Georg-August-Universität
Göttingen

Modulverzeichnis

zu der Prüfungs- und Studienordnung für den konsekutiven Master-Studiengang "Earth and Environmental Sciences" (Amtliche Mitteilungen I Nr. 22/2024 S. 471)

Module

Übersicht nach Modulgruppen

I. Master-Studiengang "Earth and Evironmental Sciences"

At least 120 C must be completed.

1. Fachstudium

Modules amounting to 60 C must be successfully completed in accordance with the following provisions.

a. Pflichtmodule

The following four modules totaling 24 C must be successfully completed:

b. Wahlpflichtmodule

At least six of the following modules totaling at least 36 C must be successfully completed:

aa. Ecosystem, Evolution and Environment

bb. Elements, Minerals and Rocks

cc. Geology

2. Professionalisierungsbereich

Modules totalling at least 30 C must be successfully completed in accordance with the following provisions.

a. Pflichtmodul

The following module totalling 6 C must be successfully completed

b. Schlüsselkompetenzen

Key competency modules from the currently valid module list of key competencies of the university totalling at least 12 C must be successfully completed.

Alternatively, key competency credits can also be acquired with the modules listed below. Upon application to the examination board, further scientific modules can be taken as key competence modules.

c. Wahlmodule

Modules totalling at least 12 C must be successfully completed. The modules from the compulsory elective area that have not yet been completed can be selected. Further geoscience modules are available as elective options depending on the programme (see below). Information about these options can be found on the programme website. In addition, modules from the university-wide range can be completed, provided they are not listed in the module directory of the university's key competences and the exporting faculty agrees.

3. Masterarbeit

30 C are awarded for the successful completion of the Master's thesis.

Georg-August-Universität Göttingen **Module M.EES.101: Earth Science, Environment and Society**	6 C 4 WLH

Learning outcome, core skills: Building and expanding on geoscientific knowledge acquired at the B.Sc. level, this module presents an overarching, systemic view of geoscience, its close links with environmental science, and the role of both for human societies. One main goal is to provide beginning M.Sc. students from diverse backgrounds with a common set of Earth System concepts they can use as a basis for their further studies. Throughout the course, they will be encouraged to consider and discuss the connections between the various fields of geo- and environmental science and their societal relevance. Topics treated in this module include the following: Factors controlling, changing and maintaining planet Earth´s habitability through deep time; evolutionary interactions with the biosphere; types, origins, availability and usage of mineral and energy resources; the history of climate change, the impact of human activities and mitigation measures; pollution, prevention and remediation; geoscience contributions to the energy transformation; world population and geohazards, future demand for resources and models for a sustainable economy.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Earth Science, Environment and Society (Lecture)	2 WLH
Course: The big picture (Exercise, Seminar)	2 WLH
Examination: Oral Presentation (approx. 15 minutes) **Examination prerequisites:** Regular attendance of exercise and seminar sessions	6 C

Examination requirements: In the course of the module, students will: • Begin to develop an integrated view of system earth and acquire skills to further develop that view on their own. • Be encouraged to engage in systemic thinking. • Become more strongly aware of the societal implications of geoscience • Learn to efficiently extract and filter scientific information from various sources. • Present and discuss results in a concise format. • Be encouraged to present science in ways understandable to non-specialist audiences	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Jonas Elmar Kley
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1

Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.EES.102: Earth and Environmental Sciences in the Field**	6 C 4 WLH

Learning outcome, core skills: The module aims at conveying expert knowledge and experience linking the geologic evolution of individual regions (Regional Geology) with the overarching plate tectonic framework and environmental conditions through time. Emphasis is placed on the transfer of theoretical knowledge from lectures and exercises to the “real world” (field course) requiring the integration of various subdisciplines (e.g. tectonics, stratigraphy, petrology, (bio)geochemistry, geobiology, sedimentology, geophysics, remote sensing). Course topics also include economic and environmental challenges related to the consumption of geologic resources.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Down to Earth – linking theoretical models with ‘real world geology’ (Lecture, Seminar) *Course frequency:* each winter semester	2 WLH
Examination: Written examination (90 minutes)	3 C

Course: Field Course on Regional Geology and Environmental Geosciences (Excursion) Maximum number of participants per course: 14 . *Course frequency:* each summer semester	4 WLH
Examination: Poster presentation (oral in front of the poster, 15 min) or written report (max.15 pages)	3 C

Examination requirements: Factual knowledge of fundamental characteristics of the presented case studies; understanding the relations between the geologic evolution of the specific regions and plate tectonic concepts; understanding the impact of environmental conditions through time on the geological record; ability to record field observations and discuss the various implications within the group; ability to critically assess existing hypotheses and create new ones linking field observations and lab data to geologic models and environmental conditions; awareness of the various economic and ecological aspects of regional geology (e.g., mineral resources, hydrocarbons, geothermal energy, environmental impacts); ability to reflect and summarize the main findings in a logical and succinct report.	

