Annex 1
Module descriptions

Module number	Module name	Lecturer responsible
M_ESS 1.1	Ecosystem Services – Concepts and Development	Prof. Ring irene.ring@tu-dresden.de
Objectives	Upon completion of this module, students will have gained knowledge of key approaches for conceptualising ecosystem services and will be familiar with current scientific developments and socio-political strategies for the sustainable provision of ecosystem services. They will have a gained a more in-depth insight into different methods used in economics and the social sciences for assessing ecosystem services, will be able to assess their limitations and determine in which cultural contexts they may be used. They will possess methodical, social and personal competencies.	
Content	The module provides an overview of the historical development and current forms of the concept of ecosystem services. The module also covers the relationships between biodiversity and ecosystem services and looks at different approaches to defining and categorising ecosystem services. It provides insights into global, regional and national ecosystem assessment processes such as the Millennium Ecosystem Assessment (MA), the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and the UK National Ecosystem Assessment (NEA). The module lastly looks at methods and approaches for performing an integrated assessment of ecosystem services in different societal contexts.	
Teaching and learning forms	Lectures (1.5 hrs/wk), exercises (2 hrs/wk), seminars (2 hrs/wk), tutorials (2 hrs/wk) and self-study.	
Participation requirements	None	
Applicability	This module is a core module for the Ecosystem Services Master's degree programme; it is a prerequisite for modules M_ESS 1.6, M_ESS 1.7 and M_ESS 2.5. This module is one of five electives from the focus area of biodiversity and nature conservation in the Biotechnology and Applied Ecology Master's degree programme, of which modules worth 15 credit points are to be chosen.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one written exam of 90 minutes and an oral presentation requiring 40 hours of work.	
Credit points and grades	10 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work and examination. The grade for the written exam is double-weighted, the grade for the oral presentation is single-weighted.	

Frequency of the module	This module runs once per year in the winter semester.
Workload	The total workload for this module is 300 hours. Of these, 112.5 hours are allocated for lectures and teaching activities and 187.5 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.
Recommended literature	Potschin, M., Haines-Young, R., Fish, R., Turner, R.K. (2016): Routledge Handbook of Ecosystem Services. Routledge, Taylor & Francis Group, London.

Module number	Module name	Lecturer responsible
M_BCM 1.1 (M_ESS 1.2)	Applied Ecology	Prof. Wesche karsten.wesche@tu-dresden.de
Objectives	Based upon a general knowledge of ecology, students will have a deeper understanding of selected groups of individuals as well as applied ecology including nature conservation. This knowledge comprises a range of different ecosystem types. Students will gain a detailed understanding of ecological interrelations and will be able to categorise these based upon key environmental factors. The impacts of human activity and suitable conservation strategies and species conservation programmes can be evaluated and conservation strategies thoroughly examined. Students will be able to analyse and evaluate landscape interventions and derive suitable strategies for taking action.	
Content	This module comprises the basic foundations of environmental history, biogeography and ecosystems (terrestrial and aquatic), implementation of applied ecology with a particular focus on nature conservation, the use of monitoring and evaluation.	
Teaching and learning forms	Lectures (2 hrs/wk), seminars (1 hr/wk), exercises (1 hr/wk) and self-study.	
Participation requirements	Foundational knowledge in general ecology and nature conservation. Literature: Pullin A.S. 2002: Conservation Biology. Cambridge: Cambridge University Press; 345 pp. or Kareiva P. & Marvier M. 2010: Conservation Science: Balancing the needs of people and nature. Roberts & Co; 576 pp.	
Applicability	This module is a core module for the Biodiversity and Collection Management and Ecosystem Services Master's degree programmes. For students on the Biodiversity and Collection Management Master's degree programme, this module is a prerequisite for core module M_BCM 1.6 and electives M_BCM 2.1, M_BCM 2.2, M_BCM 2.3, M_BCM 2.4 and M_BCM 2.5. For students on the Ecosystem Services Master's degree programme, this module is a prerequisite for module M_ESS 2.13.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one written exam of 90 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
M_ESS 1.3	Introduction into Key Taxa	Prof. Xylander willi.xylander@tu-dresden.de
Objectives	Students will have more in-depth knowledge of species groups in applied ecology. They will gain an overview of the systematics, taxonomy and behaviour of these selected animal and plant groups. They will be able to differentiate and identify important species groups using commonly used keys. Students will be familiar with the features and taxidermy methods necessary for identification. They will have knowledge of the distribution, frequency and level of endangerment for the relevant animal and plant species and be able to evaluate the occurrence of specific species or taxa for purposes of nature conservation.
Content	The module covers the systematics and taxonomy of species groups that are important for research and application (reviews, monitoring, modelling), the method for identifying selected animal groups and looks at aspects of their importance in ecology and nature conservation.
Teaching and learning forms	Lectures (2.5 hrs/wk), exercises (2.5 hr/wk) and self-study.
Participation requirements	Basic knowledge of organismic zoology and botany. Literature: Simpson, M. (2010): Plant Systematics, Academic Press; Weistheide, W., Rieger, G. (2015): Spezielle Zoologie Band 2 (English edition if applicable).
Applicability	This module is a core module for the Ecosystem Services Master's degree programme. This module is a prerequisite for modules M_ESS 2.13, M_ESS 2.14, M_ESS 2.15 and M_ESS 2.16.
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one oral examination of 30 minutes.
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.
Frequency of the module	This module runs once per year in the winter semester.
Workload	The total workload for this module is 150 hours. Of these, 75 hours are allocated for lectures and teaching activities and 75 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.

Module number	Module name	Lecturer responsible
M_ESS 1.4	Methods of Empirical Social Research	Prof. Ring irene.ring@tu-dresden.de
Objectives	Upon completion of this module, students will have a comprehensive overview of the range of empirical research methods available in the social sciences and will be able to apply these to social science research problems and issues. They will have the required social competencies to negotiate access to a field of research with all stakeholders involved in a culturally appropriate manner. They will be able to reflect upon and assess from a methical standpoint the possibilities and limitations of generalising the findings of empirical social science research studies.	
Content	The module covers the specific features of empirical social research and comprises the following four topic areas: 1) Research topics, research questions and aims, research designs and sampling methods – steps in the systematic preparation of an empirical social science research project. 2) The common methods of data collection used in empirical social research, in particular, the traditional tool of standardised quantitative interviews, the Delphi interview, guided individual and group interviews, ethnographic methods of observing participants as well as strategies for quantitative and qualitative inclusion of secondary data sources. 3) An overview of the methods and approaches of qualitative and quantitative data analysis. 4) Reporting on research projects, including aspects such as the traditional placement of empirical studies in research literature as well as reporting and presentation of research findings.	
Teaching and learning forms	Lectures (2 hrs/wk), seminars (2 hrs/wk) and self-study.	
Participation requirements	None.	
Applicability	This module is a core module for the Ecosystem Services Master's degree programme, it is a prerequisite for module M_ESS 2.6. This module is one of nine electives for the Biodiversity and Collection Management Master's degree programme, of which four must be selected.	
Requirements for the award of credit points	This module is examined with coursework requiring 30 hours of work. A short oral presentation of 15 minutes is required as a pre-examination.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
M_IM 1.6 (M_ESS 1.5)	Intercultural Communication and Foreign Language Skills	Mr M. A. Tettenborn oliver.tettenborn@tu-dresden.de
Objectives	Students will learn about the fundamental models of communicative relations with a focus on intercultural communication. They will understand how these relate to philosophical and discourse ethics, with a focus on respect. They will be able to apply their acquired theoretical knowledge in specific cultural contexts and gain some practical experience in a foreign or multicultural environment. Students will possess knowledge of a foreign language which will form the basis of, and be a useful tool for, intercultural communication.	
Content	This module covers a) models of communication b) models of intercultural communication c) dialectic and rhetoric d) discourse ethics and concepts of respect e) foreign language skills	
Teaching and learning forms	Lectures (1 hr/wk), exercises (2 hrs/wk), seminars (1 hr/wk) and self-study. Lectures and seminars in this module are held in English; exercises may also be completed in English if the student wishes.	
Participation requirements	None.	
Applicability	This module is a core module for the International Management Master's degree programme. It is a prerequisite for module M_IM 1.9 in the aforementioned Master's degree programme. This module is also a core module for the Ecosystem Services Master's degree programme.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one written exam in English of 120 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
M_ESS 1.6	Biodiversity and Ecosystem Governance	Prof. Ring irene.ring@tu-dresden.de
Objectives	Students will become familiar with different ways of integrating ecosystem services in public and private decision-making contexts. They will learn about the different instruments of environmental policies and will be able to assess their role in the policy mix. Students will be able to independently write academic papers on this topic. Students will further possess their individual presentation and moderation skills.	
Content	The module covers the principles of societal governance for the conservation and sustainable use of biodiversity and ecosystem services. a) Governance and institutional analysis in multi-level systems (from the local level to the global level) b) Environmental federalism c) Consideration of different groups of actors (state, market actors, civil society) d) Design and analysis of environmental policy instruments: Regulatory law and planning; economic instruments in environmental policy; information and communicative instruments e) The role of instruments in the policy mix f) Mainstreaming of biodiversity and ecosystem services in sector policies.	
Teaching and learning forms	Lectures (1.5 hrs/wk), exercises (2 hrs/wk), seminars (3 hrs/wk), 1 day excursion and self-study.	
Participation requirements	The knowledge and skills from module M_ESS 1.1 are required for this module.	
Applicability	This module is a core module for the Ecosystem Services Master's degree programme and one of 14 electives in the Spatial Development and Natural Resource Management Master's degree programme, from which students must select modules totalling 20 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined via a seminar paper requiring 60 hours of work and an oral presentation requiring 15 hours.	
Credit points and grades	10 credit points are awarded for this module. The module grade is calculated from the unweighted average of grades from the assessed work.	
Frequency of the module	This module runs once per year in the summer semester.	
Workload	The total workload for this module is 300 hours. Of these, 105 hours are allocated for lectures and teaching activities and 195 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Recommended literature	Potschin, M., Haines-Young, R., Fish, R., Turner, R.K. (2016): Routledge Handbook of Ecosystem Services. Routledge, Taylor & Francis Group, London. Ring, I., Barton, D.N. (2015): Economic instruments in policy mixes for biodiversity conservation and ecosystem governance. In: Martínez-Alier, J., Muradian, R. (Eds.): Handbook of Ecological Economics. Edward Elgar, Cheltenham, 413-449. Ring, I., Schröter-Schlaack, C. (2015): Policy Mixes for Biodiversity Conservation and Ecosystem Service Management. In: Grunewald, K., Bastian, O. (Eds.): Ecosystem Services – Concept, Methods and Case Studies, Springer-Verlag, Berlin, Heidelberg, 146-155. Vatn, A. (2015). Environmental Governance. Institutions, Policies and Actions. Edward Elgar, Cheltenham.

