets in the n-dimensional spaces (representation of elementary sets, definition of the interior, closure and boundary of sets), vector-valued mappings, graphical representation of functions of 2 and 3 variables, sequences, limits of functions, continuity of functions, differentiation of functions (partial derivatives, total differential, directional derivative, differentiation of vector-valued functions, chain rule), applications of differentiation (Taylor expansion, Newton's method for the solution of systems of nonlinear equations, first and second order optimality conditions for local minimizers and maximizers, application to least-squares approximation), integration, initial value problems theoretical results, one-step methods, explicit and implicit Runge-Kutta methods).

Recommended Prerequisites	Knowledge of the topics in Mathematics of Engineering 1
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 4 hours per week per semester Exercise - 2 hours per week per semester Self organised studies - 90 hours
Teaching Materials and Literature	<ul style="list-style-type: none"> • Finney, R. L., Weir, M. D., and Giordano, F. R.: Thomas's Calculus, 10th ed., Addison Wesley, Boston 2001 • Salas, S., Hille, E., Etgen, G.: Calculus. One and Several Variables, 8th ed., John Wiley & Sons, New York, 1999
Module Examination	Prerequisite + Final Module Examination (MAP)
Assessment Mode for Module Examination	<p>Prerequisite:</p> <ul style="list-style-type: none"> • Successful completion of exercise sheets <p>Final module examination:</p> <ul style="list-style-type: none"> • Written examination, 90 min.
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	<ul style="list-style-type: none"> • Study programme Environmental and Resource Management B. Sc.: Mandatory module "B3".
Module Components	<ul style="list-style-type: none"> • Lecture: Mathematics of Engineering II • Accompanying exercises • Related exam
Components to be offered in the Current Semester	<p>130830 Lecture Mathematics of Engineering II - 4 Hours per Term</p> <p>130831 Exercise Mathematics of Engineering II - 2 Hours per Term</p> <p>130833 Examination</p>

Mathematics of Engineering II

Module 11212 Statistics

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	11212	Mandatory

Modul Title	Statistics Statistik
Department	Faculty 1 - Mathematics, Computer Science, Physics, Electrical Engineering and Information Technology
Responsible Staff Member	Prof. Dr. rer. nat. habil. Wunderlich, Ralf Prof. Dr. rer. nat. Hartmann, Carsten
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	<ul style="list-style-type: none"> • Aquirement of basic knowledge and skills in Probability Theory and Mathematical Statistics • Qualifying for solving typical problems from engineering using statistical methods and for critical interpretation of results of statistical investigation <p>The lectures give theoretical fundamentals and explain them at typical examples from engineering. Exercises aim to deepen this knowledge and to apply it at further typical situations. Homework sheets, to be solved independently, serve for further consolidation, deepening and enhancement of lecture and exercise contents.</p>
Contents	Introduction to fundamentals of probability theory and mathematical statistics: random variables and their distributions (discrete and continuous), limit theorems, laws of large number, point and interval estimations, significance tests (parametric as well as non-parametric for one or two samples), correlation and regression analysis
Recommended Prerequisites	Knowledge of subject matters from the modules <ul style="list-style-type: none"> • 11110: Mathematics of Engineering I • 11111: Mathematics of Engineering II
Mandatory Prerequisites	none

Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Exercise - 2 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	<ul style="list-style-type: none"> • Smith, P. J. : Into Statistics, Springer (Singapore) 1998 • Montgomery, D. C./ Runger, G. C.: Applied Statistics and Probability for Engineers, John Wiley Sons, Inc. 1994 • Frank, H./ Althoen, S. C.: Statistics, Concepts and Applications, Cambridge University Press 1994 • McClave, J. T.: A First Course in Business Statistics, Prentice Hall 2001 • McClave, J. T./ Sincich, T. L.: A First Course in Statistics, Prentice Hall 2002
Module Examination	Prerequisite + Final Module Examination (MAP)
Assessment Mode for Module Examination	<p>Prerequisite:</p> <ul style="list-style-type: none"> • Successful completion of homework <p>Final module examination:</p> <ul style="list-style-type: none"> • Written examination, 90 min. or oral examination, 30 min. + preparation time <p>The type (written or oral) will be announced at the beginning of the lecture period.</p>
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	<ul style="list-style-type: none"> • Study programme Artificial Intelligence M.Sc.: Compulsory elective module in the complex „Advanced Methods“
Module Components	<ul style="list-style-type: none"> • Lecture Statistics • Exercise Statistics • Tutorial Statistics • Examination Statistics
Components to be offered in the Current Semester	130060 Examination Statistics (Wiederholung)

Module 11645 Basic Soil Science

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	11645	Mandatory

Modul Title	Basic Soil Science
	Grundlagen der Bodenkunde
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. phil. Raab, Thomas
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	<p>Student will be able to:</p> <ul style="list-style-type: none"> • explain the factors and processes of soil development and taxonomic tools • understands the mutual relationship between biotic and abiotic factors of the environment • know the biological and mineral constituents of soils and related interactions • assess the various natural and anthropogenic impacts on soils • understands the role of the most relevant functions of soils in ecosystems • find and work with the scientific literature regarding soil science • get familiar with the laboratory methods concerning soil properties characteristics • present orally on chosen laboratory and field methods and pedology
Contents	<p>Part 1 Lecture:</p> <ul style="list-style-type: none"> • Importance and functions of soils • Soil development: soil forming factors and processes • Soil classification, soil definition, soil distribution • Soil physical properties: colour, texture, structure • Soil Clay Minerals • Oxides and Hydroxides • Soil Organic Matter • Soil Acidity • Soil Water • Soil Contamination • Field Work

Part 2 Seminar:

- Excursion: field trip focusing on soil development and classification
- Introduction to lab work: overview of available soil analytical methods
- Laboratory and Excursion presentations
- Extended discussion on chosen topics presented during the lectures

Recommended Prerequisites

- Basic knowledge in Chemistry, Physics and Mathematics
- 13110 Basic Natural Sciences
- 42201 Water and Waste
- 42203 Geosciences and Natural Resources
- 42205 Soil Protection and Management

Mandatory Prerequisites

none

Forms of Teaching and Proportion

Lecture - 2 hours per week per semester
Seminar - 2 hours per week per semester
Self organised studies - 120 hours

Teaching Materials and Literature

- Blume, H.-P., G.W. Brümmer, Horn, R., Kandeler, E., Kögel-Knabner, I., Kretzschmar, R., Stahr, K. & B.-M. Wilke (2010): Lehrbuch der Bodenkunde. Spektrum Verlag.
- Brady, N.C. & Weil, R. (2008): The Nature and Properties of Soils.
- Brady, N. C. & Weil, R. (2010): Elements of the Nature and Properties of Soils.
- Noorallah, Juma G. (2009): The pedosphere and its dynamics.
- FAO (2006): Guidelines for soil descriptions.
- Ad-hoc-AG Boden (2005): Bodenkundliche Kartieranleitung.
- Zepp, R. G. & Sonntag (1995): The role of nonliving organic matter in the earths carbon cycle.
- Lal, R., J. M. Kimble, R. F. Follet & B. A. Stewart (2001): Assessment Methods for Soil Carbon.
- Frimmel, F. H. & R. F. Christman (1998): Humic substances and their role in the environment.
- Dickinson, G. & Murphy, K. (1997): Ecosystems - A Functional Approach. Routledge Introductions to Environment.
- Moore, D.M. & R.C. Reynolds, Jr. (1997): X-Ray Diffraction and the Analysis of Clay Minerals.
- Birkeland, P.W. (1999): Soils and Geomorphology.
- Brindley, G.W. & Brown, G. (1980): Crystal structures of clay minerals and their identification.
- Schaetzl, R. & S. Anderson (2005): Soils. Genesis and Geomorphology.
- Birkeland, P. (1999): Soils and Geomorphology.
- Dixon, J.B. & Weed, S.B. (eds., 1989): Minerals in Soil Environments.
- Cornell, R.M. & U. Schwertmann (1996): The Iron Oxides. Structures, Properties, Reactions, Occurrences and Uses.
- Schwertmann, U. & R.M. Cornell (2000): Iron Oxides in the Laboratory.van Breemen, N., Mulder, J., Driscoll, C.T. (1983): Acidification and alkalization of soils.

Module Examination

Continuous Assessment (MCA)

Assessment Mode for Module Examination	<ul style="list-style-type: none">• Mid term assessment (written or oral) on lecture Basic Soil Science, 40 min. (30 %)• Final assessment (written or oral) on lecture Basic Soil Science, 40 min. (30 %)• Protocol (written) on laboratory exercise (20 %)• Presentation (10 min. talk) on laboratory exercise (20 %)
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	Due to current situation assesments may be time adepcted
Module Components	<ul style="list-style-type: none">• 240422 Lecture Basic Soil Science• 240433 Seminar/Exercise Laborseminar
Components to be offered in the Current Semester	240422 Lecture Basic Soil Science - 2 Hours per Term 240433 Exercise Lab Exercise Basic Soil Science - 2 Hours per Term

Module 11647 Freshwater Conservation and Water Resource Management

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	11647	Mandatory

Modul Title	Freshwater Conservation and Water Resource Management Gewässerschutz und Gewässerbewirtschaftung
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. rer. nat. habil. Martin-Creuzburg, Dominik
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	The module will provide the base for sustainable freshwater resource management. Understanding shall be achieved of the comprehensive water cycle with its abiotic and biotic processes, basics of hydrology and freshwater conservation, terms and methods related to water balance and the components of the water cycle, hydrological and ecological processes and their interaction relevant to water quantity and quality. Students will know main impacts to the freshwater resources and understand their relation to land use. The interaction of impacts with ecological processes and their consequences on ecology and use of freshwaters (flood water storage, drinking water supply, recreation, nature conservation) will be understood. The options and methods of surface water diagnosis and of management and conservation will be understood. The European Water Framework Directive as the base for evaluation and management of freshwater resources will be known. Students will be able to evaluate the consequences of major impacts on ecosystem functioning and ecosystem services. Principal strategies for restoring impacted freshwater systems will be known.
Contents	Part Hydrology Introduction to hydrology and water resources, definitions; hydrologic cycle; conservation equation; catchment; energy and water balance as a coupled system; water cycle as transport cycle, precipitation (types, measurement, areal analysis), water in the soil, soil water characteristics, infiltration, evapotranspiration, (processes, determination) runoff (controlling factors, measurement, interpretation of runoff data, hydrological regimes); Methods to estimate groundwater balance, present groundwater use and exploitation; vulnerability and

activities to protect groundwater resources. Impacts to the water resources; water balances under human influence; pathways of main pollutants of ground and surface waters; concepts of an integrated description of water quantity and water quality at catchment scale.

