UNIVERSITÄT BAYREUTH

Module Handbook

International Programme of Study

Environmental Geography (M.Sc.)

at the University of Bayreuth

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Contents

Abbreviations

A#	Modules from the area General Environmental Geography, # = consecutive number
AEG	Advances in Environmental Geography (Detailed Physical Geography)
B#	Modules from the area Advances in Environmental Geography (Earth, Soil, Surface), # = consecutive number
C#	Modules from the area Advances in Environmental Geography (Climate, Water, Vegetation), # = consecutive number
ECTS	Credit points (European Credit Transfer System), 1 ECTS = 30 hours
ES	Environment and Society
EW	Assessment component
F#	Modules from the freely selectable area, # = consecutive number
FC	Free Choice
GEG	General Environmental Geography
HS	Advanced seminar (course mode)
I	Internship (non-university internship)
M#	Modules from the area Methods in Environmental Geography , # = consecutive number
MEG	Methods in Environmental Geography
OE	Oral examination (assessment component)
Pres	Presentation (assessment component)
R#	Modules from the area Research in Environmental Geography , # = consecutive number
REG	Research in Environmental Geography
Rep	Report (assessment component)
S	Seminar (course mode)
SWS	Weekly hours per semester
T	Master's Thesis and Defence
Ü	Exercise (course mode)
WE	Written examination (assessment component)

1 Objectives and focuses of the programme of study

Environmental changes at all scales from global to local are of central importance to life on earth. In addition to climate change which is often focused on, there are other changes, such as biodiversity loss and biological invasion, pollutant inputs, land use changes, degradation of soils and reinforcements of mass movements, which are of equal importance. Processes of environmental change are often only able to be understood in the spatio-temporal coupling of the atmosphere, biosphere, reliefsphere, pedosphere and hydrosphere, whereby the interactions with various sectors of society are of central importance. It is assumed that environmental change does not lose momentum on a regional or on a global scale and continues to significantly determine the development of societies as well as political debates in the future. However, many processes in their interactions are still poorly understood, whereby effective foundations for decision-makers and the implementation of measures for the prevention and mitigation of anthropogenic environmental impacts as well for the development of suitable adaptation strategies are often lacking.

Due to the spatial quality of environmental characteristics, changes and burdens as well as the required social strategies, economic and political decisions, it is not only necessary to understand processes and mechanisms taking place in detail. Additionally, special attention to geographical aspects of the environment is essential. "Environmental Geography" addresses these spatial characteristics at different scales and allows for analysis beyond temporal scales. The relations of these topics in environmental science to aspects of the social sciences separate Environmental Geography from Physical Geography in the narrow sense.

The programme of study Environmental Geography, as a modern programme of study focusing on current issues with close ties to Physical Geography, addresses students whose core interests lie in Physical Geography. The main focus is on the fields of climatology/biogeography and relief/soil as well as with a strong relation to social issues. The programme addresses students from countries where environmental changes and the management thereof are already current issues, as well as students from countries where environmental problems are developing particularly dramatically in the wake of increasing industrialization, where solutions are often still completely missing. Hence, the programme addresses students, who understand their future field of activity in an international context

Physical Geography, as an interdisciplinary science, which determines the scope of the programme of study of Environmental Geography, has, in addition to the basic research in its sub-disciplines, a strong focus on social-environmental processes. This plays a key role in understanding the correlations described. Physical Geography is an applied, highly interdisciplinary science that requires fundamental understanding of the systems atmosphere, biosphere, relief, soil and water and moreover pays attention to the interaction between environment and society. Dealing with a variety of analytical tools is therefore indispensable. The demand for graduates of Physical Geography will strongly increase against the background of further continuing global change in the coming years and offer excellent employment opportunities worldwide in academia, industry or the public sector.

One objective of the programme of study is to consciously integrate the different perceptions of environmental problems from different perspectives against different cultural and socio-economic backgrounds and therefore to present Environmental Geography in an international context.

The required initial degree for the master's programme Environmental Geography is usually a B.Sc. (180 ECTS points). Possible subjects of the initial degree are: e.g. geography, geo-ecology, biology, landscape ecology, geology, earth sciences, forestry sciences, meteorology, environmental sciences, environmental nature sciences, spatial planning and related disciplines. Sound basic knowledge of physical geographical topics is an indispensable prerequisite. This focus of interest must be documented by prior knowledge to the extent of at least 90 ECTS points. Above-average demands will be made on the candidate's profile. The programme of study is open to excellent, hard-working and committed domestic and international students. Candidates undergo an aptitude test. Suitability parameters are: reliable mastery of one's subject-related expertise from the undergraduate studies, a strong interest in environmental-geographical issues, the required reflection and abstraction capacity for the understanding of an interdisciplinary programme of study and the ability to passively and actively penetrate the depth of technicalities of the subject in English.