Admission requirements: None	**Recommended previous knowledge:** BSc-level knowledge in Earth Sciences and Regional Geology
Language: English, German	**Person responsible for module:** Prof. Dr. Hilmar Freiherr von Eynatten
Course frequency: once a year	**Duration:** 2 semester[s]

Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.EES.103: Analytical, Experimental, and Preparation Methods in Earth and Environmental Sciences**	6 C 6 WLH

Learning outcome, core skills: In the module, students learn to practically carry out various preparative and analytical techniques, document each step in a laboratory book, use data repositories, and to combine and critically assess the results from the different methods. Students are able using suitable software relevant for the respective tasks. Students go through the essential phases of different methods applied in geo- and environmental sciences, from selecting and preparing samples, conducting experiments and measurements to analyzing the data obtained, and presenting and discussing their own results. In this process, students carry out different experiments from the module's accompanying catalog. Each of these experiments includes preparation with the help of literature (scripts, text books), an introductory discussion with the experiment supervisor, conducting the experiment with the preparation of a protocol, preparing a written elaboration of the experiment results, and a final discussion of the results with the respective experiment supervisor.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Analytical, Experimental, and Preparation Methods in Earth and Environmental Sciences (Practical course)	6 WLH

Examination: Acquisition of a total of 100 points **Examination prerequisites:** 1. Passing a short (~15 min) oral examination (with experiment supervisor) about the planned experiment 2. Successful conduction of experiments 3. Presentation of a legible and organized lab book 4. Evaluation and presentation of results for each experiment	6 C

Examination requirements: In-depth understanding of the methods applied, critical evaluation of the obtained data, using statistical methods, data repositories, and communication of the results. The acquisition and presentation of the methods and results considers the FAIR principles (within the course, including a legible and organized lab book).	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Dr. phil. nat. Tommaso di Rocco Prof. Andreas Pack
Course frequency: each semester	**Duration:** 1-3 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 65	

Additional notes and regulations:
At the beginning of each semester, the module coordinator provides information about the laboratory courses offered in a semester. The respective laboratory courses take place in small groups of 2-3 students by arrangement with the lecturers. The laboratory courses can be completed by the students in 1 to 3 semesters according to their own schedule. A different number of achievable points is awarded for each laboratory course completed. At least 100 points must be achieved to complete the module.

Georg-August-Universität Göttingen **Module M.EES.104: Digital Methods in Earth and Environmental Sciences**	6 C 4 WLH

Learning outcome, core skills: Students will learn a number of fundamental skills related to earth sciences using programming languages. These will include plotting and projecting data, using and interacting with databases, interfacing databases to the internet, using artificial intelligence and integrating it into problem solving and coding, and basic mathematical programming and algorithms. A variety of programming languages and environments will be demonstrated. A range of earth science topics will be integrated into exercises.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Digital Methods in Earth and Environmental Sciences (Lecture)	2 WLH
Course: Digital Methods in Earth and Environmental Sciences (Exercise)	2 WLH
Examination: Complete a programming task, write a short report explaining / demonstrating the task **Examination prerequisites:** Successfully complete programming exercises during the course	6 C

Examination requirements: • Report to be written in shareLaTeX • Ability in database interrogation/extraction • Ability to write basic code in some language • Ability to use AI to iteratively generate new code for a specific task, to analyse code, find and trace errors	

Admission requirements: None	**Recommended previous knowledge:** None
Language: English, German	**Person responsible for module:** Dr. rer. nat. David Andrew Hindle
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.EES.105: Scientific Work**	6 C 3 WLH

Learning outcome, core skills: This module accompanies the master program. The students are taught to formulate scientific questions, methods and results in a clear and structured manner, to communicate them comprehensibly and to present them in writing. Another goal is to provide students with a more in-depth understanding of the practical methodology of modern scientific work (for example, use of databases and bibliographic management systems, citation methods, software usage, writing and formatting of manuscripts, review procedures, written communication with editors and reviewers, etc.). In addition, students learn to write research proposals. The module strengthens the ability to design a scientific study, to plan the implementation and to present the results comprehensible, structured and efficient verbally as well as in writing.	**Workload:** Attendance time: 42 h Self-study time: 138 h