Module number	Module name	Lecturer responsible
M_ESS 1.7	Ecological Economics	Prof. Ring irene.ring@tu-dresden.de
Objectives	Upon completion of this module, students will have gained an understanding of the relevance, application and limits of economic approaches to decision-making for environmental and conservation policy. They will be familiar with assessing ecosystem services and including these in accounting systems for different spatial scales.	
Content	This module covers basic economic principles and their application to environmental and resource problems as well as the historical development of ecology and economics. This includes key issues and fundamental principles of ecological economics such as the concept of sustainability as well as traditional and alternative ways of measuring welfare. The module provides an insight into the possibilities for identifying and assessing ecosystem services and how these can be included into different accounting systems (ecosystem accounting using examples from the project, business, municipal or regional levels as well as environmental-economic accounting).	
Teaching and learning forms	Lectures (2 hrs/wk), exercises (2 hrs/wk) and self-study.	
Participation requirements	The knowledge and skills from module M_ESS 1.1 are required for this module.	
Applicability	This module is a core module for the Ecosystem Services Master's degree programme.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined via a seminar paper including a presentation and discussion requiring 45 hours of work.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the summer semester.	
Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
M_ESS 2.1	Ecosystem Services in Practice – Specialisation	Prof. Ring irene.ring@tu-dresden.de
Objectives	Students will gain in-depth knowledge of the application and implementation of what they have learned during their studies in the selected practical context. Depending on the chosen institution for their internship, students will gain in-depth insights into advanced research topics in research institutions or into the application of research and its findings in the economy and in society. Upon completion of this module, students will also have gained their first practical work experience in the field.	
Content	This module comprises the practical application and active collaboration in research institutions, business enterprises, public authorities, professional associations, organisations or consortia. This includes regional, national and international institutions as well as intergovernmental organisations and platforms.	
Teaching and learning forms	Seminars (1 hrs/wk), internships (at least 6 weeks) and self-study.	
Participation requirements	None.	
Applicability	This module is one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined in the form of an ungraded internship report requiring 30 hours of work. A further requirement for passing this module is documentary evidence of having completed a 6-week internship within an institution working on activities typical of careers in this field.	
Credit points and grades	10 credit points are awarded for this module. The module will be graded as "passed" or "not passed".	
Frequency of the module	This module runs every semester.	
Workload	The total workload for this module is 300 hours. Of these, 255 hours are allocated for lectures and teaching activities and 45 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
M_ESS 2.2	Ecosystem Services in Practice – Foundations	Prof. Ring irene.ring@tu-dresden.de
Objectives	Students will gain knowledge of the application and implementation of what they have learned during their studies in the selected practical context. Depending on the chosen institution for their internship, students will gain insights into advanced research topics in research institutions or into the application of research and its findings in the economy and in society.	
Content	This module looks at practical applications within research institutions, business enterprises, public authorities, professional associations, organisations or consortia. This includes regional, national and international institutions as well as intergovernmental organisations and platforms.	
Teaching and learning forms	Seminars (1 hr/wk), internships (at least 3 weeks).	
Participation requirements	None.	
Applicability	This module is one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined in the form of an ungraded internship report requiring 15 hours of work. A further requirement for passing this module is documentary evidence of having completed a 3-week internship within an institution working on activities typical of careers in this field.	
Credit points and grades	5 credit points are awarded for this module. The module will be graded as "passed" or "not passed".	
Frequency of the module	This module runs every semester.	
Workload	The total workload for this module is 150 hours. Of these, 135 hours are allocated for lectures and teaching activities and 15 hours for assessed work.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
M_ESS 2.3	Nature and Ecosystem Services in the City	Prof. Knippschild robert.knippschild@tu-dresden.de

Objectives	Upon completion of this module, students will have gained an overview of the issues and problems presented by urban geography and urban sociology. They will have become familiar with the (historical) characteristics of European cities and know about the global challenges currently faced by urban nature and urban ecosystem services. Students will be able to characterise urban areas from a sociological perspective and are aware of the functions of (green) public spaces for the constitution of urban society. Students will be familiar with the specific spatial and societal framework and different types of urban nature. They will be able to assess the role of urban nature in the provision of ecosystem services from a sociological perspective. Students will be able to apply their knowledge of urban geography, urban sociology, urban nature and urban ecosystem services and conduct empirical testing using independently developed research questions. They will be able to reflect on, present and discuss the findings of their research.
Content	This module covers various disciplinary perspectives related to (European) cities and how they have developed historically. The main focus lies on urbanity, urban nature and on urban ecosystem services from a sociological perspective. Conflicts of interest in the use of urban nature, questions of environmental justice and quality of life in urban areas are also covered in this module.
Teaching and learning formats	Lectures (2 hrs/wk), project work (2 hrs/wk) and self-study.
Participation requirements	None.
Applicability	This module is one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined in the form of a project lasting 2 weeks.
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.
Frequency of the module	This module runs once per year in the summer semester.
Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.

Module number	Module name	Lecturer responsible
M_ESS 2.4	Investing in a Sustainable Future	Prof. Günther edeltraud.guenther@tu-dresden.de
Objectives	Students will understand sustainability assessment and policy as a scientific and societal area of research. Students will be able to independently research and make use of relevant academic literature. Students will be able to use the theoretical framework to classify information about case studies and analyse this information on five different levels (strategic, financial, ecological, social and barrier analysis). They will be familiar with the use of English in science.	
Content	This module looks at sustainability assessments and policy as a scientific and societal area of research.	
Teaching and learning forms	Lectures (2 hrs/wk) and self-study.	
Participation requirements	None.	
Applicability	This module is one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations. This module is also one of 5 electives in the Organic and Molecular Electronics Master's degree programme, from which one module must be chosen.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one written exam of 90 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the summer semester.	
Workload	The total workload for this module is 150 hours. Of these, 30 hours are allocated for lectures and teaching activities and 120 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
M_ESS 2.5	Ecosystem Services – Case Studies	Prof. Ring irene.ring@tu-dresden.de
Objectives	Upon completion of this module, students will be able to independently develop a practical research topic, plan the research process, carry it out and evaluate their findings. They will be able to assess the possibilities and limits for the practical implementation of the ecosystem service concept and make use of empirical research methods. They will gain the required specialist and social expertise for interacting with societal actors as well as critically discuss the process and findings with them.	
Content	The module covers the concept of ecosystem services, a personal research plan and the fundamentals of project management. It further comprises a (regional) case study from an economic, socio-political or ecological field with relevance to incorporating the benefits of ecosystem services into public and private decision-making.	
Teaching and learning forms	Seminars (4 hrs/wk) and self-study.	
Participation requirements	A basic knowledge of the concept of ecosystem services from module M_ESS 1.1 of the Ecosystem Services Master's degree programme or module M_BCM 1.5 of the Biodiversity and Collection Management Master's degree programme is required for this module.	
Applicability	This module is one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations. This module is also one of nine electives for the Biodiversity and Collection Management Master's degree programme, of which four must be selected.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined via a seminar paper including a presentation and discussion requiring 50 hours of work.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
M_BE 5.2.2 (M_ESS 2.6)	Quantitative Methods of Empirical Research	PD Dr Burkatzki eckhard.burkatzki@tu-dresden.de
Objectives	Students will learn about the statistical methods of regression analysis, main component analysis and cluster analysis for testing and exploring structures in multivariate data analysis that they can make use of when working on empirical quantitative problems. They will be able to check the requirements for applying these methods at the data structure level, as well as uncover model violations and eliminate them. Students will have a fundamental understanding of analysis strategies for testing and exploring structural relationships using the general linear model. They will have an understanding of the requirements and analytical possibilities of quantitative empirical methods. They will possess the ability to use methodical research instruments for answering scientific questions. Students will further possess skills in working with statistical analysis software. They will also gain the ability to critically approach quantitative empirical research literature as well as independently understand the basic literature on statistics.	
Content	This module covers multivariate methods of empirical social research; it looks at the central significance of multivariate methods of analysis in quantitative empirical research as well as its meaningful application to problems of structural analysis in economic and social science data.	
Teaching and learning forms	Lectures (2 hrs/wk), exercises (1 hr/wk), seminars (1 hr/wk) and self-study. The language of teaching for lectures, exercises and seminars can be either German or English and will be determined by the Academic Affairs Committee at the start of the semester and made known via the usual channels.	
Participation requirements	Fundamental knowledge of statistics, such as taught in module M_ESS 1.4 of the Ecosystem Services Master's degree programme, is required for this module. Literature to be acquired by the student: Levin, J.; Fox, J.A.; Forde, D.A. (2016): Elementary Statistics in Social Research. New York: Pearson; Alternatively (with heavily mathematical approach) Aron, A.; Aron, E.N.; Coups, E. (2010): Statistics for the Behavioral and Social Sciences: a Brief Course. Essex: Pearson Education.	
Applicability	This is one of eleven electives in the Business Ethics and Responsible Management Master's degree programme, of which six must be chosen. This module is one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one written exam in English of 90 minutes. During the module, the pre-examination consists of three assessed tasks that must be completed in English.	

Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.
Frequency of the module	This module runs once per year in the winter semester.
Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.
Recommended literature:	Field, A. (2013): Discovering Statistics using IBM SPSS Statistics. London, Thousand Oaks: Sage Hair, J.F.; Black, W.C.; Babin, B.J.; Anderson, R.E. (2014): Multivariate Data Analysis. Essex: Pearson

Module number	Module name	Lecturer responsible
M_BCM 3.8 (M_ESS 2.7)	Biodiversity Management and Sustainability	Prof. Kramer matthias.kramer@tu-dresden.de

Objectives	Students will be qualified to integrate aspects of biodiversity into sustainability management in businesses.
Content	This module covers a) System concepts in environmental science b) Globalisation versus regionalisation c) Global economic cycles and value creation d) International and national programmes for implementing the UN's sustainable development goals e) Ecosystem services and biodiversity indicators (analysis and integration into decision-making strategies) f) Internationally oriented biodiversity management as part of sustainability strategies in business g) Biodiversity-oriented consideration of operational functions and cross-sectional fields h) Examples of application of Biodiversity in Good Company initiative.
Teaching and learning forms	Lectures (2 hrs/wk), seminars (2 hrs/wk) and self-study.
Participation requirements	None.
Applicability	This module is one of nine electives for the Biodiversity and Collection Management Master's degree programme, of which four must be selected. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations. This module is a core module for the focus area of environmental management in the International Management Master's degree programme; in accordance with Sec. 26(4)(2) of the examination regulations for the International Management Master's degree programme, two of the six focus areas must be chosen. This module is one of five electives from the focus area of biodiversity and nature conservation in the Biotechnology and Applied Ecology Master's degree programme, of which modules worth 15 credit points are to be chosen. This is a core module in the Business Ethics and Responsible Management Master's degree programme.
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined via a seminar paper including a presentation requiring 50 hours of work.
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.

Frequency of the module	This module runs once per year in the winter semester.
Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.

Module number	Module name	Lecturer responsible
M_BAÖ 4.1 (M_ESS 2.8)	Environmental Law	Prof. Delakowitz b.delakowitz@hszg.de

Objectives	Students will learn the basics of civil law and will be able to apply the relevant legal regulations. They will understand the fundamental legal principles of environmental law (precautionary, polluter pays, burden-sharing, cooperation, subsidiarity principles) and become familiar with legal sources and standardisation levels (international environmental law, EU law, environmental law at the federal, state and local levels). Students will be familiar with international agreements relating to bio-diversity. They will be able to apply the impact regulation and compensation under nature conservation law. They will also know about main activities required where plans are subject to approval or there is an obligation to perform an environmental impact assessment (EIA). They will be able to independently carry out or contribute to the approval and EIA procedure. Students will possess knowledge of the legally compliant handling of hazardous substances and the European chemical policy REACh; students can use these as a basis for creating registers of hazardous substances and for carrying out workplace safety analyses (in accordance with German hazardous materials regulations). Students will be able to formulate and evaluate operational instructions, lead disposal concepts and document waste disposal as well as be capable of making decisions on environmental issues.
Content	This module covers environmental and nature conservation law, environmental impact assessments, classes of hazardous materials and their management.
Teaching and learning forms	Lectures (4 hrs/wk), exercises (1 hr/wk) and self-study. All teaching for this module is done in English.
Participation requirements	None.
Applicability	This module is one of six electives for the focus area of biodiversity and nature conservation in the Biotechnology and Applied Ecology Master's degree programme, of which students must choose five. This module is one of nine electives for the Biodiversity and Collection Management Master's degree programme, of which four must be selected. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations. This module is a core module for the focus area of environmental management in the International Management Master's degree programme; in accordance with Sec. 26(4)(2) of the examination regulations for the International Management Master's degree programme, two of the six focus areas must be chosen. For the Business Ethics and Responsible Management Master's degree programme, this is one of eleven electives, of which six must be chosen.

Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one written exam in English of 180 minutes.
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.
Frequency of the module	This module runs once per year in the winter semester.
Workload	The total workload for this module is 150 hours. Of these, 75 hours are allocated for lectures and teaching activities and 75 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.
Recommended literature:	Delakowitz, B. (2016): Lecture notes on principles of environmental law; Hochschule Zittau/Görlitz Delakowitz, B. (2016): Lecture notes on principles of energy law Hochschule Zittau/Görlitz Delakowitz, B. (2016): Lecture notes on principles of hazardous substances law; Hochschule Zittau/Görlitz Kotulla, M. (2014): Umweltrecht - Grundstrukturen und Fälle. 6th edition; Boorberg Verlag Kluth, W., Smeddinck, U. (2013): Umweltrecht - Ein Lehrbuch. Springer Spektrum Makuch, K., Pereira, R. (Eds.) (2012): Environmental and Energy Law. Wiley-Blackwell Morgera, E. (2017): Corporate Accountability in International Environmental Law. 2nd edition; Oxford University Press Morgera, E., Razzaque, J. (Eds.) (2017): Biodiversity and Nature Protection Law. Elgar Encyclopedia of Environmental Law; University of Strathclyde Storm, P.-Chr.: Umweltrecht, Beck-Texte im dtv (current edition)

Module number	Module name	Lecturer responsible
M_BAÖ 1.10 (M_ESS 2.9)	Microbial Ecology	Prof. Hofrichter martin.hofrichter@tu-dresden.de
Objectives	Students will become familiar with the ecological position of micro-organisms (bacteria, fungi, protists) in the biosphere and their interrelationships with inanimate and animate elements in nature. They will understand the ecological backgrounds of the processes of microbial chemical reactions and gain knowledge of their central importance for the state of our environment. Students will gain in-depth knowledge and become familiar with things such as microbial autecology as well as with extremophiles. They will learn about the forms of the interactions between micro-organisms and plants, micro-organisms and animals as well as specialised interactions between fungi and insects. They will gain an overview of syntrophic bacterial communities and become familiar with the microbial corrosion of various materials.	
Content	This module covers a) microbial autecology (the abiotic factors of temperature, water activity, pH value, radiation) b) antagonistic and mutualistic interactions between micro-organisms, plants and animals c) selected processes of biocorrosion and biodeterioration d) types of rot, microbial attacks on concrete and steel.	
Teaching and learning forms	Lectures (3.5 hrs/wk), seminars (0.5 hrs/wk) and self-study. All teaching for this module is done in English.	
Participation requirements	Fundamental knowledge of microbiology and ecology from modules M_BAÖ 1.3, M_BAÖ 1.4 und M_BAÖ 1.5 in the Biotechnology and Applied Ecology Master's degree programme is required for this module. Literature: Fritsche, W. (2001) Mikrobiologie. Spektrum Gustav Fischer; Madigan, M. T., Martinko, J.M. (2014) Brock Biology of Micro-organisms, Global Edition, Addison-Wesley Longman, Amsterdam.	
Applicability	This module is a core module for the focus area of biotechnology in the Biotechnology and Applied Ecology Master's degree programme. This module is one of nine electives for the Biodiversity and Collection Management Master's degree programme, of which four must be selected. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one oral examination held in English of 25 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	

Frequency of the module	This module runs once per year in the winter semester.
Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.