A solution-oriented approach is at the core of the training. The qualification objectives of the programme will be attained by creating a common theoretical and methodological basis, which is followed by a specialization in environment-oriented sub-areas of Physical Geography. In addition to the theoretical work on special topics of Physical Geography, the specialization is particularly based on independent work in teaching research, which is closely related to the research focus of the Department of Earth Sciences and leads to the degree as part of the master's thesis. The methodological basics for teaching research will be formulated in method-modules. The research workshop enables students to categorize and present course content in the light of the current discussions in the subject area. Creativity, flexibility, teamwork and sense of responsibility will be encouraged.

Environmental Geography will be complemented by subject-related foundations of the cultural and social sciences, which allows students to put natural phenomena and processes into the social context. In the Free Choice area, study-related individual counselling helps to create a distinctive individual profile. A special offer in this sense is the "Entrepreneurial Education". Linking of course content enables students to understand and evaluate complex environment-society relations, and to derive possible courses of action accordingly. For their master's thesis, working groups of the participating instructors with numerous national and international projects are available to the students, through which an extension of their own network is possible. Through the direct integration into current research projects, the understanding of physical-geographical problems in an international context is supported by personal experience.

Individual supervision in small groups, an intensive exchange between instructors and students, as well as early involvement in current research topics of various working groups have always been hallmarks of Earth science programmes in Bayreuth. In addition, the programme of study uses the integration of course content from Human Geography and Geoecology, the strengths of the University, which is characterized by a diversity in environmental sciences that can only be found at a few locations in German-speaking countries. The walkable campus also promotes the interdisciplinary exchange between students from different programmes of study and different nationalities.

The objective of the programme of study is to train highly qualified leaders in science, environmental protection, politics and economic consulting. Based on well-founded expertise, they have to be capable of identifying new problems, analysing complex issues and developing flexible proposals for solutions. After completing

their studies, a variety of career opportunities in academia, in the industry (appraisers, environmental commissioners of national and international companies, founding of a company) and the public sector (administration, policy consulting, development cooperation) are open to the graduates. Possible employers include international organizations (e.g. UN, EU, NGOs), national authorities (ministries, federal authorities, state offices, municipal administrations), sustainability departments, consulting firms, insurance companies, universities and major research centres. International students from developing and emerging countries, in particular, will have excellent career opportunities in their home countries, due to the need for communicators with expertise. After graduation an active alumni network facilitates intellectual, and possibly also personal exchange with other international scientists active in the field.

2 Study concept

2.1 Study design

The master's programme Environmental Geography is to be passed within the standard period of study (four semesters of full-time study) as an on-campus degree programme, and concludes with the writing of a master's thesis. All courses are offered annually. Enrolment is only possible for the winter semester.

Students will acquire 30 ECTS points points per semester, a total of 120 ECTS points, where 1 ECTS point corresponds to a workload of 30 hours. For the on-campus degree programme, a two-hour lecture equals 1 ECTS point (2 SWS x 15 weeks = 30 hours). For any necessary preparation and follow-up work, including examination preparation, additional credits will be awarded depending on the time involved. Examinations and assessment components are completed over the course of one's studies. The programme of study uses a broad spectrum of examination forms, which support the qualification of students in different formats and adequately covers their individual skills. These range from the appropriation of empirical knowledge and analytical skills for the penetration of complex issues, to the representation and analysis of the connections in oral presentations and written work. Seminars aiming at the writing of scientific texts are concluded by a graded term paper, whereby the lecturer has the chance to intervene supportively and correctively in individual cases. In the seminars, topics will be independently presented and discussed. In the other types of courses (methods, research training, research workshop) there will be discussion of theories, paradigms and methods of Physical Geography and theses will be applied to specific research questions. The work will be determined by written or oral examinations, graded written reports or graded presentations of results.

The training is modular and divided into the following greater module areas:

- Foundations: General Environmental Geography (GEG)
- Specialization: Advances in Environmental Geography (AEG)
- Methods: Methods in Environmental Geography (MEG)
- Environment and Society (ES)
- Research: Research in Environmental Geography (REG)
- Free Choice Area (FC)
- Master's Thesis (MT)

The basis block (GEG) lays a common basis with two modules; in the specialization (AEG), there are two focuses, Relief/Soil (Earth, Surface, Soil B) and Climate/Biosphere (Climate, Vegetation, Water C). Within the components another focus can be set. The research modules (REG) allow professional specialization in the direction of relief/soil or climate/biosphere. For module R1, numerous field exercises with a high proportion

of independent work can be chosen, which will be subsequently evaluated and discussed in module R2. The module R3 is used for the communication of concepts of the dissemination of research, for example through participation in scientific conferences, schools or the independent presentation of results from the modules R1 and R2 in the context of a workshop or an exhibition at the University of Bayreuth. In the method area (MEG), a selection of modern methods, such as remote sensing, modelling, laboratory analysis and field methods, will be offered. In the module area Environment and Society (ES), the link between environmental science with social science issues will be explored. In the free choice area (FC), supplemental courses at the University in environmental, cultural and social science subjects can be taken. In addition, in the practical experience module (Internship I) an internship will be done in a relevant institution with a focus on enviroenmental issues, to provide insights into professional practice. All modules amount to 5 ECTS points, the module R1 amounts to 10 ECTS points. The master's thesis, which will be presented in form of a defence (T) counts for 30 ECTS points.