Course: Academic Writing (Lecture, Exercise) *Course frequency:* each winter semester	1 WLH
Course: Masters seminar with lecture (Seminar) *Course frequency:* each semester	1 WLH
Course: Geoscientific Colloquium *Course frequency:* each semester	1 WLH
Examination: Term Paper (max. 1500 words), not graded **Examination prerequisites:** In lecture 2: Presentation of the conception of the master thesis in the masters seminar (approx. 15 min.). In lecture 3: Regular participation in the Geoscientific Colloquium (at least 14 dates)	6 C

Examination requirements: The students are able to communicate scientific content in writing. They use the knowledge gained in the lectures. The students can design a scientific study (usually the topic of their master's thesis) and organize it in a limited time. They present their work in a seminar and show that they can present the background, the direction and the conception of the work to a scientific audience.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Andreas Pack Prof. Dr. Volker Thiel
Course frequency: once a year	**Duration:** 2 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1

Maximum number of students: 65	

Georg-August-Universität Göttingen **Module M.EES.201: Environmental Geoscience**	6 C 4 WLH

Learning outcome, core skills: The module will provide an overview on transformations of the natural environment caused by natural and anthropogenic processes. This includes an introduction to the various natural systems and compartments on Earth as well as the consequences of man-made interruptions to those systems. The course will provide a deeper understanding of the interaction between the lithosphere, pedosphere, hydrosphere, atmosphere and biosphere and changes caused by both natural processes and anthropogenic exploitation of natural resources. Environmental problems arising from the overexploitation of natural resources, for example overexploitation of land and water resources, mining of ores and minerals and their environmental impact, as well as fossil fuel consumption and extensive agricultural practices and their contribution to the production of greenhouse gasses and climate change, will be discussed. The general focus of the course will be on the comparison of the natural and the disrupted environment, including groundwater and soil contamination, long-term effects of land use practices and of climate change on soils and water resources to provide an understanding for environmental changes throughout the past centuries. The course will further discuss current monitoring and remediation techniques.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Environmental Geoscience (Lecture, Seminar)	2 WLH
Examination: Seminar lecture (30 minutes)	4 C

Course: Lab exercise (Practical course)	2 WLH
Examination: Report on the laboratory exercise (max. 10 pages)	2 C

Examination requirements: Knowledge about natural and environmental processes causing changes to ecosystems, soils and water resources; have an understanding of the impacts of anthropogenic activities on the environment and a basic knowledge of climate change and its effect on the various compartments of our habitat.	

Admission requirements: None	**Recommended previous knowledge:** None
Language: English, German	**Person responsible for module:** Dr. rer. nat. Bettina Wiegand
Course frequency: each summer semester	**Duration:**
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module M.EES.202: Geobiology**	6 C 6 WLH

Learning outcome, core skills: In this module, students will be introduced to the fundamentals of geobiology and explore the complex interconnections between biotic evolution, biodiversity dynamics and environmental change by examining records of past and modern-day ecosystems. Particular emphasis is placed on the formation and preservation (“taphonomy”) of biosignatures, which are powerful tools for studying biological and environmental processes, as well as on their application to understanding geo-bio interactions in modern and fossil ecosystems. Depending on interest, the course will also touch on applications of biosignatures in related other fields such as environmental sustainability and astrobiology. The module is essential to students interested in pursuing a career in geoscience and related fields (including environmental and applied sectors), but also relevant to those from other study programs within the natural sciences (geography, biology, etc.).	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Biosignatures - From fossils to biogeochemical fingerprints (Lecture, Seminar)	2 WLH
Course: Analytical techniques in Geobiology (Excursion, Practical course)	2 WLH
Course: Biodiversity & ecosystem evolution through time (Seminar)	2 WLH
Examination: Oral Presentation (15 minutes) and written report (max. 10 pages) **Examination prerequisites:** Regular attendance in the courses	6 C

Examination requirements: In this module, students will - develop a deep understanding of geobiological key-processes in ecosystems - learn how to investigate biodiversity change, environmental processes, and geo-bio interactions in past and modern-day environments by using various types of biosignatures - practice the analysis and presentation of research results Students are required to participate regularly and to get acquainted with geobiological concepts and analytical approaches.	