Part Freshwater Conservation

Main water quality problems related to agriculture, forestry, urbanization and mining; eutrophication, acidification, salinization, siltation, contamination, effects of neobiota; civil engineering and degradation of streams and rivers; loss of ecosystem services in degraded freshwaters; expected impacts of climate change. Principles of sustainable water management; principles of lake diagnosis, quality assessment and evaluation as prerequisites for mitigation and restoration; EU Water Framework Directive; strategies to improve and restore impacted freshwaters, current status of restoration.

Recommended Prerequisites	Module 41102 Ecology
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 3 hours per week per semester Exercise - 1 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	All material will be provided (mostly via Moodle) during the semester: <ul style="list-style-type: none"> • Lecture notes, short learning clips and reading material, • Recommended literature, • Catalogue of questions and short self-tests in Moodle to support self-organized work and self-testing of learning success.
Module Examination	Final Module Examination (MAP)
Assessment Mode for Module Examination	Written examination (80 minutes), with the two parts Hydrology and Water Resource Management and Freshwater Conservation in the first examination period. The exam will contribute 60% to the module grade. Exercises and homework will contribute 40% to the module grade (20% in Hydrology and Water Resource Management and 20% in Freshwater Conservation).
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	in winter semester: <ul style="list-style-type: none"> • 240509 LE/EX Freshwater Conservation • 240613 LE/EX Hydrology and Water Resource Management
Components to be offered in the Current Semester	240533 Examination Freshwater Conservation and Water Resources Management

Module 11648 Sustainable Waste Management

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	11648	Mandatory

Modul Title	Sustainable Waste Management Nachhaltige Abfallwirtschaft
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. habil. Abendroth, Christian
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	In the field of waste management, the student will learn to analyse and to understand typical problems of disposal within the social, economical and technical framework of sustainability. New approaches to solutions of waste problems will be discussed. Students should learn to adapt technological solutions and to develop appropriate strategies to the conditions of their home countries. A deeper focus on biological treatment is given.
Contents	The module is about sustainability with a focus on biological treatment technologies. In preparation for the module "municipal solid waste management", this module gives already a glimpse into recent novelties, which address sustainability and biological treatments. To do so, recent research articles are going to be summarized in order to present novel substrates, integrated sustainability concepts, pre- and post-treatments, which are related to technologies like anaerobic digestion, dark fermentation, biofuel production and fuel cells. In this relation, the following topics will be covered. <ol style="list-style-type: none"> 1. History on sustainability 2. Legislation in sustainability 3. Waste types and their relation to biological treatments 4. Zero waste and smart cities 5. Novel and problematic substrates for anaerobic digestions 6. Dark fermentation 7. Microbial fuel cells 8. Microbial electrolysis cells 9. Power2Gas 10. Biochar and its application 11. Integrated concepts

	12. Practical training
Recommended Prerequisites	None
Mandatory Prerequisites	None
Forms of Teaching and Proportion	Lecture - 3 hours per week per semester Seminar - 1 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	<ul style="list-style-type: none"> • Lecture notes • List of recommended literature <p>References/textbooks:</p> <ul style="list-style-type: none"> • Wellinger, Arthur, Murphy Jerry, Baxter David: The biogas handbook, 2013 Woodhead Publishing Series in Energy: Number 52, • Kalamdhad: Advances in Waste Management, 2019 • Thomé-Kozmiensky, Karl J.: Waste management, Volume1-4, 2010-2014, TK Verlag • Vesilind, Worrell, Reinhart: Solid Waste Engineering, Brooks/Cole 2002 • Kühle Weidemeier: Waste to resources 2011; mechanical biological waste treatment and material recovery facilities; 2011 • Rada, E.-C.: Biological treatment of solid waste enhancing sustainability, 2016
Module Examination	Prerequisite + Final Module Examination (MAP)
Assessment Mode for Module Examination	<p>Prerequisite:</p> <ul style="list-style-type: none"> • written work (30% of the final grade) <p>Final module examination:</p> <ul style="list-style-type: none"> • written examination, 60 min. (70% of the final grade))
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	<ul style="list-style-type: none"> • 230144 Lecture/Seminar Sustainable Waste Management - 4 Hours per Week per Semester • 238106 Examination Sustainable Waste Management
Components to be offered in the Current Semester	<p>230144 Lecture/Seminar Sustainable Waste Management - 4 Hours per Term</p> <p>238106 Examination Sustainable Waste Management</p>

Module 11681 Atmosphere

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	11681	Mandatory

Modul Title	Atmosphere
	Physik und Chemie der Atmosphäre
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Dr. rer. nat. Will, Andreas
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	The module trains basic knowledge and understanding of the physics of the atmosphere, of fundamental mechanisms within the Earth's system and exchange processes between the spheres. Students acquire knowledge of fundamental principles of physics and dynamics of the atmosphere on time scales of weather and climate and on local to global space scales. They get the competences to comprehend and evaluate basic questions and problems in the context of climate change.
Contents	<p>In the lecture physics of atmosphere and its interaction with other spheres are addressed, such as:</p> <ul style="list-style-type: none"> · The Earth system components and their interactions · Physical properties and variables of the atmosphere · Forces in the atmosphere · Water, clouds and precipitation · Radiation principles and greenhouse effect · Atmospheric dynamics · Atmospheric phenomena and mechanisms · Methods for weather forecast and climate projections <p>In the exercise the knowledge gained in the lecture will be applied in form of weekly exercises. The solutions will be presented by the students and discussed. The exercise solutions need to be prepared by the students in form of self organized studies.</p> <p>In the exercise the knowledge gained in the lecture will be applied in form of weekly exercises, which will be presented by the students and discussed. The exercises need to be solved by the students in form of self organized studies.</p>
Recommended Prerequisites	Successfull participation in modules:

	<ul style="list-style-type: none"> • 11110 "Mathematics for Engineering I" and • 13110 "Basic Natural Sciences" <p>Basic knowledge in tensor algebra and tensor analysis, classical and fluid mechanics.</p>
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Exercise - 2 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	All materials presented in the lecture are made available in electronic form. Text books will be recommended during the lecture. All exercises will be made available in electronic form.
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	<ul style="list-style-type: none"> • Presentation of solution of one exercise, 20 min. (15%) • Written solution of 2 exercise sheets (35%) on first and second part of the module • Written examination on 3rd part of the module, 45 min. (50%)
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	<ul style="list-style-type: none"> • 240122 Lecture Atmosphere - 2 Hours per Week per Semester • 240123 Exercise Atmosphere - 2 Hours per Week per Semester • 240124 Examination Examination Atmosphere
Components to be offered in the Current Semester	No assignment

Module 13110 Basic Natural Sciences

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	13110	Mandatory

Modul Title	Basic Natural Sciences
	Grundlagen der Naturwissenschaften
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. rer. nat. Schmid, Reiner
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	<p>The students</p> <ul style="list-style-type: none"> • are able to understand and use the chemical vocabulary (nomenclature) • can write reaction equations • can perform stoichiometric and other chemical calculations • can use the periodic system and know its structure • understand the fundamental interrelations between structure and properties of matter • can describe the most important reaction types • know the fundamental concepts of chemical bonding • have an overview over a few important chemical elements and their compounds • apply the physical laws of the respective topics, to solve simple physical problems
Contents	<p>Part Chemistry</p> <ul style="list-style-type: none"> • Atoms, Molecules and Ions • Stoichiometry: Calculations with Chemical Formulas • Aqueous Reactions and Solution Stoichiometry • Chemical Equilibrium • Acid-Base Equilibria • Additional Aspects of Aqueous Equilibria • Gases • Thermochemistry • Electronic Structure of Atoms • Periodic Properties of Elements • Basic Concepts of Chemical Bonding • Molecular Structure and Bonding Theories

- Intermolecular Forces
- Electrochemistry
- Organic Chemistry - Introduction
- Bonding Theory for Hydrocarbons

Laboratory:

- Introduction into fundamental lab works
- qualitative analysis and determination of inorganic ions
- quantitative analysis (titrimetric analysis)

Part Physics

Taking examples from different fields of physics:

- Motion Along a Straight Line
- Motion in Two and Three Dimensions
- Force and Motion
- Kinetic Energy and Work
- Potential Energy and Conservation of Energy
- Linear Momentum
- Angular Momentum
- Fluids
- Oscillations
- Waves - General Properties
- Sound Waves
- Electromagnetic Waves
- Images
- Interference
- Diffraction
- Electric Current and Resistance
- Capacitance, Dielectrics

Recommended Prerequisites	School knowledge in physics, chemistry and mathematics
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 4 hours per week per semester Exercise - 3 hours per week per semester Laboratory training - 1 hours per week per semester Self organised studies - 60 hours
Teaching Materials and Literature	<p>Part Chemistry</p> <ul style="list-style-type: none"> • Brown/Lemay/Bursten: Chemistry - The Central Science (Pearson) • Whitten/Gailey/Davis: General Chemistry (Saunders College Publishing) <p>Part Physics</p> <ul style="list-style-type: none"> • Halliday / Resnick / Walker: Fundamentals of Physics (WILEY) • Giancoli: Physics for Scientists & Engineers (Pearson)
Module Examination	Prerequisite + Final Module Examination (MAP)
Assessment Mode for Module Examination	<p>Prerequisite:</p> <ul style="list-style-type: none"> • Successful completion of the safety instructions including "check of knowledge"-test, and the subsequent practical training with a minimum score.