Module number	Module name	Lecturer responsible
M_BAÖ 1.6 (M_ESS 2.10)	Molecular Ecology	Dr. Kellner harald.kellner@tu-dresden.de
Objectives	Students will learn about techniques, equipment and procedures for generating and evaluating sequential data. They will create phylogenetic genealogical trees and gain an overview of molecular methods in ecology and biotechnology.	
Content	This module covers a) principles of modern sequential methods and their application in ecology and biotechnology b) concepts in molecular ecology and functional biodiversity research c) sequential data collection and evaluation.	
Teaching and learning forms	Lectures (1 hr/wk), exercises (2.5 hrs/wk), seminars (0.5 hrs/wk) and self-study. All teaching for this module is done in English.	
Participation requirements	Fundamental knowledge of molecular biology, microbiology and ecology at Bachelor level or as gained from studying module M_BAÖ 1.3 from the biotechnology focus area of the Biotechnology and Applied Ecology Master's degree programme and in module M_BAÖ 1.5 of the biotechnology or biodiversity and nature conservation focus areas of the Biotechnology and Applied Ecology Master's degree programme are required for this module. Literature: Joanna R. Freeland (2005) Molecular Ecology, John Wiley & Sons Ltd. Chichester, UK.	
Applicability	This module is a core module for the focus area of biotechnology in the Biotechnology and Applied Ecology Master's degree programme as well as being one of five electives to be chosen from the focus area of biodiversity and nature conservation in the Biotechnology and Applied Ecology Master's degree programme whose modules are worth 15 credit points. This module is one of nine electives for the Biodiversity and Collection Management Master's degree programme, of which four must be selected. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one written exam in English of 90 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
M_BAÖ 1.8 (M_ESS 2.11)	Biomineralization and Environmental Analysis	Dr. Liers christiane.liers@tu-dresden.de
Objectives	Students will learn about the fundamental biological and biochemical principles for the genesis of firm tissue structures and will possess knowledge of the properties and functions of the mineral products produced by organisms (biominerals, biomaterials). Students will further gain knowledge and skills in the various chemical and analytical aspects of retrieval, treatment and data interpretation of environmental and biomass samples. They will learn the requirements and limits of environmental and bioanalysis as a function of the available sample types and analysis methods.	
Content	This module covers a) biogenesis of biominerals and biopolymers b) functions and properties of biominerals, biomaterials, biopolymers c) importance of biominerals and biomaterials for science and research c) retrieval of polluted environmental samples e) representative samples and their preparation f) methods of measurement, data analysis and data evaluation g) bioconcentration, biomagnification and biomonitoring.	
Teaching and learning forms	Lectures (3 hrs/wk), exercises (1 hr/wk), seminars (2 hrs/wk), practical trainings (1 hr/wk) and self-study. All teaching for this module is done in English.	
Participation requirements	Fundamental knowledge in ecology, ecotoxicology, biotechnology and chemical analysis from module M_BAÖ 1.3 of the Biotechnology and Applied Ecology Master's degree programme is required for this module. Literature: Mann, S. (2001): Biomineralization – Principles & Concepts in Bioinorganic Materials Chemistry, Oxford Chemistry Masters; Bäuerlein, E. (2008): Handbook of Biomineralization: Biological Aspects and Structure Formation, Wiley-VCH; Sigel, A., Sigel, H., Sigel, R.K.O. (2008): Biomineralization: From Nature to Application, Wiley-VCH; Fränzle, S., Markert, B., Wünschmann, S. (2009): Technische Umweltchemie, Wiley-VCH Verlag, Weinheim; Schwister, K. (2007): Taschenbuch der Verfahrenstechnik, Karl Hanser Verlag GmbH & Co.; Heintz, A., Reinhardt, G.A. (2000): Chemie & Umwelt, Springer.	
Applicability	This module is a core module for the focus area of biotechnology in the Biotechnology and Applied Ecology Master's degree programme. This module is one of nine electives for the Biodiversity and Collection Management Master's degree programme, of which four must be selected. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	

Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one oral exam held in English of 30 minutes. Pre-examination is a written paper in English requiring 15 hours of work.
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.
Frequency of the module	This module runs once per year in the winter semester.
Workload	The total workload for this module is 150 hours. Of these, 105 hours are allocated for lectures and teaching activities and 45 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.

Module number	Module name	Lecturer responsible
M_BAÖ 2.6 (M_ESS 2.12)	Applied Microbiology	Dr. Kayser gernot.kayser@tu-dresden.de

Objectives	Using examples, students will become familiar with processes, techniques and systems for the biological treatment of environmental media and understand the various influencing factors. They will gain an overview of fermentation techniques and reactor design and become familiar with the relevant micro-organisms.
Content	This module covers a) applications of micro-organisms in environmental protection and biotechnology products b) structure and use of bioreactors c) aquatic and waste water microbiology of aquatic fungi.
Teaching and learning forms	Lectures (2 hrs/wk), seminars (0.5 hrs/wk), practical trainings (1.5 hrs/wk) and self-study. All teaching for this module is done in English.
Participation requirements	Basic knowledge of microbiology and biochemistry is required. Literature: Fritsche, W. (2001) Mikrobiologie. Spektrum Gustav Fischer; Reinecke, W., Schlömann, M. (2007) Umweltmikrobiologie. Spektrum Gustav Fischer. Jördening, H.-J.; Winter, J. (2005) Environmental Biotechnology. Wiley-VCH
Applicability	This module is one of two electives for the focus area of biotechnology in the Biotechnology and Applied Ecology Master's degree programme, of which students must choose one. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one oral exam held in English of 25 minutes.
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.
Frequency of the module	This module runs once per year in the winter semester.
Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.

Module number	Module name	Lecturer responsible
M_ESS 2.13	Field Ecology	Prof. Wesche karsten.wesche@tu-dresden.de

Objectives	Upon completion of the module, students will possess practical experience in surveying and recording important species in the field as well as describing and assessing ecological interactions. They will have knowledge of a broad spectrum of methods used in ecology and will be able to work on complex ecological issues. Students will understand the cause and effect relationships between the occurrence of communities of organisms and the environmental factors that affect them, particularly land use.
Content	This module focusses on the surveying, collection and documentation of important taxa using specific methods in the field as well as on the ecological relationships within biotopes in consideration of climate and land use and the changes taking place in these.
Teaching and learning forms	Seminars (1 hr/wk), practical trainings (4 hrs/wk) and self-study.
Participation requirements	The knowledge and skills from modules M_ESS 1.2 and M_ESS 1.3 are required for this module.
Applicability	This module is one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations. This module is a prerequisite for modules M_ESS 2.14 and M_ESS 2.15.
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined via a seminar paper including a presentation requiring 45 hours of work.
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.
Frequency of the module	This module runs once per year in the summer semester.
Workload	The total workload for this module is 150 hours. Of these, 75 hours are allocated for lectures and teaching activities and 75 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.

Module number	Module name	Lecturer responsible
M_BCM 1.7 (M_ESS 2.14)	Museum and Collections	Prof. Xylander willi.xylander@tu-dresden.de

Objectives	Students will learn the methods for putting together natural history collections, taxon-specific methods of taxidermy, documentation using various methods including databases as well as georeferencing. They will become familiar with theoretical and practical issues of maintaining specimens. They will practice presenting for science, teaching, also to a wider audience and look at examples of the development of presentation concepts and a scenography. Upon completion of this module, students will be able to independently develop strategies and concepts for collecting, maintaining, documenting and undertaking scientific study. They will learn about databases and be able to use them. They will further gain fundamental knowledge about how to develop exhibits.
Content	The modules covers topics such as: the tasks of museums, funding bodies, museum organisation, museum architecture, collection strategies, type material, lending, housing collections, combating pests, taxidermy methods for museums, documenting collections, procurements concepts, museum pedagogy and exhibitions.
Teaching and learning forms	Lectures (2 hrs/wk), exercises (2 hrs/wk), excursions (1.5 days) and self-study.
Participation requirements	For the Master's degree programme in Biodiversity and Collection Management, the knowledge and skills acquired in core modules M_BCM 1.2, M_BCM 1.3 and M_BCM 1.6 are required for this module. For the Master's degree programme in Ecosystem Services, the knowledge and skills from modules M_ESS 1.3 and M_ESS 2.13 are required for this module.
Applicability	This module is a core module for the Biodiversity and Collection Management Master's degree programme. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with course work requiring 50 hours of work.
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.
Frequency of the module	This module runs once per year in the winter semester.
Workload	The total workload for this module is 150 hours. Of these, 72 hours are allocated for lectures and teaching activities and 78 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.