Admission requirements: None	**Recommended previous knowledge:** None
Language: English, German	**Person responsible for module:** Prof. Dr. Jan-Peter Duda
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students:	

20	

Additional notes and regulations:
This course is also open for interested students outside the geosciences

Georg-August-Universität Göttingen **Modul M.EES.203: Environmental Geomicrobiology** *English title: Environmental Geomicrobiology*	6 C 5 SWS

Lernziele/Kompetenzen: The module introduces the basics, methods and application fields of geomicrobiology. Starting from basics in cell biology, mechanisms of microbial metabolism and biogeochemical element cycles (carbon, sulphur, nitrogen, iron, manganese), knowledge on the structure, composition and interactions within microbial communities is imparted. The role of geomicrobiological processes in the environment, in rock and economic deposit formation as well as their relevance on a global and earth-historical scale are illustrated by case studies. In exercises, geomicrobiological procedures and working methods are learned. In the seminar, students work independently on a geomicrobiological topic (basic or applied) and present it in the form of a talk.	**Arbeitsaufwand:** Präsenzzeit: 70 Stunden Selbststudium: 110 Stunden

Lehrveranstaltung: Environmental Geomicrobiology (Vorlesung, Seminar)	2 SWS
Lehrveranstaltung: Methods in Geomicrobiology (Praktikum) Field and laboratory exercises are conducted as a 5-day block course directly following the lecture period.	3 SWS
Prüfung: Oral Presentation (20 minutes), written lab report (max. 10 pages)	6 C

Prüfungsanforderungen: In the course of the module, the student will: • Develop an advanced knowledge on mechanisms of microbial metabolism, biogeochemical cycles of elements, structure of microbial communities, microbial formation of rocks and economic deposits. • Be able to carry out hydrochemical field measurements and calculations using Phreeqc. • Be able to carry out state-of-the-art geomicrobiological field sampling and sample processing. • Be able to analyse hardpart microtome sections using fluorescence and laser scanning microscopy. • Evaluate and integrate hydrochemical, microscopical, and microbiological results to understand microbial community composition, environmental conditions, and mineral precipitation. • Present and communicate scientific results independently.	

Zugangsvoraussetzungen: None	**Empfohlene Vorkenntnisse:** None
Sprache: Englisch, Deutsch	**Modulverantwortliche[r]:** apl. Prof. Dr. rer. nat. Gernot Arp Dr. Andreas Reimer
Angebotshäufigkeit: jedes Wintersemester	**Dauer:**
Wiederholbarkeit:	**Empfohlenes Fachsemester:**

zweimalig	ab 1
Maximale Studierendenzahl: 16	

Bemerkungen:
This course is also open for interested students outside the geosciences

Georg-August-Universität Göttingen **Module M.EES.204: Molecular Geobiology**	6 C 6 WLH

Learning outcome, core skills: A feature of modern geobiology is the application of diverse tools to study the interactions between life and the physical earth. One set of tools well equipped to study many aspects of these interactions are those focused on their molecular and genetic aspects. In this module participants will be exposed to some of the ways in which molecular biology can be used to identify cryptic microbes from diverse environments, to survey the metabolic capacity of these microbial communities, and to develop evidence-based hypotheses regarding the interactions of these communities with their environment. The lectures and seminars will provide a theoretical background to these principles, while the lab-based and computer exercises will expose students to some of the techniques that modern molecular geobiology employs. The skills obtained will provide a background for the analysis of various types of molecular datasets relevant to the practical management of ecosystems, and to understanding their evolution and function.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Molecular Geobiology (Lecture, Seminar)	3 WLH
Examination: Lecture (approx. 30 minutes)	4 C

Course: Practical Molecular Geobiology (Practical course)	3 WLH
Examination: Written lab report (max. 10 pages)	2 C

Examination requirements: Students are expected to actively demonstrate an understanding of the concepts presented in this module by integrating the laboratory skills and theoretical knowledge they acquire.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Daniel Jackson
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 20	

Additional notes and regulations: This course is also open for interested students within and outside of the geosciences.

Georg-August-Universität Göttingen **Modul M.EES.205: Carbon and Organic Matter** *English title: Carbon and Organic Matter*	6 C 5 SWS

Lernziele/Kompetenzen: This module provides deepened knowledge about the key areas of the carbon cycle, with a focus on the production, recycling, and diagenetic transformations of organic matter. In the seminar, biogeochemical processes are discussed in terms of their role in geology, climate change, and the functioning of ecosystems. In the lab course, the participants will gain hands-on experience with modern analytical techniques used for the study of organic substances in rocks, soils, and biological samples. The skills obtained will provide a background for the evaluation of organic geochemical data in various professional branches, such as ecosystem analyses, oil and gas exploration, forensics, and environmental protection and remediation.	**Arbeitsaufwand:** Präsenzzeit: 70 Stunden Selbststudium: 110 Stunden

Lehrveranstaltung: Carbon and Organic Matter (Vorlesung, Seminar)	2,5 SWS
Prüfung: Präsentation (ca. 30 Minuten)	4 C