	Final Module Examination: <ul style="list-style-type: none">• Written exam (120 min.), consisting of two equally graded parts, "Physics" and "Chemistry".
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	<ul style="list-style-type: none">• 228410 Lecture Physics (Basic Natural Sciences)• 228420 Lecture General Chemistry (Basic Natural Sciences)• 228411 Exercise Physics (Basic Natural Sciences)• 228421 Exercise General Chemistry (Basic Natural Sciences)• 228422 Laboratory training General Chemistry (Basic Natural Sciences)• 228424 Examination Basic Natural Sciences
Components to be offered in the Current Semester	228426 Examination Basic Natural Sciences/ Physics and Chemistry - Wiederholung

Module 41101 Introduction to Environmental and Resource Management

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	41101	Mandatory

Modul Title	Introduction to Environmental and Resource Management Einführung in den Studiengang Umwelt- und Ressourcenmanagement
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Dr. rer. nat. Bucher, Roman
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	<p>Rationale The class will give an introductory overview into “Environmental and Resource Management”. Both empirical (measuring data) and theoretical (modelling) approaches to environmental problems and their solution will be taken. Additionally, the class intends to give an introduction to methods of scientific work with special emphasis on information acquisition and information presentation.</p> <p>Part "Introduction to ERM" Objectives are to enable students to define and identify environmental problems and to enable students to apply management techniques to regional and global environmental problems. Students will be able</p> <ul style="list-style-type: none"> • to overview the structure and philosophy of the Bachelor programme ERM and the research focus of the participating departments, • to judge the importance of environmental and resource management based on a first account of a variety of case studies. <p>Part "Introduction to Scientific Work" Objectives are to enable students to gain relevant information about environmental problems, and to enable students to present the results in an acceptable form. Students will be able</p> <ul style="list-style-type: none"> • to adequately use the university library, the internet and other information sources, • to understand the structure of various scientific presentations (e.g. research paper, oral presentations, poster)
Contents	Part "Introduction to ERM" Lectures presented by different departments to following topics:

- Scientific basis of environmental problems in different ecosystems (terrestrial, aquatic, atmospheric/in different climatic zones) including a high variety of organisms (e.g. microorganisms, plants, animals)
- Human dominated landscapes with a focus on land use and nature conservation/restoration
- Economic perspectives (Macroeconomics, incentives/planning, environmental law, impact assessment)
- Environmental data science and modelling of complex environment-human interactions

The content is changing from year to year according to topicality.

Part "Introduction to Scientific Work"

- Basic understanding of scientific methods
- Learning the use of different literature search tools
- Reading and writing scientific texts
- Do's and Don'ts in scientific presentations

Recommended Prerequisites	None
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Seminar - 2 hours per week per semester Consultation - 20 hours Self organised studies - 100 hours
Teaching Materials and Literature	<p>Part "Introduction to ERM"</p> <ul style="list-style-type: none"> • Series of lectures BTU professors and invited guest lecturers • Lecture notes • Material available on Moodle <p>Part "Introduction to Scientific Work"</p> <ul style="list-style-type: none"> • Self-organized work • Material on Moodle <p>Suggested reading</p> <ul style="list-style-type: none"> • Barrow, C.J. 1999. Environmental Management. Principles and Practice. Routledge. • Further available literature (Moodle)
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	<p>Part "Introduction to Scientific Work"</p> <ul style="list-style-type: none"> • Writing a midterm text in presence (25%) • Revised text after consultation (25%) <p>Part "Introduction to ERM"</p> <ul style="list-style-type: none"> • Written examination, 60 min. (50%) The examination is to be carried out as eTest in presence.
Evaluation of Module Examination	Performance Verification – graded

Limited Number of Participants none

Remarks None

Module Components

- 240729 Lecture Introduction to ERM
- 240730 Seminar Introduction to Scientific Work
- 240731 Examination Introduction to Environmental and Resource Management

Components to be offered in the Current Semester No assignment

Module 41102 Ecology

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	41102	Mandatory

Modul Title	Ecology Ökologie
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. rer. nat. Birkhofer, Klaus
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	<p>Overall Students will be able to understand ecological principles and functioning of ecosystems and to apply them to different ecosystems. The connection between ecosystem integrity, ecosystem functions and resource management will be understood.</p> <p>Part "Terrestrial Ecology" The objective is to outline the fundamentals of ecology, including biodiversity-ecosystem function research in terrestrial ecosystems with a focus on conservation and resource management. Students will gain knowledge about biodiversity as a basic ecological concept, and will be able to understand the different dimensions of biodiversity when focusing on the protection and management of ecosystems. Students will learn about:</p> <ul style="list-style-type: none"> • Ecophysiology & Population Ecology • The different dimensions of biological diversity and their applied role in conservation and ecosystem management • The role of diversity in ecosystem stability and ecosystem functioning • The ethical and economic justifications of biodiversity protection and related management strategies <p>Part "Aquatic Ecology" Students will understand the diversity and variability of freshwater ecosystems. They will obtain knowledge on freshwater ecology, principle functioning of lakes and running waters as well as their role in biogeochemical cycling of landscapes. They will understand the connection between freshwater organisms and ecosystem services. Students will be able to apply general principles of ecology to aquatic ecosystems.</p>

Contents	<p>Part "Terrestrial Ecology"</p> <ul style="list-style-type: none"> • Definitions & measures of biodiversity • The importance of biodiversity for human well-being • Management approaches for biodiversity conservation <p>Part "Aquatic Ecology"</p> <ul style="list-style-type: none"> • Running water ecosystems: variability, characteristics and functions, connectivity, aquatic organisms, food webs, ecosystem engineers • Standing water ecosystems: genesis and typology, physical and chemical properties and biogeochemistry of water and sediment, habitats and organisms
Recommended Prerequisites	Biology, Chemistry, Statistics
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 4 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	<p>Part "Terrestrial Ecology"</p> <ul style="list-style-type: none"> • Lecture slides (in Moodle) <p>Recommended readings: Levin - Encyclopedia of Biodiversity (e-book) Jorgensen - Encyclopedia of Ecology (e-book available) Schowalter – Insect Ecology (e-book available) Coleman - Fundamentals of Soil Ecology (e-book available) Van Dyke – Conservation Biology (e-book available)</p> <p>Part "Aquatic Ecology "</p> <ul style="list-style-type: none"> • Lecture slides (in Moodle) <p>Recommended readings: Dodds, Whiles – Freshwater Ecology (e-book available)</p>
Module Examination	Final Module Examination (MAP)
Assessment Mode for Module Examination	Written exam at the end of the lecture period (120 min.) covering both parts of the module. Each part (LE Terrestrial Ecology & LE Aquatic Ecology) contributes 50% to the total number of achievable points.
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	<ul style="list-style-type: none"> • 240537 Lecture Aquatic Ecology • 240731 Lecture Terrestrial Ecology • 240766 Examination Ecology
Components to be offered in the Current Semester	<p>240537 Lecture Aquatic Ecology - 2 Hours per Term</p> <p>240731 Lecture Terrestrial Ecology - 2 Hours per Term</p> <p>240766 Examination</p>

Ecology

Module 41105 Economics

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	41105	Mandatory

Modul Title	Economics
	Volkswirtschaftslehre
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	No assignment
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	none
Contents	none
Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	No assignment
Teaching Materials and Literature	none
Module Examination	Unspecified - Specification from winter semester 2016/17 required!
Assessment Mode for Module Examination	none
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	none
Components to be offered in the Current Semester	No assignment

Module 41106 Biology

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	41106	Mandatory

Modul Title	Biology
	Biologie
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	No assignment
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	none
Contents	none
Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	No assignment
Teaching Materials and Literature	none
Module Examination	Unspecified - Specification from winter semester 2016/17 required!
Assessment Mode for Module Examination	none
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	none
Components to be offered in the Current Semester	No assignment

Module 41107 Business Administration

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	41107	Mandatory

Modul Title	Business Administration Betriebswirtschaftslehre
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. rer. pol. Wätzold, Frank
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	After participating in the module, students will be able to <ul style="list-style-type: none"> • understand the various aspects of how to establish and run a business • understand and evaluate selected management concepts, and • apply various decision-making tools in business.
Contents	Lecture: <ul style="list-style-type: none"> • Motives and functions of a business • Business ethics and social responsibility • Assessing economic conditions • Starting a new business • Business planning • Managing effectively • Organizational structure • Improving productivity and quality • Hiring, training, motivating, and evaluating employees • Creating, pricing and promoting products • Distributing products • Accounting and financing • Expanding the business abroad • Macroeconomics and macroeconomic policy • Stimulating economic growth in the long and short run • Unemployment and inflation • Money and monetary policy • Fiscal policy • International trade and comparative advantage • Exchange rates and the macro economy

	Seminar:
	<ul style="list-style-type: none"> • Finance, evaluation and decision making • Creating a business plan
Recommended Prerequisites	None
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Seminar - 2 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	<ul style="list-style-type: none"> • Madura, J. (2007): Introduction to Business, Thompson South-Western, 4th edition, Mason, USA. • Baye, M.R. (2003): Managerial Economics and Business Strategy. Boston u.a.O.: McGraw-Hill
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	<ul style="list-style-type: none"> • Written examination, 80 min. (50%) • Written paper (business plan) OR oral presentation, 20 min. (50 %)
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	None
Module Components	<ul style="list-style-type: none"> • 240907 Lecture/Seminar Business administration • 240963 Examination Business administration
Components to be offered in the Current Semester	<p>240907 Lecture/Seminar Business administration - 4 Hours per Term</p> <p>240963 Examination Business administration</p>

Module 41201 International Environmental Law

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	41201	Mandatory

Modul Title	International Environmental Law Internationales Umweltrecht
Department	Faculty 5 - Business, Law and Social Sciences
Responsible Staff Member	Prof. Dr. jur. Albrecht, Eike
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	<p>After completing the module, students are able to :</p> <ul style="list-style-type: none"> • Understand the key concepts of law and international environmental law including its evolution as well as sources. • Name an understand legal principles used in establishing and maintaining environmental quality • Identify and analyse problems relating to implementation and enforcement of multilateral environmental agreements. • Comprehend techniques of solving environmental problems through environmental law
Contents	<p>Lecture: "International Environmental Law"</p> <ul style="list-style-type: none"> • Introduction to international law • Basic features of international law especially Vienna Treaty Conventions • UN environmental declarations • International environmental treaties with special emphasis on biodiversity and climate change <p>Students can chose between 2 different seminars:</p> <ol style="list-style-type: none"> 1. Seminar 1: "Implementation of the international environmental laws on Air Pollution Water, wastewater management and solid waste" 2. Seminar 2: "Transposition of International Climate Policy in the EU and Germany"
Recommended Prerequisites	None
Mandatory Prerequisites	none

Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Seminar - 2 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	<ul style="list-style-type: none">• Birnie/Boyle/Redgwell, International Law and the Environment, 4th edition, Oxford University Press, 2021• Knopp/Epstein/Hoffmann, International and European Environmental Law with Reference to German Environmental Law – A Guide for International Study Programs, 2nd edition, Berlin 2019• Albrecht/Egute/Wanki/Ezeamama (eds.), International environmental law (IEL) – Agreements and introduction. 6th expanded and updated edition, 2022 <p>Additional literature will be announced in the first class meeting.</p>
Module Examination	Final Module Examination (MAP)
Assessment Mode for Module Examination	<ul style="list-style-type: none">• Written examination, 120 minutes <p>In total 60 points can be achieved. The written examination includes the contents of the lecture and the seminar.</p>
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	<p>A yearly excursion in relation to the module may be organised. Depending on the situation, teaching formats and the written examination might be offered digitally or in presence. Students are required to inform themselves on the website of the chair and the Moodle course of the module.</p>
Module Components	<ul style="list-style-type: none">• Lecture International Environmental Law• Seminars that will be announced in class.
Components to be offered in the Current Semester	520233 Examination International Environmental Law (Modul 41201)

Module 41202 Integrated Environmental Planning

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	41202	Mandatory

Modul Title	Integrated Environmental Planning Umweltplanung
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. rer. nat. Beckmann, Michael
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	Rationale

This module introduces the students to various tools of environmental planning and impact analysis with the help of activities, presentations, and lectures. The module covers environmental planning process and tools, sustainability strategies, international conventions, natural and man-made disasters and hazards, environmental impact analysis, strategies and tools for the protection of natural and cultural landscapes.

Lectures/ Seminars: Integrated Environmental Planning

The lectures and seminars shall provide students with a basic knowledge of planning and management strategies and tools, information about main syndromes of anthropogenic influence and impacts on nature and human resources, partial overview of current concepts for environmental planning, instruments and methods for monitoring and evaluation processes in the wide field of different programmes' and projects' implementations. This knowledge obtained will be tested in a final oral exam at the end of the semester. In addition, students will be asked to participate in application-based presentations, discussions and essays throughout the module duration.

Learning Outcome :

- To develop an understanding of the conflicts that environmental planning seeks to address.
- To familiarize students with the key tools, complexity, and diversity of environmental planning practices.
- To strengthen students' skills in analyzing and managing problems relevant to the IEP field of study.
- To enable students to make informed and rational choices regarding the appropriate methods and tools for different planning situations.
- To provide knowledge of, and insight into, the importance of monitoring and evaluation processes.
- To equip students with the ability to predict and assess the environmental impacts of anthropogenic activities.

Contents

Environmental problems and conflicts from global to local scale: anthropogenic influences and natural disasters affecting natural resources and human health

- Syndromes of global change
- Global climate change and response options (mitigation and adaptation)
- Concept and history of sustainable development
- Voluntary Sustainability Standards
- Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA)

Recommended Prerequisites

None

Mandatory Prerequisites

None

Forms of Teaching and Proportion

Lecture - 4 hours per week per semester
Self organised studies - 120 hours

Teaching Materials and Literature

Lein JK (2003): Integrated Environmental Planning, Blackwell, Oxford

Canter, L. W. (1996): Environmental Impact Assessment. Second Edition. McGraw-Hill Inc. Series in Water Resources & Environmental Engineering.

Daniels, T. and Daniels, K. (2003): Environmental Planning Handbook, Chicago: APA Planners Press.

Glasson, J., Chadwick A. and Therivel, R. (1999): Introduction to Environmental Impact Assessment: Principles and procedures, process, practice and prospects. London : UCL Press

Marriot, B. B. (1997): Environmental Impact Assessment: A practical guide, McGraw-Hill

Randolph, J. (2004): Environmental Land Use Planning and Management, Washington, DC: Island Press.

Schmidt, M., João, E. and Albrecht, E. (2005) (Eds.): Implementing Strategic Environmental Assessment. Environmental Protection in the European Union, Volume 2. 742 pages. Heidelberg: Springer Verlag.

Journals:

Environmental Impact Assessment Review

Impact Assessment and project appraisal

Module Examination

Continuous Assessment (MCA)

Assessment Mode for Module Examination

- Oral performance assessment (duration 10 minutes, maximum 15 points)
- Presentation (duration 10 minutes per student, maximum 15 points)

To pass the module students need to gain a minimum of 12 points (the sum of points for the above mentioned module components).

Evaluation of Module Examination

Performance Verification – graded

Limited Number of Participants

none

Remarks

Module Components

240308 VL/SE Integrated Environmental Planning

Components to be offered in the Current Semester

240308 Lecture/Seminar
Integrated Environmental Planning - 4 Hours per Term

Module 41205 Sociology

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	41205	Mandatory

Modul Title	Sociology Soziologie
Department	Faculty 5 - Business, Law and Social Sciences
Responsible Staff Member	Prof. Dr. phil. Jaeger-Erben, Melanie
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	General overview on sociological approaches, theories and research topics. Insights into different epistemological perspectives and paradigms. Appropriation of a sociological perspective.
Contents	<p>The module provides basic knowledge of sociological approaches, theories and research topics. The focus is on trying out and acquiring sociological perspectives and approaches in the analysis of society and social change. Various paradigms of past and present sociology are taught and current issues such as the Anthropocene debate or feminist sociology are addressed.</p> <p>Topics include:</p> <ul style="list-style-type: none"> - Core topics in sociology: social order and social change. - Sociological paradigms: from the linguistic turn to New Materialism - Sociological perspectives on human-environment relations and social relations with nature - Current issues in sociology: socio-ecological transformation, global inequalities and intersectionality, post-pandemic renewal <p>Students will be given various assignments throughout the semester, such as reviews of texts or documentaries, Ted Talks, debate walks, and mappings, which will be presented and discussed in class.</p>
Recommended Prerequisites	None
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Seminar - 2 hours per week per semester Self organised studies - 120 hours

Teaching Materials and Literature	<p>The lecture will partially refer to the following books:</p> <ul style="list-style-type: none">• Giddens, A., & Sutton, P. W. (2021). <i>Sociology</i>. John Wiley & Sons.• Dürbeck, G., & Hüpkes, P. (Eds.). (2020). <i>The Anthropocenic Turn: The Interplay Between Disciplinary and Interdisciplinary Responses to a New Age</i>. Routledge.• Harper, C. L., & Snowden, M. (2017). <i>Environment and society: Human perspectives on environmental issues</i>. Routledge.• Abbott, P., Tyler, M., & Wallace, C. (2006). <i>An introduction to sociology: Feminist perspectives</i>. Routledge. <p>Further literature will be announced during the lectures.</p>
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	<ul style="list-style-type: none">• Pecha Kucha Presentation, 7:40 min (30%)• Protocol, 1-2 pages (20%)• Review, 1-2 pages (20%)• Reflection, 2-3 pages (30%)
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	<ul style="list-style-type: none">• 248106 Lecture Sociology• 248107 Exercise Sociology
Components to be offered in the Current Semester	No assignment

Module 41206 Economic and Social Instruments of Environmental and Resource Management

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	41206	Mandatory

Modul Title	Economic and Social Instruments of Environmental and Resource Management Ökonomische und politische Instrumente in Umwelt- und Ressourcenmanagement
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. rer. oec. Steckel, Jan Christoph
Language of Teaching / Examination	English
Duration	2 semesters
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	<p>The module "Economic and Social Instruments of Environmental and Resource Management" consists of two parts.</p> <p>The lecture "Economic instruments for climate policy" covers different policy instruments and their economic assessment. The lecture features an introduction to various perspectives on environmental policy, including first-best welfare economic perspectives. It will also introduce to a political economy perspective, including decision problems of different economic agents. The lecture will provide guidance on how to evaluate policy instruments and introduce students to the most common strands of policy analysis.</p> <p>The seminar "Political Economy of Energy Transitions" will expand students' understanding of challenges to energy transitions. For example, energy transitions may consist of phasing out coal. This course features threats to effective and just energy transitions and options to possibly overcome such threats.</p>
Contents	<p>The lecture "Economic instruments for climate policy" will introduce the broader field of climate economics. It will first give an overview of welfare economic assessment frameworks of environmental (particular climate) policy instruments, including different normative viewpoints. It will then introduce modern political economy debates and how they relate to the analysis and assessment of climate policy instruments. Students will also learn about the role of distributional effects and acceptability for assessing policy instruments.</p>

The seminar “Political Economy of Energy Transitions” will illustrate political economy problems in energy transitions using a simulation game. After an introduction to the topic of energy transitions and key political aspects, students will prepare the positions of specific actors relevant for the energy transition in a selected country. Material and background information will be provided, but students are encouraged to also engage in their own analyses and research. The course will culminate in a simulation game to illustrate barriers and potential solutions to energy transitions.

Recommended Prerequisites	The module builds upon basic knowledge in social sciences and economics. Therefore, such basic knowledge is recommended.
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Seminar - 2 hours per week per semester
Teaching Materials and Literature	A detailed syllabus and reading lists will be provided.
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	<ul style="list-style-type: none"> • Winter Term: 1 written assignment (1000-2000 words, 30%) at mid-term and one exam (70%) at the end of the semester [together 50% of the grade] • Summer Term: Seminar paper and preparation for the simulation game (~20 pages in total, 60%) and presentation (~15 minutes, 40%) • Details to be explained at the beginning of the course.
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	<p>Wintersemester:</p> <ul style="list-style-type: none"> • 232301 Lecture Economic instruments for climate policy <p>Sommersemester:</p> <ul style="list-style-type: none"> • 232302 Seminar Political Economy of Energy Transitions
Components to be offered in the Current Semester	232302 Seminar Political Economy of Energy Transitions - 2 Hours per Term

Module 42203 Geosciences and Natural Resources

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	42203	Mandatory

Modul Title	Geosciences and Natural Resources Geowissenschaften und Rohstoffe
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. rer. nat. Herd, Rainer
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	<p>At the end of the module the student are able:</p> <ul style="list-style-type: none"> • to understand the nature of geological processes and the role of these processes for the life on earth • to get to know the methods of investigation of these processes • to realize the interaction between geological processes, environment, anthropogenic activities • to study methods for the protection of natural hazards • to become acquainted to the processes of the formation of different raw materials • to understand how raw material economy and raw material policy works • to realize the ambivalence between the utilisation of natural resources and the protection of the environment • to get a personal relation to raw material issues by being responsible for raw material policy during a simulation course • to be able to present working results in an oral presentation and to defend them in an open discussion
Contents	<p>Environmental Geology</p> <ul style="list-style-type: none"> • The lectures provide an overview about the geological processes at the surface and subsurface of the earth • endogenic processes on the basis of plate tectonics (crustal dynamics, rock deformation, earthquakes, magmatic and volcanic activities) • exogenic surface processes (weathering, erosion, transport and sedimentation in various environments) • environmental aspects and anthropogenic influences on the theses processe

The lecture is accompanied by an excursion (240822): a field trip to an active mining site. Topics: Geological setting, mining technology, economic and political aspects, environmental impact of mining activities.