The course of studies emphasizes interactive teaching methods, which is reflected in each semester by a wide range of seminars, advanced seminars and exercises.

The programme leads to the degree "Master of Science (M.Sc.)".

<table>
<tr><th>Semester</th><th colspan="6">Modules</th></tr>
<tr><td>1</td><td>A1
Theories /Scientific Working</td><td>A2
Debated Topics in Environmental Geography</td><td>B1
Earth, Soil, Surface I</td><td>C1
Climate, Water, Vegetation I</td><td>M
Methods</td><td>F
Free Choice</td></tr>
<tr><td>2</td><td colspan="2">R1
Research Training (B or C)</td><td>B2
Earth, Soil, Surface II</td><td>C2
Climate, Water, Vegetation II</td><td>S
Environment and Society</td><td>M
Methods</td></tr>
<tr><td>3</td><td>R2
Research Training (B or C)</td><td>R3
Scientific workshop, conference, school</td><td>S
Environment and Society</td><td>M
Methods</td><td>F
Free Choice</td><td>I
Internship</td></tr>
<tr><td>4</td><td colspan="6">T
Master´s Thesis & Defence</td></tr>
</table>

Fig. 1: Breakdown of the programme into the thematic module areas: foundations A), subject specialization (B and C), methods (M), environment and society (S), research (R), selectable modules (F) and internship (I). The second module F can be replaced by another module I. All modules correspond to 5 ECTS points, the module R1 amounts to 10 ECTS points. The master thesis and disputation (T) correspond to 30 ECTS points. For more details about the study and work plan, see chapter 4.

2.2 Structure and progression of the programme of study

Orientation week: To facilitate entrance into the programme of study, especially for foreign students, an orientation week in cooperation with the Welcome Centre at the University of Bayreuth will be offered before the start of the first semester. Naturally, this event is also open to all other students of the programme of study. Here organizational information will be given, and the motivation and objectives of the programme of study, as well as the model of study and progression of the courses, will be explained. The University of Bayreuth, with its research areas, central facilities and research centres will be introduced to the students. A tour of the campus of the University of Bayreuth, the Botanical Garden as well as the laboratories of the research groups involved in the programme of study gives an introduction to the scientific structures on campus. Sufficient time will be allowed for individual meetings to discuss expectations for the programme of study, previous knowledge, but also knowledge gaps and ways to close them. The aim is to determine whether that which is offered suits the students' expectations. Individual interests should be identified early, enabling them, where possible, to be addressed in the individual courses. A separate section will be dedicated to the exchange of previous perceptions of physical-geographical problems from different perspectives and against various cultural and socio-economic backgrounds.

In the first semester, in the foundation section *General Environmental Geography (GEG),* in two modules (A1 and A2), Physical Geography relating to theory of science and scientific methodology will be introduced and controversial current issues in Physical Geography discussed. These modules will enable students to critically evaluate different concepts and paradigms in current issues. In the advanced seminar, current topics of Physical Geography will be controversially discussed by the students in the form of presentations and written work. In the exercise, theories and methodological approaches will be discussed. In the specialization block *Advances in Environmental Geography (AEG)*, current topics of Physical Geography will be treated in two subregions (B1 and C2) by the students independently in the form of presentations and written assignments in two modules. In the method block *Methods in Environmental Geography (MEG)* modern methods are worked on by the students independently in exercises in a module (M). In module F, students attend courses in other subjects at the University of Bayreuth that supplement their studies in a way that is worthwhile for their individual qualification.

In the second semester, the focus is on the module block Research in Environmental Geography (REG), in which (in the module Research Training) selected aspects of Physical Geography in one of the focus areas (B or C) are examined in the field and/or laboratory and the results are analysed and presented by the students. The foundation is laid through independent familiarization with the subject and the design of the research. The module may be based closely on research projects to allow the students to get an up-close look at research practice. In two modules of the block AEG, current topics in some sub-areas (B2 and C2) of Physical Geography are dealt with independently by the students in the form of presentations and written term papers.

In the environment-society-block Environment and Society (ES), topics of society-environment-relationships in module S1 are independently developed in the form of presentations and written term papers. In doing so, parts of existing modules from other programmes of study will be drawn on. In the methods module (M), modern methods will be worked on by the students individually in exercises.

In the **third semester** the module block Research in Environmental Geography (REG) will be continued with the modules R2 and R3. The module R2 may be the continuation of the module R1, where more in-depth analysis and presentation of the results take place. The module can however, also treat selected aspects of Physical Geography in an independent exercise. In module R3 several options are available. A school, a scientific workshop or conference can be participated in. There is also the opportunity to present results from the modules R1 and R2 internally to a wider audience. In the methods module (M), modern methods will be worked on by the students individually in exercises. In module F, students attend courses in other subjects at the University of Bayreuth that are worthwhile for their individual qualification. The practical experience module (I) provides insights into professional practice. The internship will be completed in institutions, the private sector or non-university research institutions in a field related to the subject area of one's studies. The practical experience module (I) may be extended by the module F from four to eight weeks.