Lehrveranstaltung: Lab Exercise Organic Geochemistry (Übung)	2,5 SWS
Prüfung: Praktikumsbericht (max. 10 Seiten) **Prüfungsvorleistungen:** Regular attendance of practical sessions	2 C

Prüfungsanforderungen: In the course of the module, the students will: • obtain a conceptual understanding of key processes in the carbon cycle • develop an advanced knowledge of factors controlling the fate and preservation of organic compounds in the geological record. • perform independent research on selected biogeochemical topics and present and communicate the results (seminar presentation). • gain a basic technical understanding of state-of-the art instrumentation used for organic-geochemical analyses • obtain basic practical skills necessary to prepare different types of natural samples for instrumental analysis, perform these analyses, and evaluate the data produced. • present and communicate the results (written lab report)	

Zugangsvoraussetzungen: none	**Empfohlene Vorkenntnisse:** None
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Volker Thiel
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** ab 1

Maximale Studierendenzahl: 15	

Georg-August-Universität Göttingen **Module M.EES.206: Palaeobotany**	6 C 4 WLH

Learning outcome, core skills: Profound understanding of the Phanerozoic evolution and palaeoecology of plants. In-depth knowledge of processes that led to transformations of terrestrial ecosystems (e.g., initial colonization of land, floral development in the Devonian, evolution of angiosperms since the Cretaceous) and how plants reacted to mass extinctions. Awareness of the relevance of interactions with animals and fungi in land plant evolution. Conception of selected terrestrial paleoecosystems. Insights into current palaeobotanical literature. Ability to evaluate morphological traits of fossil plants, fungi and lichens using light microscopy.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Palaeobotany (Lecture)	2 WLH
Course: Current topics in palaeobotany (Seminar)	1 WLH
Course: Palaeobotany (Exercise)	1 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** Regular attendance at seminar and exercise, and a seminar talk based on a peer-reviewed journal article.	6 C

Examination requirements: Understanding the evolution and paleoecology of plants, development of palaeoecosystems, and processes driven by land plant evolution.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Alexander Schmidt
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 30	

Additional notes and regulations:
This module is suitable for students of M.Sc. Earth and Environmental Science and MSc Biodiversity, Ecology and Evolution.

Georg-August-Universität Göttingen **Module M.EES.207: Hydrogeochemistry**	6 C 5 WLH

Learning outcome, core skills: The module intends to convey an understanding for the role of chemical processes in water-rock interaction. The first lecture introduces the essential thermodynamics to understand basic and coupled electrolyte equilibria (i.e. redox processes, acid/base reactions, solubility, complexation, ion exchange) in environments and is accompanied by simple and complex calculations of real-world problems as well as coursework. This lecture also introduces processes of sorption and degradation, relevant for the transport of organic compounds in the subsurface. The second lecture provides an introduction to the concepts of isotope hydrology and the application of modern isotope techniques to solve hydro(geo)logical and environmental research questions. Students will learn about isotope geochemistry and apply isotope methods to better understand processes such as solute generation, water-rock interaction, and surface water/groundwater interaction in catchments and groundwater systems. The third lecture focuses on fundamentals of environmental geochemistry and comprises an introduction to the evaluation of natural background and environmental pollution in different compartments by looking at interactions between the geosphere, hydrosphere, pedosphere, atmosphere, and biosphere.	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: Introduction in Hydrogeochemistry (Lecture, Exercise)	2 WLH
Course: Isotope Hydrogeochemistry (Lecture, Exercise)	2 WLH
Course: Environmental Geochemistry (Lecture, Exercise)	1 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: Knowledge about basic inorganic equilibrium water chemistry, water chemistry data interpretation, contaminant classes, basic organic chemistry, structure-properties relationships for organic compounds, distribution equilibria	

Admission requirements: none	**Recommended previous knowledge:** basic knowledge in chemistry
Language: English, German	**Person responsible for module:** Dr. rer. nat. Bettina Wiegand
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 15	

Georg-August-Universität Göttingen **Modul M.EES.208: Earth Surface Dynamics and Associated Hazards** *English title: Earth Surface Dynamics and Associated Hazards*	6 C 4 SWS

Lernziele/Kompetenzen: The students understand past, present and future landscape dynamics, their natural and human drivers, path-dependent processes and scale-dependent impacts. They know how to identify relevant Earth surface dynamics and associated hazards from the geological, geomorphological, hydrological and ecological configuration of a landscape. The students can apply suitable methods to analyze a landscape through field mapping and (geo-)statistical data analyses. They are able to use theoretical and data-based knowledge to identify path-dependencies and dynamics that act across different spatial and temporal scales. They can develop strategies to inform regional land management and to anticipate and mitigate future environmental and resource crises	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Earth surface dynamics and challenges in managing associated hazards (Vorlesung, Seminar)	2 SWS
Lehrveranstaltung: Practical course on Earth surface dynamics (Übung) *Angebotshäufigkeit:* jedes Sommersemester	2 SWS
Prüfung: Presentation (20 min.) with term paper (15 pages) or Presentation (20 min.) with written report (15 pages)	6 C