Raw Materials and Resource Economics

The lecture provides information about raw materials and resources of energy, metals, industrial minerals etc. Emphasis is laid on the genesis, the world-wide distribution, the utilisation, the trade ways and volume, the substitution potential, the recycling possibilities and the environmental relevance of different raw materials. Important aspects are world resource balances and resource management of different regions. Also prognosis and scenarios for selected materials are presented.

The lecture is further complemented by a weekend course (exercise): UE POLIS (240829). This class is a simulation and gives the students the opportunity to act as a responsible person in the field of raw material and resource policy. Participants assume political positions and represent different regions of the world with the task to manage the emerging problems and act for the interests of their region controlled by oppositions, NGO's and the UN.

Recommended Prerequisites	None
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 4 hours per week per semester Exercise - 2 hours per week per semester Excursion - 8 hours Self organised studies - 82 hours
Teaching Materials and Literature	Environmental Geology: <ul style="list-style-type: none"> • Press & Sievers: Earth • Grotzinger, J.: Understanding earth Raw Materials and Resource Economics: <ul style="list-style-type: none"> • Script provided by the chair, internet sources Excursion POLIS: <ul style="list-style-type: none"> • Material provided by the chair
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	<ul style="list-style-type: none"> • Written examination, 90 min. - Environmental Geology, 50 % • Written examination, 90 min. - Raw Materials and Resource Economics, 50% Excursion and exercise are mandatory.
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	Short coming changes will be announced during the first lecture.
Module Components	In summer semester:

- 240812 Lecture Environmental Geology
- 240821 Lecture Raw materials and resource economics
- 240822 Excursion Mining and environment
- 240829 Seminar/Exercise POLIS
- 240854 Examination Environmental Geology
- 240867 Examination Raw materials and resource economics

In winter semester:

- 240867 Examination Raw materials and resource economics (Part of Module 42203)
- 240870 Examination Environmental Geology

**Components to be offered in the
Current Semester**

240812 Lecture

Environmental Geology - 2 Hours per Term

240821 Lecture

Raw materials and resource economics - 2 Hours per Term

240822 Excursion

Mining and environment (Part of Modul 42203)

240829 Seminar/Exercise

POLIS (Part of Modul 42203)

240854 Examination

Environmental Geology

240867 Examination

Raw materials and resource economics (Part of Module 42203)

Module 43201 Corporate Environmental Protection

assign to: Mandatory Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	43201	Mandatory

Modul Title	Corporate Environmental Protection Umweltschutz im Unternehmen
Department	Faculty 5 - Business, Law and Social Sciences
Responsible Staff Member	Prof. Dr. rer. pol. habil. Lee, Roh Pin
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	After attending the module, students will have a basic understanding of environmental and sustainability management.

Especially, they:

- Understand the **relevance** of environmental protection and sustainability for corporations;
- Contextualize the **historical development** of sustainability and the implications for corporations;
- Understand **critical terms and concepts** in sustainability within the corporate context;
- Have developed an understanding of how to build up a **sustainability management** in a corporation;
- Understand the use of **tools and management systems** for environmental and sustainability management;
- Understand the most important **legal frameworks** influencing environmental and sustainability management in corporations

Contents	<ul style="list-style-type: none"> • Concepts of sustainability as guidelines for corporations • The history of sustainability and implications for corporations • Laws and regulations for environmental protection and sustainability and their implications for corporations • Integrated sustainability management in corporations • Evaluation and measuring tools (e.g., life cycle assessment), indicators for ecological performance, and environmental accounting • Management tools and standardisation of management tools: EMAS, DIN ISO 14000
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	<ul style="list-style-type: none"> • Sustainability and environmental protection communications, reports, labels, terms
Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Self organised studies - 120 hours Project Seminars - 2 hours per week per semester
Teaching Materials and Literature	The lecture is based on presentations, which can be used for lecture notes. Additional reading may be referenced during the lectures.
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	<ul style="list-style-type: none"> • Written examination, 60 min. (50 %) • Group examination, 30 min. (50 %)
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	<ul style="list-style-type: none"> • Lectures 2 hours per week per semester • Seminars/Projects 2 hours per week per semester, including presentations
Components to be offered in the Current Semester	<p>510619 Lecture Corporate Environmental Protection - 2 Hours per Term</p> <p>510620 Project Seminars Corporate Environmental Protection - 2 Hours per Term</p>

Module 12261 Ecological Excursion

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	12261	Compulsory elective

Modul Title	Ecological Excursion Ökologische Exkursion
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. rer. nat. Birkhofer, Klaus
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	12
Learning Outcome	<p>The Ecological Excursion module provides hands-on experience of biodiversity threats and conflicts and basic ecological adaptations to dryland conditions.</p> <p>Part "Ecological Excursion: Seminar" The seminar introduces students to the main components of terrestrial dryland ecosystems and provides a forum for discussion of topics relevant to the field trip. Students will learn about:</p> <ul style="list-style-type: none"> • biodiversity crisis and threats • human-wildlife conflicts • German colonial history • competent use of English <p>Part "Ecological Excursion: Excursion" The Ecological Excursions provide a hands-on experience that combines elements of scientific expeditions, teamwork projects and taxonomic identification of organisms. Students will learn about:</p> <ul style="list-style-type: none"> • independent and team-oriented ecological project work • adaptations of animals and plants to local conditions • poverty alleviation and food security • geological and hydrological conditions and processes • ecological concepts such as food webs, species inventories, sampling theory
Contents	<p>Part "Ecological Excursion: Seminar"</p> <ul style="list-style-type: none"> • Fauna and Flora (plants, vertebrates, invertebrates) • contemporary ecological challenges (biodiversity conservation, climate change, invasive species, ecosystem services)

- contemporary social challenges (human wildlife conflicts, poaching, food security, colonial history)

The seminar classes are organised as 8 double blocks of lectures by the lecturer and seminar presentations by the students during the semester. Lectures will be complemented by discussions and individual contributions from students. Self-organised work is required, in particular the preparation of seminar presentations and the acquisition of previously discussed content for the field trip.

Part "Ecological Excursion: Excursion"

- study design and hypothesis testing
- multidisciplinary teamwork
- communication skills

The field trip will last up to 16 days.

Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 1 hours per week per semester Seminar - 2 hours per week per semester Excursion - 10 hours per week per semester Self organised studies - 165 hours
Teaching Materials and Literature	Relevant literature and equipment needed during the field trip will be provided to the participants.
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	Part "Ecological Excursion: Seminar" One oral presentation, 15 min followed by discussion (50%) Part "Ecological Excursion: Excursion" An individual log of a pre-assigned field day (25%) and a species list of a pre-assigned taxonomic group after the field day (25%, one list for every two students participating).
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	18
Remarks	The excursion to Namibia is associated with costs for participants (around 2.500 €). In previous years, stipends were available for qualified students to reduce the costs. PLEASE NOTE: The module can only be offered with a minimum number of 8 participants! If fewer than 8 participants register for the module, the module must be cancelled.
Module Components	<ul style="list-style-type: none"> • 240708 Lecture/Seminar Ecological Excursion: Seminar • 240709 Excursion Ecological Excursion: Excursion
Components to be offered in the Current Semester	No assignment

Module 12971 Operations Research for Environmental and Resource Management

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	12971	Compulsory elective

Modul Title	Operations Research for Environmental and Resource Management
Department	Operations Research für Umwelt- und Ressourcenmanagement Faculty 1 - Mathematics, Computer Science, Physics, Electrical Engineering and Information Technology
Responsible Staff Member	Prof. Dr. rer. nat. habil. Fügenschuh, Armin
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	On special announcement
Credits	6
Learning Outcome	Students get familiar with basic concepts of mathematical optimization (in particular, linear, nonlinear, and mixed-integer optimization) and graph theoretic concepts. They will gain the ability to formalize an applied optimization problem e.g. from the field of environmental sciences and resource management and solve them with mathematical means, and will know how use computer software (modeling languages and solvers) to formulate and solve optimization problems.
Contents	Graphs, algorithmic problems on graphs (shortest path, spanning trees, Steiner trees, maximum flow, minimum cut, assignment, coloring, and others), Dantzig's simplex linear optimization method, non-linear optimization methods, integer optimization methods, multi-criteria (multi-objective) optimization, stochastic optimization, robust optimization, bilevel optimization, modeling languages to formulate optimization problems, analysis of case studies e.g. from the field of environmental sciences and resource management.
Recommended Prerequisites	Knowledge of the content of modules <ul style="list-style-type: none"> • 11110 : Mathematics of Engineering I • 11111 : Mathematics of Engineering II
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 3 hours per week per semester Exercise - 1 hours per week per semester

	Self organised studies - 120 hours
Teaching Materials and Literature	<ul style="list-style-type: none">• S. Nickel, O. Stein: Operations Research, Springer Verlag, 2014.• W. Domschke, A. Drexl: Einführung in Operations Research, 9. Aufl., Springer-Gabler Verlag, 2015.• V. Chvatal: Linear Programming, W.H. Freeman & Co, 1983. (Englisch) <p>Further might be announced by the lecturer at the beginning of the course.</p>
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	<ul style="list-style-type: none">• 4 written examinations, 30 minutes each, of which the best 3 contribute to the final module grade with a weighting of 1/3 each
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	<ul style="list-style-type: none">• Study programme Environmental and Resource Management B.Sc.: Compulsory elective module• Study programme Environmental and Resource Management M.Sc.: Compulsory elective module• Study programme Physics M. Sc.: Compulsory elective module in complex „Minor Subject“
Module Components	<ul style="list-style-type: none">• Lecture: Operations Research for Environmental and Resource Management• Accompanying exercise• Related examination
Components to be offered in the Current Semester	No assignment