Module number	Module name	Lecturer responsible
M_BCM 1.8 (M_ESS 2.15)	Collection-based Research	Prof. Wesche karsten.wesche@tu-dresden.de
Objectives	Upon completion of this module, students will be able to prepare collection specimens as carefully as possible for genetic study. They will be able to work with the material using phylogenetic methods and methods of population genetics, while also gaining fundamental knowledge of morphometric methods. Students will become familiar with statistically minimum requirements for collecting usable data and will be able to evaluate morphometric and genetic data using current univariate and multivariate methods. Experience is also gained in the use of the relevant software packages.	
Content	The module covers morphometric and genetic analysis, the principles of quantitative working methods, descriptive and inferential statistics (univariate and multivariate) relevant to ecology / taxonomy.	
Teaching and learning forms	Seminars (1 hr/wk), exercises (1.5 hrs/wk), practical trainings (1.5 hrs/wk) and self-study.	
Participation requirements	An understanding of biological issues and a basic knowledge of quantitative working methods and statistics from modules M_BCM 1.2, M_BCM 1.3 and M_BCM 1.6 in the Biodiversity and Collection Management Master's degree programme or in modules M_ESS 1.3 and M_ESS 2.13 of the Ecosystem Services Master's degree programme are prerequisites. Literature to be acquired by the student: McCune B. & Mefford M.J. 1997: PC-ORD. Multivariate Analysis of Ecological Data. Gleneden Beach, Oregon: MJM Software Legendre P. & Legendre L. 2012: Numerical Ecology. Amsterdam, NL: Elsevier; Borcard D., Gillet F. & Legendre P. 2011: Numerical Ecology with R. New York, Dordrecht, London, Heidelberg: Springer; 306 pp.	
Applicability	This module is a core module for the Biodiversity and Collection Management Master's degree programme. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit oints	Credit points are earned upon successful completion of the module. This module is examined with an oral presentation requiring 25 hours of work.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
M_ESS 2.16	Systematics and Taxonomy of Invertebrates and Cryptogams	Prof. Xylander willi.xylander@tu-dresden.de
Objectives	Students will possess in-depth knowledge species on groups that are difficult to identify but which are of key importance for the functioning of the ecosystem. They will gain an overview of the classification, taxonomy and behaviour of these selected invertebrate and cryptogram groups. They will be able to differentiate and identify important species using the appropriate literature. Students will be familiar with the features and taxidermy methods necessary for identification. They will have knowledge of the distribution, frequency and level of endangerment for the species groups and be able to evaluate the occurrence of specific species or taxa for purposes of nature conservation.	
Content	This module covers the classification and taxonomy of selected invertebrates and cryptogams, the methods of identification and aspects of their ecology.	
Teaching and learning forms	Lectures (4 hrs/wk), exercises (5 hrs/wk) and self-study.	
Participation requirements	Basic knowledge of important species groups in zoology and botany from module M_ESS 1.3 are required for this module.	
Applicability	This module is one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one oral exam of 30 minutes.	
Credit points and grades	10 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 300 hours. Of these, 135 hours are allocated for lectures and teaching activities and 165 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
FOMT 1.7 (M_ESS 2.17)	Management of Vegetation and Soil in Watersheds	Prof. Feger karl-heinz.feger@tu-dresden.de
Objectives	Students will have the ability to understand and analyse the major factors and processes in plant-soil systems in context with watersheds. They will further be able to analyse soil and water resources with regard to land-use conflicts. They will be able to apply methods for simulating and assessing scenarios (climate, spatial distribution of land use) and use their finding as a basis for interdisciplinary concepts for sustainable watershed management. As well as the ability to work as part of a team, students will improve their competencies in communication, presentation, argumentation, moderation and documentation of findings.	
Content	The role of forests in watersheds and water cycles as well as their ecosystem services with regard to soil properties. Present and future challenges in watershed management. Relationships between water supply and food security, climate change, integrated land-use planning and management. Compromises and synergies between forestry and water management, particularly in regions with low and/or irregular precipitation and high evaporation. Concepts of location-appropriate and adapted land usage.	
Teaching and learning forms	2 hrs/wk lectures, 2 hrs/wk seminars, 1.5 hrs/wk project work (grouped into a block of 3 days), 0.5 days excursions. Self-study.	
Participation requirements	Knowledge in the fields of forestry, particularly soil science, biogeochemistry, hydrology, climatology (Bachelor level). Literature: Brady, N.C., Weil, R.R. (2017) The Nature and Properties of Soils, 15th ed. Prentice Hall, Upper Saddle River. Calder, I.R. (2005) Blue Revolution: Integrated Land and Water Resource Management. Earthscan, London.	
Applicability	This module is a core module in the Tropical Forestry Master's degree programme for the focus area of Tropical Forestry and Management and one of two electives in the focus area of Sustainable Tropical Forestry, of which one must be selected. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined in the form of a project work (1 week) and a seminar paper (30 hours).	
Credit points and grades	7 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work as follows: Project work 33%, seminar paper 67%.	
Frequency of the module	This module runs once per year in the summer semester.	

Workload	The total workload for this module is 210 hours. Of these, approx. 87 hours are allocated for lectures and teaching activities and approx. 123 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.
Relevant literature:	Brady, N.C., Weil, R.R. (2017) The Nature and Properties of Soils, 15th ed. Prentice Hall, Upper Saddle River. Brauman, K.A.; et al. (2007) The nature and value of ecosystem services: An overview highlighting hydrologic services. Annual Review of Environmental Resources 32, pp 67–98. Calder IR (2005) Blue Revolution: Integrated Land and Water Resource Management. Earthscan, London. Falkenmark, M.; Rockström, J. (2004) Balancing water for humans and nature: The New Approach in Ecohydrology. Routledge, London. Feger, K.H.; Hawtree, D. (2013) Soil carbon and water security. In: Lal, R. et al. (eds.) Ecosystem services and carbon sequestration in the biosphere. Springer, Dordrecht. Julich, S., Mwangi, H.M., Feger, K.H. (2016) Forest Hydrology in the Tropics. In: Pancel, L., Köhl, M. (eds.) Tropical Forestry Handbook, 2nd ed., Springer, Berlin, Heidelberg. pp. 1917-1939. Lal, R. (2009) Ten tenets of sustainable soil management. Journal of Soil and Water Conservation 64, 20A–21A. Soil and Water Conservation Society, Ankeny. Mwangi, H.M., Julich, S., Feger, K.H. (2015) Introduction to Watershed Management. In: Pancel, L., Köhl, M. (eds.): Tropical Forestry Handbook, 2nd ed., Springer, Berlin, Heidelberg. pp. 1869-1896. Mwangi, H.M., Julich, S., Feger, K.H. (2015): Watershed Management Practices in the Tropics. In: Pancel, L., Köhl, M. (eds.): Tropical Forestry Handbook, 2nd ed., Springer, Berlin, Heidelberg. pp. 1897-1915. Nair, P.K. et al. (2009) Agroforestry as a strategy for carbon sequestration. Journal of Plant Nutrition and Soil Science 172, 10–23. Wiley-VCH, Weinheim.

Module number	Module name	Lecturer responsible
FOMT 1.2 (M_ESS 2.18)	Forest Related Development Policy and Culture	Prof. Pretzsch juergen.pretzsch@tu-dresden.de
Objectives	Students will be able to diagnose and assess social systems with regard to how they are linked with ecosystems and in a historical context. This includes the application of analytical instruments and explanatory models of the social sciences. They will be able to recognise the political structures and how these work at different levels and understand the connection between politics, social economics, land use, forestry, environmental protection and nature conservation. They will have the ability to make use of policy instruments and assess their effectiveness. They will be able to analyse, understand and model cultural relationships with regard to the interactions of humans with forests.	
Content	Development models as a framework for policy and process analyses with regard to forests, land and the environment in tropical countries. Policy instruments relevant to forests, nature conservation and the livelihood of the local population. Processes of institutional change, participation of interest groups and potential consequences; theoretical principles of cultural ecology and ethnology, local moral and spiritual/religious ideas, relationships between people and forests. Traditional use of forests in the tropics, colonial and post-colonial influences and changes as well as the effects of globalisation.	
Teaching and learning forms	3.5 hrs/wk lectures, 2 hrs/wk seminars, 1.5 hrs/wk exercises, Self-study.	
Participation requirements	Secondary education level knowledge of geography and history (basic course). Literature: Todaro, M.P.; Smith, S.C. (2006): Economic development. Pearson Addison Wesley. Boston. Cubbage, F.W.; O'Laughlin, J.; Bullock, I.C.S. (1993): Forest resource policy. J. Wiley. New York. Ember C.R., Ember M. (2004): Cultural Anthropology. New Jersey. Englewood Cliffs.	
Applicability	This module is a core module for the Tropical Forestry Master's degree programme. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with a seminar paper including a presentation (60 hours) and one oral exam (20 minutes).	
Credit points and grades	9 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work as follows: Seminar paper including presentation: 33%, oral exam 67%.	

Frequency of the module	This module runs once per year in the winter semester.
Workload	The total workload for this module is 270 hours. Of these, approx. 105 hours are allocated for lectures and teaching activities and approx. 165 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.
Relevant literature:	North, D.C. (1991): Institutions. Journal of Economic Perspectives, Vol. 5, Number 1, 97-112. American-Economic Association, Nashville, Tennessee. Pretzsch J. (2005): Forest related rural livelihood strategies in national and global development. In: Forests, trees and livelihoods, Great Britain, Vol. 15, 115-117. Hunt, D. (1989): Economic theories of development: An analysis of competing paradigms. Harvester Wheatsheaf. London. Thirlwall, A.P. (2006): Growth and development. Palgrave MacMillan. Hampshire and New York. FAO (2012): State of the World's Forest. FAO, Rome. Messner, D.; Nuscheler, F. (2002): World politics – structures and trends. In: Kennedy, P.; Messner, D.; Nuscheler, F. (eds.), Global Trends and Global Governance, 125-155. Pluto, London. Ingold, T. (2000): The Perception of the Environment. Essays on livelihood, dwelling and skill. Routledge, London. Roger, S.G. (2004): This sacred earth. Religion, nature, environment. 2nd ed., Routledge, New York and London. Pretzsch, J. et al. (eds.) (2013): Forests and rural development. Springer, Heidelberg.