Prüfungsanforderungen: The students prove that they understand past, present and future landscape dynamics, their natural and human drivers, path-dependent processes and scale-dependent impacts. They demonstrate that they can identify relevant Earth surface dynamics and associated hazards from the geological, geomorphological, hydrological and ecological configuration of a landscape. The students show that they are able to use theoretical and data-based knowledge to identify path-dependencies and dynamics that act across different spatial and temporal scales. They prove that they can develop strategies to inform regional land management and to anticipate and mitigate future environmental and resource crises.	

Zugangsvoraussetzungen: none	**Empfohlene Vorkenntnisse:** none
Sprache: Englisch, Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Elisabeth Dietze
Angebotshäufigkeit: jährlich	**Dauer:** 1-2 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** ab 1
Maximale Studierendenzahl: 20	

Georg-August-Universität Göttingen **Modul M.EES.209: Climate and Glaciation** *English title: Climate and Glaciation*	3 C 2 SWS

Lernziele/Kompetenzen: The module addresses the relationship between climate and ice sheet evolution in the course of Earth's history, where the focus is on the recent geological past, since roughly the Mid Pleistocene Transition. Methodological examples focus on the paleo-proxy reconstruction in ice cores, to illustrate which information on the climate evolution is contained in ice cores and how this information can be obtained.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 62 Stunden

Lehrveranstaltung: Climate and Glaciation (Vorlesung, Seminar)	2 SWS
Prüfung: Seminar lecture followed by discussion (about 20 min. in total) or term paper (max. 5 pages). **Prüfungsvorleistungen:** Regular participation in the seminar presentations	3 C

Prüfungsanforderungen: The students have knowledge about interaction of climate and glaciation on Earth and other examples of planets and their moons in the solar system. They have an understanding on the climate reconstruction from proxy-archives, with a focus on ice core records.	

Zugangsvoraussetzungen: none	**Empfohlene Vorkenntnisse:** none
Sprache: Englisch, Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Frank Wilhelms
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** ab 1
Maximale Studierendenzahl: nicht begrenzt	

Georg-August-Universität Göttingen **Modul M.EES.210: Critical Intervals in geological History** *English title: Critical Intervals in geological History*	3 C 2 SWS

Lernziele/Kompetenzen: The module provides a coherent insight into the major development phases of the geo-biosphere with its complex interactions. The causes and effects of Global Change since the Archaic are presented and discussed. The "Critical Intervals of Earth History" event focuses on those phases / events in the Earth's history that have changed the conditions in the Earth system in a sustainable way, decisively influencing the dynamics of evolution, the geo-biosphere, and the development of ecosystems.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 62 Stunden

Lehrveranstaltung: Critical intervals in geological history (Vorlesung, Seminar)	2 SWS
Prüfung: Seminar lecture followed by discussion (about 20 min. in total) or term paper (max. 5 pages)	3 C

Prüfungsanforderungen: Students know the methods with which global change processes can be identified and traced, in particular stable isotope systems as well as petrographic findings and organic geochemical markers in (bio-) geochemical archives.	

Zugangsvoraussetzungen: none	**Empfohlene Vorkenntnisse:** none
Sprache: Englisch, Deutsch	**Modulverantwortliche[r]:** Dr. rer. nat. Manuel Reinhardt
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** ab 1
Maximale Studierendenzahl: nicht begrenzt	

Georg-August-Universität Göttingen **Module M.EES.211: Case Studies in Environmental Geoscience**	3 C 3 WLH

Learning outcome, core skills: In the module, students learn to carry out a research project with focus on an applied, environmental research topic. This will include the sampling process, analytical procedures in field and laboratory, data processing, interpretation and geochemical modeling. Necessary analytical skills will be developed and applied during the course. Research topic will be e.g. an investigation of environmental archives i.e marine sediments, lake sediments, pet bogs or floodplain deposits or the study of recent geochemical processes in sediments. Sampling methods include percussion- or gravity coring, extraction of porewater and bulk sediment. Analytical procedures cover a broad range of wet chemical methods, i.e. acid digestion, spectrometry, ICP-OES, ion chromatography, elemental analysis, grainsize analysis and phase identification, depending on the research topic. Geochemical modeling will be carried out with PHREEQC.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Case Studies in Environmental Geoscience (Excursion, Practical course, Seminar)	3 WLH
Examination: Oral presentation (15min + 15 min Discussion) and written report of results (4 pages)	3 C