Module 13109 Philosophy of Technology and Nature

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	13109	Compulsory elective

Modul Title	Philosophy of Technology and Nature
	Technik- und Naturphilosophie
Department	Faculty 5 - Business, Law and Social Sciences
Responsible Staff Member	Prof. Dr. rer. nat. phil. habil. Schwarz, Astrid
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	<p>After passing the module, students should:</p> <ul style="list-style-type: none"> • understand main philosophical theories of “nature” • interrogate the concept of “nature” and to expose its numerous ideological and cultural manifestations. • identify the main ethical dimensions of “nature”, and their crosscultural and political dimensions. • gain insight into reading, writing, and visual practices about “nature” and understand the power of narratives and storytelling to shape our environmental present and future.
Contents	<p>What is “nature”? Is “nature” the same in all times and cultures? Is the “nature”/culture distinction still worth drawing? This module seeks to answer these and other questions, by approaching “nature” with various grounded historical and contemporary philosophical approaches. The module has two parts: „How to talk about “nature”?“ and „Living in the Anthropocene: concepts, models, and narratives in the climate crisis debate.“</p> <p>The module provides an overview on how “nature” reveals itself in various environmental debates. For example, the concept of “nature” was differently interpreted in ancient times, compared to modern contemporary cultures. We will probe the different usage, the scope of historical and cross-cultural depth, the semantics, the imageries, and finally, the logical coherence of “nature” concepts. This variety of topics means that the assigned readings will draw from a wide range of sources.</p> <p>With respect to handle current ecological and technocultural problems, a conscious reflection about “nature” seems to be required. Thus, the module should be also seen, in part, as a way to gain insight into</p>

reading and writing about “nature”. In this module, we will demonstrate the power of narratives and storytelling to understand and shape our environmental present and future.
Participation in the accompanying excursion is requested.

Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Seminar - 2 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	See course material in moodle.
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	<ul style="list-style-type: none"> • One short essay, max. 2 pages (20%) • Two reviews, max. 5 pages (each 25%) • 2 oral group presentations, about 15 min OR weekly submitted written answers to one short question on the topical readings to be determined by the instructor (30%)
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	Lectures and seminars in the corresponding field.
Components to be offered in the Current Semester	No assignment

Module 13234 Communication of Science and Technology

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	13234	Compulsory elective

Modul Title	Communication of Science and Technology Wissenschafts- und Technikkommunikation
Department	Faculty 5 - Business, Law and Social Sciences
Responsible Staff Member	No assignment
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every semester
Credits	6
Learning Outcome	none
Contents	none
Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	No assignment
Teaching Materials and Literature	none
Module Examination	Unspecified - Specification from winter semester 2016/17 required!
Assessment Mode for Module Examination	none
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	none
Components to be offered in the Current Semester	No assignment

Module 13245 Human Resource Management and Organizational Behaviour

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	13245	Compulsory elective

Modul Title	Human Resource Management and Organizational Behaviour Personalmanagement und Verhalten in Unternehmen
Department	Faculty 5 - Business, Law and Social Sciences
Responsible Staff Member	Prof. Dr. rer. pol. habil. Lee, Roh Pin
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	<p>On completion of the module, students are able to:</p> <ul style="list-style-type: none"> • Acquire in-depth knowledge of the central topics in the fields of OB and HRM • Apply insights and learnings from the areas of OB and HRM to concrete practical situations, especially in the environment and resource sectors. • Able to work on concrete OB and HRM problems individually and in teams • Provide constructive feedback to other students on their skills (e.g., interview, assessment center) • Have the ability to think in larger contexts to support their entry and development in their future careers.
Contents	<p>When they enter the job market, students will be working in organizations, in (interdisciplinary/international/virtual) teams and/or engage in management/leadership activities. This module will provide them with theoretical and practical knowledge about key issues of organizational behaviour (OB) and Human Resource Management (HRM) to support them in increasing their awareness and skills in these areas to prepare them for their future careers, especially in the environment and resource sectors.</p> <p>Course coverage:</p> <ul style="list-style-type: none"> - Introduction to organizational behavior and why it is relevant • Organizational behaviour/OB • Individual level (e.g., foundations of individual behaviour, impacts of individual characteristics, impact of situational factors)

- Group level (e.g., foundations of group behaviour, understanding work teams, group processes such as communication, power, conflict)

- Management & Leadership

- Management roles
- Leadership styles
- Employee motivation

- Human resource systems and practices (e.g., planning personnel needs, personnel recruitment, personnel development, appraisal and compensation)

Students will also be given opportunities to develop and practice their skills (e.g., working in teams, preparing for job application and interviews).

Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Seminar - 2 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	<ul style="list-style-type: none"> • Robbins, S.P., Judge, T.A. 2022. Organizational Behavior, 19th Edition, New York, Pearson. <p>Further references will be provided during the first lecture meeting.</p>
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	<ul style="list-style-type: none"> • Individual assignment – Short essay 1500 words (30%) • Group project – 15 min oral presentation (30%) • Written test – 60 min multiple choice (40%)
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	<ul style="list-style-type: none"> • Human Resource Management & Organizational Behavior (Lecture; 2 SWS) • Human Resource Management & Organizational Behavior (Seminar; 2 SWS)
Components to be offered in the Current Semester	No assignment

Module 13314 Instrumental Analysis and Physical Chemistry

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	13314	Compulsory elective

Modul Title	Instrumental Analysis and Physical Chemistry Instrumentelle Analytik und physikalische Chemie
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	No assignment
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	none
Contents	none
Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	No assignment
Teaching Materials and Literature	none
Module Examination	Unspecified - Specification from winter semester 2016/17 required!
Assessment Mode for Module Examination	none
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	none
Components to be offered in the Current Semester	No assignment

Module 13659 Sustainability and Digitalisation

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	13659	Compulsory elective

Modul Title	Sustainability and Digitalisation Digitalisierung und Nachhaltigkeit
Department	Faculty 5 - Business, Law and Social Sciences
Responsible Staff Member	No assignment
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	none
Contents	none
Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	No assignment
Teaching Materials and Literature	none
Module Examination	Unspecified - Specification from winter semester 2016/17 required!
Assessment Mode for Module Examination	none
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	none
Components to be offered in the Current Semester	No assignment

Module 13711 Colloquium Transdisciplinary Sustainability Research

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	13711	Compulsory elective

Modul Title	Colloquium Transdisciplinary Sustainability Research Kolloquium Transdisziplinäre Nachhaltigkeitsforschung
Department	Faculty 5 - Business, Law and Social Sciences
Responsible Staff Member	No assignment
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every semester
Credits	6
Learning Outcome	none
Contents	none
Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	No assignment
Teaching Materials and Literature	none
Module Examination	Unspecified - Specification from winter semester 2016/17 required!
Assessment Mode for Module Examination	none
Evaluation of Module Examination	Study Performance – ungraded
Limited Number of Participants	none
Remarks	none
Module Components	none
Components to be offered in the Current Semester	No assignment

Module 13735 Biodiversity of Terrestrial Invertebrates

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	13735	Compulsory elective

Modul Title	Biodiversity of Terrestrial Invertebrates Biodiversität terrestrischer Wirbelloser
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	No assignment
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	none
Contents	none
Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	No assignment
Teaching Materials and Literature	none
Module Examination	Unspecified - Specification from winter semester 2016/17 required!
Assessment Mode for Module Examination	none
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	none
Components to be offered in the Current Semester	No assignment

Module 13737 Practical Course Aquatic Ecology

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	13737	Compulsory elective

Modul Title	Practical Course Aquatic Ecology Praktikum Gewässerökologie
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. rer. nat. habil. Martin-Creuzburg, Dominik
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	The students know basic methods for the investigation of standing and running waters and can apply them independently. They can effectively use different data and information in order to answer research questions or develop hypotheses. The students can compare and assess the possibilities and limitations of methods and data in aquatic ecology.
Contents	Recording and evaluation of abiotic and biotic water quality parameters within the framework of a case study on a watercourse and a standing water body. Field measurements with different probes, limnological sampling techniques and laboratory analyses, process measurements, experimental approaches, microscopy of aquatic organisms, data analyses and preparation of reports.
Recommended Prerequisites	13298 Basics for Freshwater Management or/and 42505 Freshwater Restoration Ecology. Commitment and willingness for active participation, self-organized work, teamwork and self-study.
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Practical training - 80 hours Self organised studies - 100 hours
Teaching Materials and Literature	The necessary materials for the practical part will be provided.
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	Oral presentations and written reports of the results for each part, Running Waters and Standing Waters.

Part Running Waters:

- 15 min presentation on one of the methods to be applied (10%)
- Course participation (10%)
- Presentation of results and written report (ca. 3 - 5 pages without figures and/or tables, 11 pt font, line spacing no more than 1.2) (30%)

Part Standing Waters:

- 15 min presentation on one of the methods to be applied (10%)
- Course participation (10%)
- Presentation of results and written report (ca. 3 - 5 pages without figures and/or tables, 11 pt font, line spacing no more than 1.2) (30%)

Evaluation of Module Examination

Performance Verification – graded

Limited Number of Participants

12

Remarks

The course will take place as a block course during the lecture-free period of the 2026 summer semester from August 17 to September 4, 2026. The number of participants is limited to 12 students. The Standing water part will take place from August 17 to 21, 2026, at the Research Station of the Department of Aquatic Ecology in Bad Saarow. This requires all students to stay overnight in a youth hostel in Bad Saarow. The accommodation costs of ~€150 will be paid by the students themselves. In order to process the booking and deposit for the accommodation and to guarantee binding participation in the module, a deposit of €100 is required. The payment terms will be communicated to students by the Department of Aquatic Ecology after they have registered for the module with the Examination Office.