The **Free Choice Area** allows specialization or the pursuit of individual interests with an allocation of 10 ECTS points. These can be selected from the full range of the university. Specific recommendations here include: specialization in the areas of Environmental Physics, Environmental Chemistry, Global Change Ecology or Environmental Law. In the first semester, an individual consultation is offered for the Free Choice area, which takes account of the differences in the students' previous knowledge and recommends specific corresponding supplementary courses. Naturally, language courses, for example, can be selected in the Free Choice area. In addition, a special elective option exists in the "Entrepreneurial Education" to acquire various qualifications in the field of entrepreneurship. Knowledge, abilities and skills are taught, which are necessary for successful business creation and management.

To consolidate practical experience and to provide some insights into professional practice, a non-university **Internship** of at least four weeks is an integral part of one's studies. They are carried out at institutions that deal thematically with issues addressed in the programme. These can be commercial enterprises, administrative institutions, international organizations or research institutions. The internship can be extended on request to eight weeks by way of module F.

The **Master's Thesis** is written during the fourth semester and includes the independent handling of a scientific Physical Geography topic over a period of 6 months. The master's thesis is preceded in the third semester with the preparation of a research plan in close consultation with the supervisors as well as the oral presentation of the same within a group seminar, so that feedback can be actively incorporated. In addition, the results of the thesis are presented at least once in a group seminar before the completion of the work. The aim is to practice the communication of scientific content as well as to promote the development of interpretive approaches in the team. The conclusion of the master's thesis is the defence before a two-member board of examiners.

Time abroad within the first 3 semesters is not allowed for, since the target group is mainly international students with very different subject-related backgrounds. In consultation with the instructors of the individual areas, however, it is always possible to work on a master's thesis abroad. This may be an attractive option, especially in the light of later professional activity especially in the student's country of origin. A **practical phase**, that could result from a specialization in the area of "Entrepreneurial Education", can normally be included, individually and in consultation with the supervisor of the master's thesis, after completing the first 3 semesters and before beginning work on the thesis.

3 Content of the courses

3.1 Module area General Environmental Geography

A1 Theories in Environmental Geography/Scientific Working

Responsible for the module:	Professor of Climatology	
Learning objectives	The students will be able to explain basic theories and concepts of Physical Geography and deal critically with these. In parallel, the basic principles of scientific work will be taught. Moreover, personal and social-communicative competencies in the sense of independent development, evaluation and presentation of research topics will be trained intensively in small groups.	
Learning content	In the excercise "Theories in Environmental Geography", knowledge of theories and paradigms of Physical Geography through the independent study of primary literature will be acquired and then critically discussed in plenary sessions. In the exercise "Scientific Working", the basic principles of scientific work, such as literature review, hypothesis formation and the selection of methods based on these, are conveyed by way of examples.	
Mode of knowledge transfer	Exercise (1 SWS), exercise (1 SWS)	
Participation prerequisites	none	
Assessment components	Presentation + report (ungraded)	
Workload	Active participation in 2 courses	30 hours
	Preparation and follow-up work:	60 hours
	Required assessment components	60 hours
	Total:	150 hours
Credits	5 ECTS	
Frequency	Winter semester (recommendation: 1st semester)	
Relation to other modules	A2	

A2 Debated Topics in Environmental Geography

Responsible for the module:	Professor of Climatology	
Learning objectives	The students are expected to learn to critically examine topics based on current topics of Physical Geography. The focus is on critical reflection and discussion of content in the context of various theories and paradigms.	
Learning content	Students independently prepare selected topics and present them. The topics can include the entire breadth of Geography, to give an insight into the spectrum of the subject. The seminar will focus on current topics that allow for a controversial debate and should thus stimulate critical thinking and controversial argumentation.	
Mode of knowledge transfer	Advanced seminar (2 SWS)	
Participation prerequisites	none	
Assessment components	Presentation + Report (graded)	
Workload	Active participation in the courses:	30 hours
	Preparation and follow-up work:	60 hours
	Required assessment components	60 hours
	Total	150 hours
Credits	5 ECTS	
Frequency	Winter semester (recommendation: 1st semester)	
Relation to other modules	A1	