Module number	Module name	Lecturer responsible
FOMT 1.4B (M_ESS 2.19)	Assessment and Evaluation of Forest Resources	Prof. Röhle
Objectives	Students will become familiar with the function, use and application of important tree measurement instruments as well as with methods for recording and analysing forest growth, yield and forest biomass production and know about the corresponding models. They will have the ability to operationally use analogue and digital remote sensing data using modern methods of aerial and satellite imagery analysis as well as apply image data and multi-thematic geodata for monitoring land use and land-use change.	
Content	Instruments and methods for measuring individual trees and tree stocks, explanation and analysis of test areas in forests and short rotation plantations. Modelling and simulation of forest growth, timber yield and biomass. Biometric methods using sample datasets. Methods of remote sensing and geographic information systems (GIS). Data collection using aircraft and satellite-supported sensor systems as well as analytical methods based upon the interpretation of aerial imagery and the classification of satellite images, including their integration into geographic information systems.	
Teaching and learning forms	2.5 hrs/wk lectures, 3 hrs/wk exercises, Self-study.	
Participation requirements	Knowledge of mathematics and statistics (Bachelor level). Literature: Loetsch, F.; Zöhrer, F.; Haller, K.E. (1973) Forest inventory. Vol.2. BLV Verlagsgesellschaft. München, Bern, Wien. Bettinger, P.; Wing, M.G. (2003) Geographic information systems – applications in forestry and natural resources management. McGraw-Hill, New York. Lillesand, T.M.; Kiefer, R.W.; Chipman, J.W. (2004) Remote sensing and image interpretation. 5th ed., Wiley, New York.	
Applicability	This module is one of two electives in the Tropical Forestry Master's degree programme, one of which must be selected. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one report (30 hours) and one written exam (90 minutes).	
Credit points and grades	7 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work as follows: Report 67%, written exam 33%.	

Frequency of the module	This module runs once per year in the winter semester.
Workload	The total workload for this module is 210 hours. Of these, approx. 82 hours are allocated for lectures and teaching activities and approx. 128 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.
Relevant literature:	Cochran, W.G. (1977): Sampling Techniques. 3rd ed. John Wiley, New York. Vanclay, J. (1999) Modelling forest growth and yield. CABI Publishing, New York. West, P.W. (2004): Tree and forest measurement. Springer, Berlin Heidelberg, New York. Wulder, M.A.; Franklin, S.E. (eds.) (2003): Remote sensing for forest environments – concepts and case studies. Kluwer, Dordrecht, Boston, London. Zar, J.H. (1996): Biostatistical analysis. 3rd ed. Prentice Hall, New Jersey.

Module number	Module name	Lecturer responsible
FOMT 2.3A-2019 (M_ESS 2.20)	Modelling	Prof. Berger uta.berger@tu-dresden.de
Objectives	Students will be able to design and program models as well as run and analyse simulation experiments using IBM/ABM. They will be able to generate, use and analyse geodata as well as use geodata as input for IBM/ABM models.	
Content	Overview of individual-based and agent-based modelling (IBM/ABM), model development, implementation, parametrisation and sensitivity analysis. Dealing with uncertainties within data, planning simulation experiments and statistical analysis of the results. Integration of spatial data into models using geographic information systems (GIS). Geodata processes and integration, visualisation and elementary analysis.	
Teaching and learning forms	1 hr/wk lectures, 1.5 hrs/wk exercises, 1 hr/wk E-learning exercises. Self-study.	
Participation requirements	Active participation and readiness to run simulation experiments and analyse the results; overview of the purpose of requirements of modelling in ecology and social sciences; knowledge of mathematics and statistics (Bachelor level). Literature: Grimm, V.; Railsback, S.F. (2005): Individual-based Modelling and Ecology. Princeton University Press, Princeton. Gilbert, N.; Troitzsch, K.G. (2005): Simulation for the Social Scientists. Open University Press, Maidenhead. Gotelli, N.J.; Ellison, A. M. (2013): A Primer of Ecological Statistics. 2nd revised edition. Sinauer Associates, Sunderland.	
Applicability	This module is one of two electives in the Tropical Forestry Master's degree programme, one of which must be selected. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with a report (15 hours) and an oral presentation (20 hours).	
Credit points and grades	5 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work as follows: Report 25%, oral presentation 75%.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours. Of these, approx. 52 hours are allocated for lectures and teaching activities and approx. 98 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Relevant literature:	Railsback, S.F.; Grimm, V. (2011): Agent-Based and Individual-Based Modelling: A Practical Introduction. Princeton University Press, Princeton. de Smith, M.; Goodchild, M.; Longley, D. (2008): Geospatial Analysis. Available under www.spatialanalysisonline.com. Worboys, M.F.; Duckham, M. (2004): GIS: A Computing Perspective (2nd ed.) CRC Press, Boca Raton.

Module number	Module name	Lecturer responsible
FOMT 2.3B (M_ESS 2.21)	Communication and Conflict Management	Prof. Pretzsch juergen.pretzsch@tu-dresden.de
Objectives	Students will be able to assess conflicts, select methods and tools to use and apply these in the field. They will have the ability to use ethical norms in problem handling and lead communication processes in a democratic and participatory manner. Students will be able to guide communication processes between groups of stakeholders as well as conduct participatory surveys.	
Content	Theories and concepts of verbal and non-verbal communication. Communication as a social behaviour, conflicts as part of social systems as well as conflict resolution, psychological dispositions and perceptions of people. Rhetorical rules and psychological patterns for purposeful actions and reactions in disputes over natural resources. Methods and instruments for proactive situation-related interventions in ongoing communication, negotiation, discourses and conflicts. Strategies for mediation, meta-plan moderation and participation in the context of rural development. Communication for participatory data collection and in field laboratories.	
Teaching and learning forms	2 hrs/wk lectures, 1 hr/wk seminars, 1 hr/wk project work, Self-study.	
Participation requirements	Knowledge of natural forest and plantation management as well as nature conservation (Bachelor level). Literature: Moore, C. W. (2003) The mediation process. Updated and revised 3rd ed., Jossey-Bass, San Francisco. Klebert, K. et al. (2000) Winning group results. Techniques for guiding group thought and decision making processes with the moderation method. 2nd ed. Windmühle, Hamburg.	
Applicability	This module is one of two electives in the Tropical Forestry Master's degree programme, one of which must be selected. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined in the form of a project (1.5 weeks) and a written exam (90 minutes).	
Credit points and grades	5 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work as follows: Project work 67%, written exam 33%.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours. Of these, approx. 60	

	hours are allocated for lectures and teaching activities and approx. 90 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.
Relevant literature:	Miall, H., et al. (2011) Contemporary conflict resolution: The prevention, management and transformation of deadly conflicts, 3rd ed. Polity Press. Cambridge. Wilkenfeld, J. et al. (2005) Mediating International Crisis. Routledge, New York. Bercovitch, J. (ed) (2002) Studies in international mediation: Essays in honor of Jeffrey Z. Rubin. Macmillian, New York. Kalyvas, S. (2006) The logic of violence in civil wars. Cambridge University Press, Cambridge.

Module number	Module name	Lecturer responsible
FOMT 2.4A (M_ESS 2.22)	Management Systems and Restoration in Natural Forests of the Tropics	Prof. Wagner wagner@forst.tu-dresden.de
Objectives	Students will possess specific knowledge about important management systems for tropical forests. They will be able to apply methods of planning, implementing, monitoring and governing for the management of natural forests and also be able to make use of multi-functional strategies for managing tropical natural forests.	
Content	Management systems for natural forest management in the tropics. Elements for recording, planning, implementing, monitoring and controlling. Management strategies using decision-theoretical models. Management of various forest formations, sustainable units and forest enterprises. Production strategies and value chains for timber, non-timber products and environmental services of forests. Biodiversity management, integrated forest conservation and fires management in natural tropical and sub-tropical forests using case studies.	
Teaching and learning forms	3 hrs/wk lectures, 2 hrs/wk seminars, 0.5 hrs/wk exercises, 1 day excursion, Self-study.	
Participation requirements	Knowledge of forestry disciplines (Bachelor level) Literature: Lamprecht, H. (1989) Silviculture in the tropics. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) Eschborn. Matthews, J. D. (1996) Silvicultural systems. Clarendon Press Oxford, Oxford. Johnson, E. A.; Miyanishi, K. (2001) Forest fires. Behavior and ecological effects. Academic Press, San Diego. Speight, M. R.; Wylie, F. R. (2001) Insect pests in tropical forestry, CABI Wallingford.	
Applicability	This module is one of two electives in the Tropical Forestry Master's degree programme, one of which must be selected. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one seminar paper including a presentation (30 hours) and a written exam (90 minutes).	
Credit points and grades	7 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work as follows: Seminar paper including presentation 33%, written exam 67%.	
Frequency of the module	This module runs once per year in the winter semester.	

Workload	The total workload for this module is 210 hours. Of these, approx. 92 hours are allocated for lectures and teaching activities and approx. 118 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.
Relevant literature:	Clemen, R. (1996) Making hard decisions. Duxbury Press, Pacific Grove.
	Ffolliott, P. F.; Brooks, K. N.; Gregersen, H. N.; Lundgren, A. L. (1995) Dryland forestry. Planning and management. Wiley, New York.
	Buongiorno, J.; Gilles, K. (2003) Decision methods for forest resource management. Academic Press, Amsterdam, Boston Goldammer, J. G. (1993) Fire management. In: Pancel, L. (ed.) (1993) Tropical Forestry Handbook. Springer, Berlin Heidelberg New York, pp.1221-1268.
	Heikkliä, T. V.; Grönqvist, R.; Jurvelius, M. (1993) Handbook on forest fire control. Forestry Training Programme: Publication 21. Helsinki.
	Speight, M. R.; Wainhouse, D. (1989) Ecology and management of forest insects. Oxford University Press, Oxford.
	Watt, A. D.; Stork, N. E.; Hunter, M. D. (1997) Forests and insects. Chapman & Hall, London.
	Heyde, W. F. (1980) Timber supply, land allocation and economic efficiency. John Hopkins Univ. Press, Baltimore.
	Neher, P. A. (1993) Natural resource economics. Conservation and exploitation. Cambridge University Press, Cambridge.