Examination requirements: In-depth understanding of the methods applied, critical evaluation oft he obtained data, and communication of the results	

Admission requirements: none	**Recommended previous knowledge:** Preparational and analytical techniques
Language: English, German	**Person responsible for module:** Dr. rer. nat. Volker Karius
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 6	

Additional notes and regulations: The course is organised as a 6-day block course

Georg-August-Universität Göttingen **Module M.EES.301: Microanalytical Methods and Applications**	6 C 5 WLH

Learning outcome, core skills: Students will practice to observe, describe, and interpret microscopic textures of silicate rocks and technical products. Petrological processes that shape these rocks are recognized and an analytical concept for further in-situ geochemical analyses will be developed. During the laboratory practical, the students will learn to independently operate the electron microprobe and laser-ICPMS instruments. Analytical results will be jointly presented and interpreted.	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: Polarization microscope petrography of metamorphic rocks (Exercise) *Course frequency:* each winter semester	1 WLH
Course: Advanced application of the electron microprobe, EPMA (Lecture, Exercise) *Course frequency:* each summer semester	2 WLH
Course: Application of the laser-ablations ICPMS (Lecture, Exercise) *Course frequency:* each summer semester	2 WLH
Examination: 2 written groupreports (word limit: 1500 words per person per report)	6 C

Examination requirements: Observation, written documentation and interpretation of petrographic characteristics in natural silicate rocks and technical products using reflected light and polarization microscope. Independent laboratory work on the electron microprobe and laser-ICPMS for in-situ major and trace element analysis.	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of optical microscopy and geochemical analytical techniques.
Language: English, German	**Person responsible for module:** Dr. rer. nat. Andreas Kronz Dr. Dirk Hoffmann
Course frequency: once a year	**Duration:** 2 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 15	

Georg-August-Universität Göttingen **Module M.EES.302: Advanced Inorganic Geochemistry I**	6 C 4 WLH

Learning outcome, core skills: Students are trained in the working methods of the chemistry of stable isotopes. In-depth discussion of case studies combined with project work should enable students to formulate concepts for the use of stable isotopes in different contexts (cosmochemistry, geology, applied mineralogy). Furthermore, the students will learn theory, laboratory technology and mass spectrometry in practical exercises.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Stable isotope geochemistry (Lecture)	2 WLH
Course: Sample preparation and mass spectrometry (Practical course)	2 WLH

Examination: Oral examination (approx. 20 minutes) **Examination prerequisites:** Class work and regular attendance in course 2	6 C

Examination requirements: Preparation for the analysis of stable isotopes, performance of analytical work, evaluation of data, understanding of theoretical concepts, computational exercises and case studies on the chemistry of stable isotopes.	

Admission requirements: None	**Recommended previous knowledge:** Basics in stable isotope geochemistry
Language: English, German	**Person responsible for module:** Prof. Dr. Andreas Pack
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 25	

Georg-August-Universität Göttingen **Module M.EES.303: Advanced Inorganic Geochemistry II**	6 C 4 WLH

Learning outcome, core skills: The course aims to deepen the understanding of the chemical processes that shape the mantle and crust of Earth and other solar system bodies. This will be based on the study of the prevailing models and theories in isotope geochemistry and petrology of terrestrial and extra-terrestrial materials. Modern concepts of mantle isotope geochemistry will be presented and critically discussed. Earth's mantle-crust evolution scenarios - including cosmochemical data - will be quantitatively scrutinised on the basis of advanced concepts in chemical geodynamics as well as the trace elemental and isotopic composition of crust and mantle rocks. Selected case studies published the peer-reviewed literature serve to deepen the understanding of the dynamics of Earth geochemical compartments.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Chemical Planetary Sciences - Case Studies (Lecture, Seminar)	2 WLH
Course: Isotope Geochemical Modelling (Exercise)	2 WLH
Examination: Written examination (60 minutes) **Examination prerequisites:** Class work and regular attendance in Courses 1 and 2	6 C

Examination requirements: Deep understanding of current isotope geochemical and petrological concepts and their application to prevalent questions in Earth and Planetary Sciences. Ability to scrutinize common models, identify their limits, quantify problems, synthesize information, hypothesize, design relevant tests and formulate theories.	