3.2 Module area Advances in Environmental Geography

B1 Earth, Soil, Surface

Responsible for the module:	Professor of Geomorphology	
Learning objectives	Students become acquainted with the breadth of "Environmental Geomorphology" in the four-dimensional space-time system. The geological substrate, the relief and its form-creating processes, as well as factors and processes of soil formation and the existing soil will be recognized as a result of mutual interaction on the time-line, as the basis for the identification, assessment and future design of the earth's surface by people taking into account risks inherent in the system.	
Learning content	Which natural and anthropogenic processes change our inherited environment? What geogenic and anthropogenic contaminants pollute the soil? What natural landscapes or landscape elements should be protected? How can the value of post-industrial landscapes be restored and which natural and quasi-natural risks are to be taken into consideration? These questions will be addressed and their importance for future social and cultural development recognized. The module is offered either in the form of an advanced seminar or a seminar and additional exercise. The exercise consolidates and supplements the contents of the seminar with independent development of the content. In the advanced seminar/seminar, students deal with processes on different space-time scales in environmental systems in the context of global changes. The knowledge transfer takes place through various introductory talks by teachers or external speakers, as well as exemplary presentations and term papers on specific topics by the students.	
Mode of knowledge transfer	Advanced seminar (3 SWS), or seminar + exercise (2+2 SWS)	
Participation prerequisites	none	
Assessment components	written or oral examination or presentation + report (graded)	
Workload	Active participation in 1/2 courses:	45/60 hours
	Preparation and follow-up work:	30 hours
	Required assessment components:	75/60 hours
	Total:	150 hours
Credits	5 ECTS	
Frequency	Winter semester (recommendation: 1st semester)	
Relation to other modules	A1, A2	

B2 Earth, Soil, Surface,

Responsible for the module:	Professor of Soil Physics	
Learning objectives	Contemporary geosystems are the product of recent and previous processes and can only be understood against the background of the recent geological past. The objective of the module is to understand the formative process structure in its spatio-temporal dynamics and unravel its interconnections. This will be achieved through the analysis and reconstruction of process flows in their response to changing ecological conditions over time. As part of the module, students will develop a problem- and process-oriented understanding of the temporal and spatial interactions between lithosphere, pedosphere, biosphere, hydrosphere and atmosphere.	
Learning content	In the seminar or advanced seminar, students deal with processes in environmental systems on widely varying spatial and temporal scales and with their manifestation in geo-archives. The analysis of these processes and the forecasting of future developments in the context of global change, are the focus of attention. Current research-related topics will be concentrated on here. The contents may originate from one of three areas *earth, surface, soil* or be interdisciplinary. The module is offered either in the form of a advanced seminar or a seminar and additional exercise. The exercise consolidates and supplements the contents of the seminar with independent development of the content.	
Mode of knowledge transfer	Advanced seminar (3 SWS), or seminar + exercise (2+2 SWS)	
Participation prerequisites	A1, A2, B1, C1	
Assessment components	written or oral examination or presentation + report (graded)	
Workload	Active participation in 1 or 2 courses:	45/60 hours
	Preparation and follow-up work:	30 hours
	Required assessment components:	75/60 hours
	Total:	150 hours
Credits	5 ECTS	
Frequency	Summer semester (recommendation: 2nd semester)	
Relation to other modules	A1, A2, B1, C1	

C1 Climate, Water, Vegetation,

Responsible for the module:	Professor of Biogeography	
Learning objectives	Students are expected to gain a deeper insight into one of the sub-regions air, water, vegetation. The objective is that the students are able to study specialized topics independently and develop a problem- and process-oriented understanding of the interactions between different spheres, especially on a global scale. They will be able to present and discuss topics and describe them in writing. In addition, technical and socio-communicative competencies, in terms of the independent development, evaluation and didactically meaningful treatment of geographical topics, will be intensively trained and expanded.	
Learning content	In the main seminar or another seminar, students deal with processes especially on global scale in environmental systems. Here, spatio-temporal characteristics of the environmental systems in the context of global changes are the focus of attention. The contents may originate from one of the three areas of climate, water, vegetation or be interdisciplinary. The module is offered either in the form of a main seminar or a seminar and additional exercise. The exercise consolidates and supplements the contents of the seminar with independent development of the content.	
Mode of knowledge transfer	Advanced seminar (3 SWS), or seminar + exercise (2+2 SWS)	
Participation prerequisites	none	
Assessment components	written or oral examination or presentation + report (graded)	
Workload	Active participation in 1/2 courses:	45/60 hours
	Preparation and follow-up work:	30 hours
	Required assessment components:	75/60 hours
	Total:	150 hours
Credits	5 ECTS	
Frequency	Winter semester (recommendation: 1st semester)	
Relation to other modules	A1, A2	

C2 Climate, Water, Vegetation,

Responsible for the module:	Professor of Climatology	
Learning objectives	The students learn the sub-areas of climate, water, vegetation: how global changes of environmental systems manifest themselves on regional and local scales and what processes are significant on these scales. The focus is primarily on temporal dynamics and spatial patterns and their interactions.	
Learning content	In the advanced seminar or seminar, students deal with processes on regional and local scales in environmental systems. Here the focus is on the effects of global change on spatio-temporal characteristics of the environmental systems. The content may originate from one of the three areas of climate, water, vegetation or be interdisciplinary. The module is offered either in the form of an advanced seminar or a seminar and additional exercise. The exercise consolidates and supplements the content of the seminar with independent development of the content.	
Mode of knowledge transfer	Advanced seminar (3 SWS), or seminar + exercise (2+2 SWS)	
Participation prerequisites	A1, A2, C1	
Assessment components	written or oral examination or presentation + report (graded)	
Workload	Active participation in 1/2 courses:	45/60 hours
	Preparation and follow-up work:	30 hours
	Required assessment components:	75/60 hours
	Total:	150 hours
Credits	5 ECTS	
Frequency	Summer semester (recommendation: 2nd semester)	
Relation to other modules	A1, A2, C1	