Module number	Module name	Lecturer responsible
FOMT 2.4B (M_ESS 2.23)	Management Systems of Forest Plantations and Rehabilitation of the Landscape in the Tropics	Prof. Kapp gerald.kapp@tu-dresden.de
Objectives	Students will be able to evaluate, model and assess forest plantations in tropical regions with regard to their yield potential and level of endangerment based on ecological, economic and social criteria. They will be able to plan, establish and manage such tree plantations according to the planned objectives and involve the relevant stakeholder groups. They will be able to integrate these into land-use concepts and determine where additional research is required.	
Content	Management of production and protection systems in forest plantations. Timber production, agroforestry, value chains, as well as erosion control, fire protection and land rehabilitation. Assessment of forest plantations and shelter plantings, and their physical and monetary modelling and evaluation. Forest plantation establishment as well as planning, organisation and control of management, involvement of stakeholder groups and determination of research needs. Connections with landscape rehabilitation and integrated land-use management.	
Teaching and learning forms	3 hrs/wk lectures, 2 hrs/wk seminars, 0.5 hrs/wk exercises, 1 day excursion, Self-study.	
Participation requirements	Knowledge of forestry disciplines (Bachelor level). Literature: Burkhart, H. E., Tomé, M. (2012) Modelling forest trees and stands. Springer, Dordrecht. Evans, J.; Turnbull, J.W. (2004) Plantation forestry in the tropics. Third edition. Oxford University Press, Oxford. Johnson, E.A.; Miyanishi, K. (2001) Forest fires. Behavior and ecological effects. Academic Press, San Diego. Wylie, F.R.; Speight, M.R. (2012) Insect pests in tropical forestry. 2nd ed., CABI, Wallingford.Wylie, F.R.; Speight, M.R. (201Speight, M. R.; Wylie, F. R. (2001) Insect pests in tropical forestry, CABI Wallingford.	
Applicability	This module is one of two electives in the Tropical Forestry Master's degree programme, one of which must be selected. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one seminar paper including a presentation (30 hours) and a written exam (90 minutes).	
Credit points and grades	7 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work as follows: Seminar paper including presentation 33%, written exam 67%.	

Frequency of the module	This module runs once per year in the winter semester.
Workload	The total workload for this module is 210 hours. Of these, approx. 92 hours are allocated for lectures and teaching activities and approx. 118 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.
Relevant literature:	Smart, J. C. R.; Burgess, J. C. (2000) An Environmental economic analysis of willow SRC production. In: J. of Forest Economics, vol. 6, no. 3, S. 193-225. Umea. Goldammer, J. G. (1993) Fire management. In: Pancel, L. (ed.) (1993) Tropical Forestry Handbook. Springer-Verlag Berlin Heidelberg New York, 1221-1268. Goldammer, J. G.; Jenkins, M. J. (eds.) (1990) Fire in ecosystem dynamics. SPB Academic Publishing, The Hague. Speight, M. R.; Wainhouse, D. (1989) Ecology and management of forest insects. Oxford University Press. Oxford. Watt, A. D.; Stork, N. E.; Hunter, M. D. (1997) Forests and insects. Chapman & Hall, London. Wright, J. W. (1976) Introduction to Forest Genetics. Academic Press, New York.

Module number	Module name	Lecturer responsible
M_ESS 2.24	Environmental Development	Prof. Schanze jochen.schanze@tu-dresden.de
Objectives	Upon completion of this module, students will have in-depth knowledge of activities related to environmental development. In particular, they will be able to independently use specific analysis, future and assessment methods for spatial environmental and risk precautions and their instruments and planning processes. They will also become familiar with selected environmental development studies and will be able to thoroughly assess the quality of their content and methodologies as a basis for future activities.	
Content	This module covers current issues, concepts and approaches in environmental development with regard to the management of spatial interdependencies between society and the natural environment. The module focusses on the theoretical and methodical principles as well as their importance for sustainable development of cities and regions, exemplified using selected areas of Germany and globally. The range of topics covered includes describing human-environment systems, analysis, future and assessment methods, as well as planning techniques and instruments. The latter includes environmental impact assessments, management and risk management plans as well as approaches to regional assessment of the impacts of climate change and adaptations. Actors and planning processes as well as boundary conditions of international, European and national environmental policy also play a role here.	
Teaching and learning forms	Lectures (2 hrs/wk), seminars (2 hrs/wk) and self-study. The language of teaching for lectures and the seminar can be either German or English and will be determined by the lecturer responsible for the module at the start of the semester and made known via the usual channels.	
Participation requirements	None.	
Applicability	This module is one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined via a seminar paper including a presentation and discussion requiring 40 hours of work.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the summer semester.	
Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
MWW26 (M_ESS 2.25)	Integrated Water Resources Management I (IWRM I)	Prof. Krebs isi@mailbox.tu-dresden.de
Objectives	Students will learn how to analyse and evaluate complex problems of the management as well as of the optimisation of water resources. Students will learn approaches for working out a course of action that is adapted to regional conditions and for analysing case studies.	
Content	This module covers interdisciplinary approaches to integrated water resources management (IWRM), introduces investigation and action concepts in which water plays an important role as a resource, in habitats and landscape elements, approaches to system analysis and modelling of natural and technical water systems and their interactions, as well as social, economic, planning, legal, political and institutional frameworks and a "capacity development" that accompanies IWRM.	
Teaching and learning forms	4 hrs/wk lectures and self-study. This module is taught in English.	
Participation requirements	Knowledge of hydrology, meteorology and climatology, ground water management, urban drainage and system analysis. Literature: Borchardt, Dietrich, Bogardi, Janos J., Ibisch, Ralf B. (Ed.), 2016: Integrated Water Resources Management: Concept, Research and Implementation. Springer, Berlin	
Applicability	This module is an elective in the Hydrology, Water Management, Hydrobiology and Hydro Science and Engineering Master's degree programmes, the selection of which is regulated by Sec. 27(3) of the applicable examination regulations. It is a prerequisite for module MWW26 (Case Studies in Integrated Water Resource Management). This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with a written exam of 90 minutes. The examination must be completed in English.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the summer semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for 1 semester.	

Module number	Module name	Lecturer responsible
MHSE 11-2019 (M_ESS 2.26)	Circular Economy (Circular Economy)	Prof. Dornack
Objectives	Students learn about relevant material flows and can assess these using up to date evaluation techniques (e.g. ecological balances). They will possess a system understanding of global change based on an integrative reflection of the global flow of materials for goods and quality of recycling.	
Content	The circular economy is a model of sustainable economic development that aims at environmental protection and prevention through conservation of resources and by promoting re-use and recycling. This minimises pollution at its source and reduces waste. The circular economy not only aims to reduce waste, it also involves the transformation into sustainable economic activity of industrial organisation, infrastructure, site selection, environmental protection, welfare, etc.	
Teaching and learning forms	2 hrs/wk lectures, 1 hr/wk exercises and self-study.	
Participation requirements	Secondary education level knowledge of mathematics, physics and chemistry.	
Applicability	This module is an elective in the Hydro Science and Engineering Master's degree programme, the selection of which is regulated by Sec. 27(3) of the examination regulations. This module is also one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined via an oral presentation requiring 25 hours of work and course work requiring 60 hours.	
Credit points and grades	5 credit points are awarded for this module. The module grade is calculated from the weighted arithmetic average of grades from the oral presentation (30%) and the course work (70%).	
Frequency of the module	This module runs once per year in the summer semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
UWMRN 2.7 (M_ESS 2.27)	Ecological and Revitalising Urban Restructuring	Chair of Ecological and Revitalising Urban Restructuring
Objectives	Students will be familiar with the activities and content of ecological and revitalising urban restructuring and will have discussed these within the framework of general urban development processes. They will be familiar with the particular requirements of revitalising urban restructuring and ecological urban development as well as how these are connected. Upon completion of this module, students will understand the special challenges associated with ecological and revitalising urban restructuring. They will be able to develop suitable concept solutions for problems at the district and city levels and to convey these appropriately to different audiences.	
Content	This module covers topics relating to ecological and revitalising urban restructuring.	
Teaching and learning forms	Lectures (2 hrs/wk), seminars (2 hrs/wk) and self-study.	
Participation requirements	The knowledge and skills from modules UWMRN 1.1, 1.2 and 1.3 in the Spatial Development and Natural Resource Management Master's degree programme are required for this module.	
Applicability	This module is one of 14 electives from which students on the Spatial Development and Natural Resource Management Master's degree programme, from which students must select modules totalling 20 credit points. This module is one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with course work requiring 75 hours of work.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours. Of these, 90 hours are allocated for lectures and teaching activities and 60 hours for self-study, including exam preparation and the examination itself.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
UWMRN 2.2 (M_ESS 2.28)	International Spatial Development and Regional Management	Prof. Dr B. Müller
		Additional lecturers: Dr P. Schiappacasse Dr M. Egermann Dr P. Wirth
Objectives	Upon completion of this module, students will have gained a good overview of the problems, concepts and plans as well as the practical relevance of issues in international spatial development and international development cooperation. Students will be able to analyse and comparatively assess problems in international spatial development.	
Content	This module provides an overview of the fundamental questions and concepts of international spatial development and regional management, particularly within the framework of international development cooperation. Different planning philosophies are discussed which lead to different expressions of spatial planning. Questions and problems within international development cooperation are considered in relation to spatial development and their consequences for spatial development processes.	
Teaching and learning forms	Lectures (2 hrs/wk), seminars (2 hrs/wk) and self-study. The language of teaching for lectures and the seminar can be either German or English and will be determined by the lecturers responsible for the module at the start of the semester and made known via the usual channels.	
Participation requirements	The skills from modules UWMRN 1.1 and 1.2 are required for this module.	
Applicability	This module is one of 14 electives from which students on the Spatial Development and Natural Resource Management Master's degree programme, from which students must select modules totalling 20 credit points. This module is one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with (1) a single oral exam lasting 20 minutes or a written exam of 90 minutes, at the discretion of the student, and (2) a seminar paper including a presentation and discussion requiring 40 hours of work.	
Credit points and grades	5 credit points are awarded for this module. The module grade is calculated from the unweighted average of grades from the assessed work.	
Frequency of the	This module runs once per year in the winter semester.	

module	
Workload	The total workload for this module is 150 hours. Of these, 90 hours are allocated for lectures and teaching activities and 60 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.