The Department of Aquatic Ecology will decide on final admission to the module. This depends on the student's qualifications and receipt of the deposit for accommodation. Only after receiving a positive decision from the Department of Aquatic Ecology will the student be given access to the course page on Moodle.

Module Components

240506 Practical course aquatic ecology

Components to be offered in the Current Semester

240506 Practical training
Practical Course Aquatic Ecology - 4 Hours per Term

Module 13822 Biodiversity of Terrestrial Arthropods

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	13822	Compulsory elective

Modul Title	Biodiversity of Terrestrial Arthropods Biodiversität terrestrischer Arthropoden
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. rer. nat. Birkhofer, Klaus
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	<p>The module Biodiversity of Terrestrial Arthropods provides an overview of the taxonomy and ecology of arthropods in terrestrial ecosystems with a mandatory 5-day excursion during the semesters excursion week and student projects.</p> <p>Part "Biodiversity: Lecture" The lectures introduce the taxonomy of terrestrial invertebrates with diagnostics for major orders and highlight the ecology of selected case taxa. Students will learn about</p> <ul style="list-style-type: none"> • Phylogenetic relationships of major terrestrial invertebrate orders • Identification and diagnostics of major terrestrial invertebrate orders • Ecology of major terrestrial invertebrate orders <p>Part "Biodiversity: Seminar" The seminars are based on student presentations of an assigned scientific publication focusing on the ecology of selected terrestrial invertebrate taxa. Students will learn about</p> <ul style="list-style-type: none"> • Interpretation of scientific articles • Ecology of a selected case taxon • Summarizing and presenting scientific results <p>Part "Biodiversity: Excursion" Students will learn:</p> <ul style="list-style-type: none"> • Ecological field work methods with a focus on biodiversity assessment

Contents

- Identification of arthropods and use of taxonomic determination keys

The courses will take students to an ecological field station in Brandenburg for five days during the semesters excursion week. A small fee of 10€ will be collected from all participating students to cover some of the costs.

Part "Biodiversity: Lecture"

- Terrestrial arthropod taxonomy
- Terrestrial arthropod ecology

Part "Biodiversity: Seminar"

- Threats to terrestrial arthropod biodiversity
- Status of terrestrial arthropod biodiversity
- Solutions to biodiversity loss in terrestrial arthropod communities

Part "Biodiversity: Excursion"

- Field methods to sample biodiversity with a focus on terrestrial arthropods
- Diagnostic criteria to identify major terrestrial arthropod orders in the field and laboratory

Recommended Prerequisites

For international study programmes and master students module "41217 General and Applied Ecology" or for BSc students module "41102 Ecology". For German study programmes module „14324 Terrestrische Ökologie" or module „41203 Allgemeine Ökologie".

Mandatory Prerequisites

none

Forms of Teaching and Proportion

Lecture - 1 hours per week per semester
Seminar - 1 hours per week per semester
Excursion - 32 hours
Self organised studies - 118 hours

Teaching Materials and Literature

Part "Biodiversity: Lecture"

The class is organized as a weekly lecture introducing major orders of terrestrial arthropods. Lecture-like presentations are complemented by discussions. Self-organized work, in particular acquiring more detailed knowledge of the taxonomic groups is required.

E-books

Piper R, What Insects Do, and Why

Schowalter TD, Insect ecology: an ecosystem approach

Beutel RG & Friedrich F, Insect morphology and phylogeny

Resh VH, Encyclopaedia of insects

New TR, Insect species conservation: Ecology, biodiversity, and conservation

Samways MJ, Insect diversity conservation

Part "Biodiversity: Seminar"

A scientific paper focusing on the ecology of a major order of terrestrial invertebrates is assigned to students. The content of the paper will then be presented as an oral presentation in the seminar by the students following the lecture. All seminar topics and material is provided.

Part " Biodiversity: Excursion"

Students will write a report on an assigned excursion. Participation in these half-day ecological excursions is mandatory. All material for the excursions is provided.

E-books

Brock PD, Britain's Insects: A Field Guide to the Insects of Great Britain and Ireland

Santos JC, Measuring arthropod biodiversity: a handbook of sampling methods

Module Examination

Continuous Assessment (MCA)

Assessment Mode for Module Examination

Part "Biodiversity: Seminar"

One oral presentation, 25 min + 20 min discussion (50%)

Part " Biodiversity: Excursion "

One written report summarising the results from the 5-day excursion (50%)

Evaluation of Module Examination

Performance Verification – graded

Limited Number of Participants

none

Remarks

The courses will take students to an ecological field station in Brandenburg for five days during the semesters excursion week. A small fee of **10 €** will be collected from all participating students to cover some of the costs.

Module Components

- 240795 Lecture/Seminar Biodiversity
- 240798 Excursion Biodiversity

Components to be offered in the Current Semester

240798 Excursion
Biodiversity

240795 Lecture/Seminar

Biodiversity: Lecture/Seminar - 2 Hours per Term

Module 13955 Geomorphology

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	13955	Compulsory elective

Modul Title	Geomorphology Geomorphologie
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. phil. Raab, Thomas
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	On special announcement
Credits	6
Learning Outcome	<p>At the end of the module, the students will be able</p> <ul style="list-style-type: none"> • to understand and remember the fundamentals of geomorphology • to explain the factors and processes of landform development • to describe the morphology of landforms and explain its formation • to understand and apply methods for quantitative landform description and analysis • to apply and evaluate different types of digital elevation data • to process and analyze digital elevation data in GIS software • to create maps of landform structures and relief features
Contents	<p>Part 1 Lecture – Geomorphology</p> <ul style="list-style-type: none"> • Fundamentals and concepts of geomorphology • Geomorphic agents and processes • Landforms and landform • Anthropogenic geomorphology • Characteristic landforms of the mid latitudes <p>Part 2 Seminar – Digital Terrain Analysis</p> <ul style="list-style-type: none"> • Concept of Geomorphometry and basic geomorphometric parameters • Digital elevation models (DEMs) – types and data sources • Software for elevation data processing and analysis • Visualization methods • Advanced geomorphometric indices • Exemplary practical applications (hydrology, archaeology, soil erosion modelling,...) <p>Part 3 Seminar/Exercise - Processing and analysis of digital landform data</p>

	<ul style="list-style-type: none"> • Practical exercises for exemplary study areas of an ongoing research project • import and processing of DEMs in GIS database • computation of basic geomorphometric parameters (slope, curvature, exposition,...) • digital landform classification • computation of advanced morphometric indices (TWI, SPI, ...) • visualization of relief structures • digitization of relief structures, analysis of spatial distribution patterns • creation of maps
Recommended Prerequisites	Basics of physical geography
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 1 hours per week per semester Exercise - 2 hours per week per semester Seminar - 1 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	<ul style="list-style-type: none"> • Anderson, R.S., Anderson, S.P. (2010): <i>Geomorphology. The Mechanics and Chemistry of Landscapes</i>. Cambridge University Press. 637 p. • Goudie, A., Viles, H. (2016): <i>Geomorphology in the Anthropocene</i>. Cambridge University Press. 324 p. • Gutiérrez Elorza, M. (2005): <i>Climatic geomorphology</i>. Elsevier, 760 p. • Hengl, T. (ed., 2009): <i>Geomorphometry. Concepts, Software, Applications</i>. Elsevier, 765 p. • Slaymaker, O., (ed., 2011): <i>Geomorphology and global environmental change</i>. Cambridge University Press, 434 p. • Wilson, J.P. (2000): <i>Terrain Analysis. Principles and Applications</i>. Wiley, 479 p. • Teaching material and further recommended literature will be provided in the specific courses
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	<ul style="list-style-type: none"> • written assessment on Lecture Geomorphology, approx. 8 questions, 2 pages (20%) • 4 seminar exercises to be solved independently or in groups, 4 protocols (1 page each) and 4 presentations (10 min each) (40%) • final integrative presentation (20 min) and discussion of exercise results (15 min) (40%)
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	<ul style="list-style-type: none"> • Lecture <i>Geomorphology</i> (1SWS) • Exercise <i>Processing and analysis of digital landform data</i> (2SWS) • Seminar <i>Digital Terrain Analysis</i> (1SWS)

**Components to be offered in the
Current Semester**

No assignment

Module 14153 Climate Change and Vegetation

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	14153	Compulsory elective

Modul Title	Climate Change and Vegetation Klimawandel und Vegetation
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Dr. rer. nat. Raffelsbauer, Volker
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	The module provides an insight into topics related to climate change and its impact on plants and plant biodiversity. Plants make a significant contribution to mitigating climate change by absorbing CO ₂ through photosynthesis. They are directly and indirectly affected by rising CO ₂ concentrations in the atmosphere, e.g. by an increase in plant photosynthesis, known as the fertilisation effect, but also by a decrease in carbon uptake due to climatic stress (e.g. water shortage, high temperatures, etc.). Students will acquire a basic knowledge of vegetation-atmosphere feedbacks, focusing on the effects of climatic stress, plant physiological responses and vegetation-related climate change mitigation strategies. They will be able to understand and assess environmental problems such as deforestation and extreme events in the context of climate change.
Contents	In the lecture professional aspects of climate change and vegetation are addressed, such as: <ul style="list-style-type: none"> · climate change and impacts · vegetation as indicator and responder · carbon cycle · plant physiological processes · climatic stresses · ecosystem services · urban greening <p>In the exercise the knowledge gained in the lecture will be applied and deepened in form of showcasing different measurement devices, discussing the application context of the respective measurement data, and presentations by students of relevant topics.</p>

Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Exercise - 2 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	will be announced at the beginning of the course
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	1. Presentation, 15 min. (30%) 2. Submission and presentation, 15 min., of a research poster of a selected topic (70%)
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	25
Remarks	none
Module Components	Lecture – Climate change and vegetation Exercise - Climate change and vegetation
Components to be offered in the Current Semester	240119 Lecture Climate change and vegetation - 2 Hours per Term 240129 Exercise Climate change and vegetation - 2 Hours per Term

Module 14299 Advances in Biogeochemistry and Pedology

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	14299	Compulsory elective

Modul Title	Advances in Biogeochemistry and Pedology Aktuelle Forschungen in Biogeochemie und Bodenkunde
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. phil. Raab, Thomas Prof. Ph. D. Rütting, Louise
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	On special announcement
Credits	6
Learning Outcome	Students will learn scientific method application, hypothesis formulation, critical reflection of results and academic discussion in fields of Soil-Plant-Systems and Geopedology.
Contents	Recent developments in the field of soil-ecosystem-landscape related research. Invited external speakers, as well as BTU PostDocs, PhD and Master students, present advances in scientific investigations in natural and human-made ecosystems. The focus is on the evolution, properties, and functions of the pedosphere and interacting processes with the biosphere. Research topics cover soil organic matter, biogeochemistry, plant nutrient uptake, stable isotope tracing, phosphorus and nitrogen cycling, soils in space and time, soil morphology and classification, and the impact of past and modern land use on soil landscapes.
Recommended Prerequisites	Basic knowledge in Biogeochemistry and Soil Science
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Seminar - 2 hours per week per semester Consultation - 2 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	will be announced at the beginning of the event
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	Students must write a series of short tests at the end of each seminar presentation (25 % of the module grade), they must ask weekly

questions on each seminar topic (25 % of the module grade) and they must give a short poster presentation (5 minutes) at the end of the seminar (50 % of the module grade).

Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	24
Remarks	No offer in Summer 2026 and Winter 2026/27
Module Components	240499 Biogeochemistry and Pedology Research Seminar, 2 SWS 240498 Biogeochemistry and Pedology Research Consultation, 2 SWS
Components to be offered in the Current Semester	No assignment

Module 14496 Applied Biostatistics for Environmental Data

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	14496	Compulsory elective

Modul Title	Applied Biostatistics for Environmental Data Angewandte Biostatistik für Umweltdaten
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Dr. Djoudi, El Aziz
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	This module will provides a theoretical introduction to data analysis and results interpretation, statistical methods and tools for environmental and biological sciences, as well as applied tools with a particular focus on R programming (R software).
Contents	<p>Part 1. Introduction to experimental design Design principles Random sampling, block design, nested design, split-plot... Replication and Pseudoreplication</p> <p>Part 2. Introduction to R Introduction to the essentials of R Basics: Syntax, packages, writing codes & functions Data handling, analysis and visualisation (graphs and tables) Exercises</p> <p>Part 3. Distributions, Parameters and Estimators Data classification & distribution Measures of central tendency: mean, median ... Measures of variability: variance and standard deviation Likelihood and Akaike Information Criterion Exercises</p> <p>Part 4. Univariate analysis T-test and ANOVA (Analysis of variance) Correlation and regression analysis Non parametric analysis (Wilcoxon, Mann-Witney-U, Kruskal-Wallis) linear models & introduction to mixed models Exercises</p> <p>Part 5. Multivariate analysis</p>

	Principal component analysis (PCA) Non-metric multidimensional scaling (NMDS) Redundancy analysis (RDA) & Canonical correspondence analysis (CCA) Exercises
Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Exercise - 2 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	Zuur, A. F., Ieno, E. N. & Smith, G. M. 2007 Analysing ecological data. New York Gotelli, N. J. & Ellison A. M. 2013 A primer of ecological statistics. Sunderland Dormann, C. 2020 Environmental Data Analysis: An Introduction with Examples in R. Cham Lakicevic, M., Povak, N. & Reynolds, K. M. 2020 Introduction to R for terrestrial ecology: basics of numerical analysis, mapping, statistical tests and advanced application of R, Cham Wilke C.O. 2019 Fundamentals of Data Visualization, O'Reilly Wickham H& Golemund G, 2017 R for Data Science, O'Reilly
Module Examination	Continuous Assessment (MCA)
Assessment Mode for Module Examination	- 10 Exercises during the courses (50%) - Individual project presentation, 15 min. (50%)
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	25
Remarks	Please bring your laptop!
Module Components	240740 Lecture/Exercise: Applied Biostatistics for environmental data
Components to be offered in the Current Semester	No assignment

Module 37101 Intercultural Competence

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	37101	Compulsory elective

Modul Title	Intercultural Competence Interkulturelle Kompetenz
Department	Faculty 5 - Business, Law and Social Sciences
Responsible Staff Member	No assignment
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	none
Contents	none
Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	No assignment
Teaching Materials and Literature	none
Module Examination	Unspecified - Specification from winter semester 2016/17 required!
Assessment Mode for Module Examination	none
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	none
Components to be offered in the Current Semester	No assignment

Module 42205 Soil Protection and Management

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	42205	Compulsory elective

Modul Title	Soil Protection and Management Bodenschutz und Management
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	No assignment
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	none
Contents	none
Recommended Prerequisites	none
Mandatory Prerequisites	none
Forms of Teaching and Proportion	No assignment
Teaching Materials and Literature	none
Module Examination	Unspecified - Specification from winter semester 2016/17 required!
Assessment Mode for Module Examination	none
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	none
Components to be offered in the Current Semester	No assignment

Module 44204 Environmental Biotechnologies

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	44204	Compulsory elective

Modul Title	Environmental Biotechnologies Umweltbiotechnologien
Department	Faculty 2 - Environment and Natural Sciences
Responsible Staff Member	Prof. Dr. rer. nat. habil Martienssen, Marion Dr. rer. nat. Schopf, Simone
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	The students will be made familiar with the main biotechnological processes in waste and water treatment as well as in soil and water remediation. They are expected to be able to find appropriate solutions fitting to the local situations of their home countries.
Contents	Environmental pollution (technologies for sampling, analyzing and interpreting environmental pollution in water, waste and soil), Remediation technologies for surface water, Waste water treatment (Basics in biological waste water treatment, Special technologies for industrial waste water), Groundwater remediation (pump and treat, in situ remediation, Natural attenuation, Soil remediation, Biological methods in waste treatment, Microbial waste air treatment, Biotechnology and land farming (advanced fertilizer, natural fertilizer, biological products in plant protection), Biotechnologies in energy production, Biotechnology in mining and oil industries, Biocorrosion and microbial destruction of construction materials, Live cycle assessment, Biosensors
Recommended Prerequisites	None
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Seminar - 2 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	• Lecture script

- J. A. Salvato, N. L. Nemerow, F. J. Agardy (2003): Environmental engineering,
- Mogens , Harremoes , Jansen 2002): Wastewater Treatment. Biological and Chemical Process: Biological and Chemical Processes (Environmental Engineering)
- Twardowska, Irena [Hrsg.] (2006): Soil and Water Pollution Monitoring, Protection and Remediation

Module Examination Final Module Examination (MAP)

Assessment Mode for Module Examination Written examination, 120 minutes

Evaluation of Module Examination Performance Verification – graded

Limited Number of Participants none

Remarks none

Module Components

In winter semester:

- 230507 Lecture Environmental Biotechnologies
- 230509 Seminar Environmental Biotechnologies
- 230534 Examination Environmental Biotechnologies

In summer semester:

- 230556 Examination Environmental Biotechnologies

Components to be offered in the Current Semester No assignment

Module 44408 Safety Technology

assign to: Compulsory Elective Modules

Study programme Environmental and Resource Management

Degree	Module Number	Module Form
Bachelor of Science	44408	Compulsory elective

Modul Title	Safety Technology
	Grundlagen der Prozess-, Anlagen- und Betriebssicherheit
Department	Faculty 3 - Mechanical Engineering, Electrical and Energy Systems
Responsible Staff Member	Prof. Dr.-Ing. Arellano-Garcia, Harvey
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every winter semester
Credits	6
Learning Outcome	At the end of the module the student are able to prevent and mitigate reaction-, fire- and explosion hazards in process plants, storage tanks/ silos and during transport of hazardous materials.
Contents	<ol style="list-style-type: none"> 1. Theory of heat explosion, fire protection, explosion prevention, reaction safety, theory of pressure relief 2. Basics of experimental determination of safety data and pressure relief devices 3. Experimental development of safety data used for the determination of storage and transport conditions according to national and international standards (EU, UN) , case study -team work- 4. Experiments for the design of pressure relief devices to, case study -team work-
Recommended Prerequisites	Strongly recommended: Fundamentals of mathematics, physics (thermodynamics, heat- and mass-transfer)
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 2 hours per week per semester Exercise - 1 hours per week per semester Practical training - 1 hours per week per semester Self organised studies - 120 hours
Teaching Materials and Literature	<ol style="list-style-type: none"> 1. Lecture notes 2. Power Point 3. Literature: see lecture notes
Module Examination	Prerequisite + Final Module Examination (MAP)

Assessment Mode for Module Examination	Prerequisite: Successful completion of laboratory tests, as well as the adjoining "check-of-knowledge"-test as part of the internship. Final module examination: Written examination, 90 min.
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Remarks	none
Module Components	<ul style="list-style-type: none">• 440503 LE Safety technology in process industries/Process and Plant Safety• 440531 Exercise/Practical Training Safety technology in process industries/Process and Plant Safety• 841232 Examination Safety Technology
Components to be offered in the Current Semester	No assignment

Erläuterungen

Das Modulhandbuch bildet als Teil der Prüfungsordnung die Rechtsgrundlage für ein ordnungsgemäßes Studium. Darüber hinaus soll es jedoch auch Orientierung bei der Gestaltung des Studiums geben.

Dieses Modulhandbuch wurde am 19. März 2026 automatisch für den Bachelor (universitär)-Studiengang Environmental and Resource Management (universitäres Profil), PO-Version 2015, aus dem Prüfungsverwaltungssystem auf Basis der Prüfungsordnung generiert. Es enthält alle zugeordneten Module einschließlich der ausführlichen Modulbeschreibungen mit Stand vom 19. März 2026. Neben der Zusammensetzung aller Veranstaltungen zu einem Modul wird zusätzlich das Veranstaltungsangebot für das jeweils aktuelle Semester gemäß dem Verzeichnis der BTU ausgegeben.

The module catalogue is part of the examination regulation and as such establishes the legal basis for studies according to the rules. Furthermore, it should also give orientation for the organisation of the studies.

This module catalogue was generated automatically by the examination administration system on the base of the examination regulation on the 19 March 2026, for the Bachelor (universitär) of Environmental and Resource Management (research-oriented profile). The examination version is the 2015, Catalogue contains all allocated modules including the detailed module descriptions from 19 March 2026. Apart from the composition of all components of a module, the list of lectures, seminars and events for the current semester according to the catalogue of lectures of the BTU is displayed.