3.3 Module area Methods in Environmental Geography

In the module area Methods in Environmental Geography, students must earn a total of 15 ECTS points in semesters 1-3. Core elective modules are available from all Earth Science modules in the natural science programmes of study, which can be chosen by the students according to their thematic orientation. Options include courses on remote sensing, modelling, multivariate statistics, time series analysis, geochronology, physico-chemical characterization and environmental isotope biogeochemistry, among others.

M Methods

Responsible for the module:	Professor of Ecological Modelling	
Learning objectives	The courses provide students with modern analytical and evaluation methods to be able to work through Physical Geography issues. Apart from the purely methodological aspects, the students will be able to critically assess the methods and link the respective methods to scientific issues.	
Learning content	The learning content is based on the titles of the exercises. They are all characterized by an independent methodical working in the field, in the laboratory and/or on the computer. The range of courses on offer can change yearly, and there is no guarantee of an individual course being regularly on offer. Other relevant courses can be incorporated as selectable courses by decision of the board of examiners.	
Mode of knowledge transfer	Exercises (2 SWS)	
Participation prerequisites	none	
Assessment components	Reports (graded)	
Workload	Active participation in the courses:	30 hours
	Preparation and follow-up work:	60 hours
	Required assessment components:	60 hours
	Total:	150 hours
Credits	5 ECTS	
Frequency	Winter and summer semester (recommendation: 1st-3rd semester)	
Relation to other modules	R1, R2	

3.4 Module area Research in Environmental Geography

R1 Research Training I

Responsible for the module:	Professor of Climatology	
Learning objectives	In this module, the focus is on independent, practical work on an environmental issue or intense engagement in an area. The objective is to formulate a research question, to work on it methodically, to discuss the results and present them, or to understand an area in its complexity. Students will therefore be introduced to independent scientific work.	
Learning content	Environmental science content or environmental-societal contexts are provided in the form of a field exercise, an intensive internship or a Science School. In these courses, the independent practical work is carried out with a topic or an area. It is preceded by preparation in the form of a seminar, which introduces students to the subject matter of the field course. The conclusion of the course is the evaluation and presentation of the results.	
Mode of knowledge transfer	Seminar (2 SWS) and exercise (several days as a block)	
Participation prerequisites	A1, A2, B1, C1	
Assessment components	Report (graded)	
Workload	Active participation in the courses:	120 hours
	Preparation and follow-up work:	60 hours
	Required assessment components:	120 hours
	Total:	300 hours
Credits	10 ECTS	
Frequency	Summer semester (recommendation: 2nd semester)	
Relation to other modules	A1, A2, B1, B2, C1, C2	

R2 Research Training II

Responsible for the module:	Professor of Geomorphology	
Learning objectives	The module serves to continue the consolidation of independent scientific work. It may be the continuation of the R1 module or an independent scientific work. The objective is to formulate a research question, to work on it methodically, to discuss the results and present them, or to understand an area in its complexity. Students will therefore be introduced to independent scientific work.	
Learning content	Independent further practical analyses, evaluations and representations of environmental scientific data are focused on in the module. The issues can result from the R1 module or arise from an independent topic.	
Mode of knowledge transfer	Exercise (2 SWS)	
Participation prerequisites	R1	
Assessment components	Presentation and report	
Workload	Active participation in the course:	30 hours
	Preparation and follow-up work:	60 hours
	Required assessment components:	60 hours
	Total:	150 hours
Credits	5 ECTS	
Frequency	Winter semester (recommendation: 3rd semester)	
Relation to other modules	R1, B1, B2, C1, C2	

R3 Scientific workshop, conference, school

Responsible for the module:	Professor of Disturbance Ecology	
Learning objectives	The students are expected to gain a deeper insight into the scientific landscape of Physical Geography. The objective is to be able to view the theoretical and practical knowledge acquired in previous courses in a broader context and evaluate it critically.	
Learning content	The students can choose from individual courses with environmental science content. A workshop concerning results from the R1 & R2 modules, which the students organize themselves, is also conceivable. It is also possible to participate in a scientific workshop or a meeting, as well as to visit colloquium lectures. These courses are theoretically prepared. It is also possible to participate in a school for environmental science topics. The choice of courses will be discussed with the module coordinator in the course of the 2nd semester.	
Mode of knowledge transfer	Workshop, conference, school	
Participation prerequisites	R1	
Assessment components	Report or presentation	
Workload	Active participation in the courses:	30 hours
	Preparation and follow-up work:	60 hours
	Required assessment components:	60 hours
	Total:	150 hours
Credits	5 ECTS	
Frequency	Winter semester (recommendation: 3rd semester)	
Relation to other modules	none	