Module number	Module name	Lecturer responsible
M_ESS 2.29	Foresight and Integrated Assessment in Environmental Development	Prof. Schanze
Objectives	Students will possess a solid overview of the principles and methods of foresight (scenario technique and other future methods) and integrated assessment (integrated impact analysis) for environmental development as well as in-depth knowledge of the potential uses of selected approaches. They will be familiar with foresight methods such as qualitative policy scenarios and visioning, and in particular with quantitative scenarios and parametrised futures. In relation to integrated assessment, they will understand the possibilities and limits of coupled modelling when analysing human-environment systems according to selected topics such as climate impact assessment and integrated water resources management. Students will be able to independently apply both foresight and integrated assessment approaches from a theoretical and methodical broader context based upon natural and social scientific perspectives of geography and further disciplines. They will become familiar with approaches taken by key global and regional studies.	
Content	This module covers the principles and methods of Foresight (scenario technique and other future methods) and integrated assessment (integrated impact analysis) for environmental development.	
Teaching and learning forms	Lectures (2 hrs/wk), seminars (2 hrs/wk) and self-study. The language of teaching for lectures and the seminar can be entirely or partly taught in English; this will be determined by the lecturers responsible for the module at the start of the semester and made known via the usual channels.	
Participation requirements	A sound knowledge of geographic areas, and particularly the relationships within human-environment systems at Bachelor level, are required for this module. Literature: Binder, C.R., Hinkel, J., Bots, P.W.G., Pahl-Wostl, C. 2013: Comparison of Frameworks for Analyzing Social-Ecological Systems. Ecology and Society, Vol. 18, Is. 4. p. 26.	
Applicability	This module is one of 29 electives from which students on the Ecosystem Services Master's degree programme must select according to Sec. 27(3) of the examination regulations.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined via a seminar paper including a presentation requiring 20 hours of work.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the winter semester.	

Workload	The total workload for this module is 150 hours. Of these, 60 hours are allocated for lectures and teaching activities and 90 hours for self-study, including exam preparation and the examination itself.
Module duration	The module lasts for one semester.

Annex 2
Study plan
with type and scope of courses given in hrs/week as well as required work; the type, scope and format of which can be found in the module descriptions

Module number	Module name	1. Semester	2. Semester	3. Semester (M)	4. Semester	LP
		V/Ü/S/P/T/eÜ/Pt	V/Ü/S/P/T/eÜ/Pt	V/Ü/S/P/T/eÜ/Pt		
Core modules						
M_ESS 1.1	Ecosystem Services – Concepts and Development	1.5/2/2/0/2/0/0 *2 PL*				10
M_BCM 1.1 (M_ESS 1.2)	Applied Ecology	2/1/1/0/0/0/0 *1 PL*				5
M_ESS 1.3	Introduction into Key Taxa	2.5/2.5/0/0/0/0/0 *1 PL*				5
M_ESS 1.4	Methods of Empirical Social Research	2/0/2/0/0/0/0 *1 PVL, 1 PL*				5
M_IM 1.6 (M_ESS 1.5)	Intercultural Communication and Foreign Language Skills	1/2/1/0/0/0/0 *1 PL*				5
M_ESS 1.6	Biodiversity and Ecosystem Governance		1.5/2/3/0/0/0/0 Excursions 1 day *2 PL*			10
M_ESS 1.7	Ecological Economics		2/2/0/0/0/0/0 *1 PL*			5
Electives*						
M_ESS 2.1**	Ecosystem Services in Practice – Specialisation		0/0/1/6 weeks/0/0/0 *1 PL*			10
M_ESS 2.2**	Ecosystem Services in Practice – Foundations			0/0/1/3 weeks/0/0/0 *1 PL*		5

Focus area of Environmental Social Sciences*						
M_ESS 2.3	Nature and Ecosystem Services in the City		2/0/0/0/0/0/2 *1 PL*			5
M_ESS 2.4	Investing in a Sustainable Future		2/0/0/0/0/0/0 *1 PL*			5
M_ESS 2.5	Ecosystem Services – Case Studies			0/0/4/0/0/0/0 *1 PL*		5
M_BE 5.2.2 (M_ESS 2.6)	Quantitative Methods of Empirical Research			2/1/1/0/0/0/0 *1 PVL, 1 PL*		5
M_BCM 3.8 (M_ESS 2.7)	Biodiversity Management and Sustainability			2/0/2/0/0/0/0 *1 PL*		5
M_BAÖ 4.1 (M_ESS 2.8)	Environmental Law			4/1/0/0/0/0/0 *1 PL*		5
Focus area of Biotechnology*						
M_BAÖ 1.10 (M_ESS 2.9)	Microbial Ecology			3.5/0/0.5/0/0/0/0 *1 PL*		5
M_BAÖ 1.6 (M_ESS 2.10)	Molecular Ecology			1/2.5/0.5/0/0/0/0 *1 PL*		5
M_BAÖ 1.8 (M_ESS 2.11)	Biomineralization and Environmental Analysis			3/1/2/1/0/0/0 *1 PVL, 1 PL*		5
M_BAÖ 2.6 (M_ESS 2.12)	Applied Microbiology			2/0/0.5/1.5/0/0/0 *1 PL*		5
Focus area of Ecology and Collections*						
M_ESS 2.13	Field Ecology		0/0/1/4/0/0/0 *1 PL*			5
M_BCM 1.7 (M_ESS 2.14)	Museum and Collections			2/2/0/0/0/0/0 Excursions 1.5 days *1 PL*		5
M_BCM 1.8 (M_ESS 2.15)	Collection-based Research			0/1.5/1/1.5/0/0/0 *1 PL*		5
M_ESS 2.16	Systematics and Taxonomy of Invertebrates and Cryptogams			4/5/0/0/0/0/0 *1 PL*		10

Focus area of Forestry*						
FOMT 1.7 (M_ESS 2.17)	Management of Vegetation and Soil in Watersheds		2/0/2/0/0/0/1.5 Excursions 0.5 days *2 PL*			7
FOMT 1.2 (M_ESS 2.18)	Forest Related Development Policy and Culture			3.5/1.5/2/0/0/0/0 *2 PL*		9
FOMT 1.4B (M_ESS 2.19)	Assessment and Evaluation of Forest Resources			2.5/3/0/0/0/0/0 *2 PL*		7
FOMT 2.3A-2019 (M_ESS 2.20)	Modelling			1/1.5/0/0/0/1/0 *2 PL*		5
FOMT 2.3B (M_ESS 2.21)	Communication and Conflict Management			2/0/1/0/0/0/1 *2 PL*		5
FOMT 2.4A (M_ESS 2.22)	Management Systems and Restoration in Natural Forests of the Tropics			3/0.5/2/0/0/0/0 Excursions 1 day *2 PL*		7
FOMT 2.4B (M_ESS 2.23)	Management Systems of Forest Plantations and Rehabilitation of the Landscape in the Tropics			3/0.5/2/0/0/0/0 Excursions 1 day *2 PL*		7
Focus area of Spatial Development and Natural Resource Management*						
M_ESS 2.24	Environmental Development		2/0/2/0/0/0/0 *1 PL*			5
MWW26 (M_ESS 2.25)	Integrated Water Resources Management I (IWRM I)		4/0/0/0/0/0/0 *1 PL*			5
MHSE 11-2019 (M_ESS 2.26)	Circular Economy		2/1/0/0/0/0/0 *2 PL*			5
UWMRN 2.7 (M_ESS 2.27)	Ecological and Revitalising Urban Restructuring			2/0/2/0/0/0/0 *1 PL*		5
UWMRN 2.2 (M_ESS 2.28)	International Spatial Development and Regional Management			2/0/2/0/0/0/0 *2 PL*		5
M_ESS 2.29	Foresight and Integrated Assessment in Environmental Development			2/0/2/0/0/0/0 *1 PL*		5

					Master's Thesis	27
					Colloquium	3
Credit points		30	30	30	30	**120**

*   Modules must be chosen by the student in accordance with Sec. 27(3) of the examination regulations.

**   Alternative (1 out of 2)

M	Mobility windows according to Sec. 6(1)(3) study regulation	Ü	Exercises	Ex	Excursions
		S	Seminars	PVL	Pre-examination
LP	Credit points	T	Tutorials	PL	Examination(s)
V	Lectures	eÜ	E-learning exercises		
P	Practical trainings / Internships	Pt	Project work		