3.5 Module area ES Environment and Society

S1 Geographies of Environment and Development

Responsible for the module:	Professor of Geographical Conflict Studies	
Learning objectives	In the seminar, students gain an insight into theoretical and conceptual approaches of the geographical society-environmental research in the development context. The objective is an interdisciplinary understanding of complex problems in the nexus of development and environment in the global south.	
Learning content	In the course, the students will acquire knowledge of theories, current trends and scientific methods to understand the nexus of environment, society and development in the global south from an interdisciplinary perspective of human and Physical Geography. Students learn concepts for the study of physical and social dimensions of environmental change. Thus, they can locate environmental trends, impacts on the environment, as well as environmental control in development discourses, in development policies and development practices.	
Mode of knowledge transfer	Advanced seminar (2 SWS)	
Participation prerequisites	A1, A2	
Assessment components	Presentation + Report (graded)	
Workload	Active participation in the courses:	30 hours
	Preparation and follow-up work:	60 hours
	Required assessment components:	60 hours
	Total:	150 hours
Credits	5 ECTS	
Frequency	Summer semester (recommendation: 2nd semester)	
Relation to other modules	S2, S3	

S2 Emergence and Development of "the Environment" as a Social and Political Issue

Responsible for the module:	Professor of Cultural Geography	
Learning objectives	The two main objectives of the course are: (1) teaching the historical and social context for the current debates on the environment; (2) teaching methods from cultural studies for the systematic analysis of discourses and debates in the context of the environment.	
Learning content	The seminar is an intensive reading seminar. At the start, the focus is on discussions, led by the course leader, of theoretical and methodological texts on cultural analysis of environmental discourses. Thereafter, the students present text analyses and moderate reading groups on selected topics. The conclusion is a panel discussion on key parts of the texts. In addition, text comparisons of reports from the Club of Rome and the IPCC are systematically undertaken. In addition, at least two film evenings with environmental documentaries and feature films concerning environmental issues will be organized.	
Mode of knowledge transfer	Advanced seminar (2 SWS)	
Participation prerequisites	A1, A2	
Assessment components	Presentation + Report (graded)	
Workload	Active participation in the courses:	30 hours
	Preparation and follow-up work:	60 hours
	Required assessment components:	60 hours
	Total:	150 hours
Credits	5 ECTS	
Frequency	Winter semester (recommendation: 3rd semester)	
Relation to other modules	S1, S3	

S3 Ecosystem Services

Responsible for the module:	Professor of Ecological Services	
Learning objectives	Global change of climate, land use, markets and politics has a strong influence on the capacity of ecosystems. The objective of this module is the in-depth analysis of ecosystem services (food production, erosion regulation, water purification, protection against risks, etc.) relevant to the society and their relationship to biodiversity.	
Learning content	The lecture "Ecosystem Services" provides an overview of ecosystem services in regional and global human-environment systems. Course contents includes the definition and classification of ecosystem services, and their relationship to biodiversity and the role of global change. Furthermore, the physical quantification and socio-economic assessment, the supply and demand by society's decisionmakers as well as the management of the performance of ecosystems through market-related policy instruments is addressed. The seminar will explore the topic of the lecture with current examples from research.	
Mode of knowledge transfer	Ü Ecosystem Services (2 SWS, 2 LP) S Current Research in Ecosystem Services and Biodiversity (2 SWS, 3 LP)	
Participation prerequisites	A1, A2	
Assessment component	Written or oral examination (graded).	
Workload	Active participation in the courses:	30 hours
	Preparation and follow-up work:	60 hours
	Required assessment components:	60 hours
	Total:	150 hours
Credits	5 ECTS	
Frequency	Winter semester (recommendation: 3rd semester)	
Relation to other modules	S1, S2	

3.6 Module area FC Free Choice

F

Responsible for the module:	Professor of Climatology	
Learning objectives	As part of the free area, students will learn basic curricula, theoretical concepts and methods from other subjects. They have the option to attend courses which convey general study skills and useful content to complement studies in geography.	
Learning content	10 credits must be earned in Studium Generale or other courses at the University of Bayreuth that constitute a useful addition. The types of courses and assessment components can be found in the course catalogue or in the information on the individual subjects. Advice on selecting courses is provided during orientation week at the beginning of one's studies.	
Mode of knowledge transfer	To be determined by the relevant instructors.	
Participation prerequisites	To be determined by the relevant instructors.	
Assessment components:	The credit earned depends on the nature of the course. The form of the assessment components are determined by the relevant instructors.	
Workload	Active participation in 2 courses:	60 hours
	Preparation and follow-up work:	60 hours
	Required assessment components:	30 hours
	Total:	150 hours
Credits	5 ECTS	
Frequency	Winter semester (recommendation: 1st semester) and winter semester (recommendation: 3rd semester)	
Relation to other modules	none	

I Internship

Responsible for the module:	Professor of Biogeography
Learning objectives	Students will demonstrate their technical and methodological competencies in specific projects within the context of one economic, administrative or research internship and continue to expand those competencies along with personal and social-communication competencies.
Learning content	As part of the module, an economic, administrative or research internship will be undertaken. The internship can be completed in a business organization, an administrative authority, a state or federal ministry, a museum, a public or private research institution, or similar institutions with a concrete relation to Physical Geography. Alternatively, active involvement in a university research project with a concrete relationship to Physical Geography is possible. In consultation with the board of examiners, a summer school or other courses can also be integrated, including the necessary preparation/follow-up. This will be credited to the internship time.
Mode of knowledge transfer	Internship
Participation prerequisites	none
Assessment component	Assessment components are determined by the internship partners and may be supplemented by the lecturer.
Workload	4 weeks
Credits	5 ECTS
Frequency	Winter semester (recommendation: 3rd semester)
Relation to other modules	

3.7 Module area T Master's Thesis

T Master's Thesis

Responsible for the module:	Professors of Geomorphology/Climatology/Biogeography
Instructors	All instructors involved in the programme of study
Learning objectives	The master's thesis is an independent research work in the focus of one's studies. Students will put into practice their acquired skills by working on a selected topic. The objective is to practice the hypothesis-driven analysis on problems, to select and accurately apply appropriate methods from a wide basis of theoretical knowledge and thus, within a specified time, find answers to specific questions and reproduce these answers in a manner that is scientifically correct in both oral and written form. Flexibility, creativity, time and problem management will be trained, as well as abstraction and communication skills. In the defence, the students will show that they are able to present the results of the master's thesis and discuss them in a wider context.
Learning content	The topic of the thesis can be freely chosen in consultation with the supervisor and must include content relevant to the Environmental Geography programme of study. In consultation with the supervisor and on request to the board of examiners, external final projects are possible, provided that the issues can be equated to scientific demands.
Mode of knowledge transfer	Independent work in close contact with the supervisor as well as his working group.
Participation prerequisites	Preparing a research plan
Assessment component	Master Thesis and at least one presentation at the respective working group seminar, as well as a defence.
Workload	Work / individual supervision (6 months): 900 hours Total: 900 hours
Credits	30 LP; the grade of the master's thesis constitutes the module grade.
Frequency	The master's thesis is written during studies in the fourth semester. Total length: 6 months.
Relation to other modules	The master's thesis facilitates a coherent reflection of the skills and competencies learned throughout one's studies, therefore all modules should be completed before the beginning of the master's thesis.

4 Study plan and mode of courses

1st Semester

	Mode	SWS	ECTS	Percentage of overall grade [%]
GEG General Environmental Geography				**5**
A1 Theories in Environmental Geography/ Scientific Working	Ü	2	**5**	
A2 Debated Topics in Environmental Geography	S	2	**5**	
AEG Advances in Environmental Geography				**10**
B1 Earth, Surface, Soil	HS (S/Ü)	3 (4)	**5**	
C1 Climate, Vegetation, Water	HS (S/Ü)	3 (4)	**5**	
MEG Methods in Environmental Geography				**5**
M Methods	Ü	2	**5**	
FC Free Choice				**0**
F Free Choice		2	**5**	

2nd Semester

	Mode	SWS	ECTS	Percentage of overall grade [%]
REG Research in Environmental Geography				**10**
R1 Research Training I (B or C)	Ü	4	**10**	
AEG Advances in Environmental Geography				**10**
B2 Earth, Surface, Soil	HS (S/Ü)	3 (4)	**5**	
C2 Climate, Vegetation, Water	HS (S/Ü)	3 (4)	**5**	
ES Environment and Society				**5**
S Environment and Society	HS/Ü	2	**5**	
MEG Methods in Environmental Geography				**5**
M Methods	Ü	2	**5**	

3rd Semester

	Mode	SWS	ECTS	Percentage of overall grade [%]
REG Research in Environmental Geography				**0**
R2 Research Training II (B or C), continued	Ü	2	**5**	
ES Environment and Society				**5**
S Environment and Society	HS (S/Ü)	2 (4)	**5**	
MEG Methods in Environmental Geography				**5**
M Methods	Ü	2	**5**	
REG Research in Environmental Geography				**0**
R3 Scientific workshop, conference, school	Ü		5	
FC Free Choice			**5**	**0**
F Free Choice 2		**2**		
I Non-university internship			**5**	

4th Semester

	Mode	SWS	ECTS	Percentage of overall grade [%]
MT Master's Thesis				**40**
T Master's Thesis & Defence			**30**	

<u>Assessment components and calculation of the overall grade</u>

All modules except the modules F, R2, R3 and I will be graded. The final grade for the Master's is calculated as follows:

- 20%: the 5 compulsory and core elective modules of the 1st semester
- 30% : the 5 compulsory and core elective modules of the 2nd semester
- 10% : 2 core elective modules of the 3rd semester
- 40% : the master's thesis in the 4th semester