Admission requirements: None	**Recommended previous knowledge:** Isotope geology, geochemistry and petrology modules at Bachelor level; participants are expected to acquire required previous knowledge as part of their self-study if necessary
Language: English, German	**Person responsible for module:** Prof. Dr. rer. nat. Matthias Willbold
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 25	

Georg-August-Universität Göttingen **Module M.EES.304: Applied Isotope Geochemistry**	6 C 4 WLH

Learning outcome, core skills: This module focusses on the application of the concepts and methods of isotope geology and isotope geochemistry to state-of-the-art questions in Applied Earth Sciences, related scientific disciplines and beyond.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Applied Isotope Geochemistry (Lecture)	2 WLH
Course: Case studies and practicals (Exercise, Seminar)	2 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** Regular attendance at practical course units	6 C

Examination requirements: Deep understanding of isotope geochemical concepts and their application to prevalent questions in natural sciences. Ability to scrutinize common models, hypothesize, design relevant tests and formulate theories.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. rer. nat. Matthias Willbold
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 2
Maximum number of students: 8	

Georg-August-Universität Göttingen **Modul M.EES.306: Advanced Geomaterials** *English title: Advanced Geomaterials*	6 C 5 SWS

Lernziele/Kompetenzen: The courses in this module focus on the usage and properties of mineralogical materials, i.e., minerals, glasses, and composite materials such as asbestos, ceramics, concrete, etc.. The course on technical glasses comprises an overview about natural, archeometric as well as technically produced glasses. Two 1-day visits are part of the course to demonstrate analytical methods examining technically used glasses and to show the production of modern technical glasses. In both courses, electron microscopy will be used to characterize the individual types of materials to describe their microstructural and -chemical properties. The module will be complemented by guest lectures from industrial partners illustrating the variety of mineralogical applications from raw material to finished products, waste management, recycling and society impacts.	**Arbeitsaufwand:** Präsenzzeit: 70 Stunden Selbststudium: 110 Stunden

Lehrveranstaltung: Technical Glasses (Vorlesung, Übung) *Angebotshäufigkeit:* jedes Sommersemester	2 SWS
Lehrveranstaltung: Applied Mineralogy (Vorlesung, Übung) *Angebotshäufigkeit:* jedes Wintersemester	3 SWS
Prüfung: 2 written group reports (word limit 1500 words per person per report)	6 C

Prüfungsanforderungen: In the course of the module, the student will: • Develop an advanced knowledge of characteristics of natural glasses and their importance for understanding archaeometric as well as technically produced glasses. • Develop an advanced understanding of the properties of mineralogical materials and their usage in industrial processes. • Develop a understanding of the practical, economic, and ethical implications of the utilization of geological resources at professional industry standard. • To deploy state-of-the-art analytical instruments to acquire textural and geochemical data characterizing mineralogical materials and to evaluate the data quality. • Present and communicate scientific results independently and as a group.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch, Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Thomas Müller Dr. Andreas Kronz, Dr. Kirsten Techmer
Angebotshäufigkeit: jährlich	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** ab 1

Maximale Studierendenzahl: 25	

Georg-August-Universität Göttingen **Module M.EES.307: Petrochronology**	6 C 5 WLH

Learning outcome, core skills: The module provides an overview and hands-on experience on modern methods used in petrology to extract kinetic and chronological information of the rock and mineral record. The concept of thermodynamic phase equilibria will be shown, and students learn how to use the software package PerpleX to calculate equilibrium phase diagrams. The course on diffusion provides an overview on diffusion modelling – its potential and pitfalls and students apply analytical and numerical models to extract timescales of geological processes such as magma residence times, exhumation or contact metamorphism. The module is complemented by a course focussing on accessory phases such as zircon, monazite, apatite, and their geochemical signatures. Special emphasize is given to the phase relation of the accessory phases to major rock forming minerals during metamorphism and their potential to date tectono-metamorphic events.	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: Diffusion in minerals and melts (Lecture, Exercise)	2 WLH
Course: Phase equilibria (Lecture, Exercise) *Course frequency:* each winter semester	2 WLH
Course: Petrochronology of accessory phases (Lecture, Exercise)	1 WLH
Examination: Virtual “Geology”-style paper & poster presentation linking content and skills of the three courses in a single research-driven topic (max. 1200 words)	6 C

Examination requirements: In the course of the module, the student will: • Develop an advanced knowledge of diffusion in minerals and melts and its application to natural settings to extract quantitative information. • Develop an advanced understanding of thermodynamic frameworks in geosciences. • Be capable to initiate, organize and carry out phase equilibria calculations using software packages such as PerpleX. • Develop a conceptual understanding of factors controlling the geochemical record of accessory phases and their application in geochronology. • Be able to process acquired geochemical to extract timescales or absolute time information and to evaluate the data quality. • Present and communicate scientific results independently.	

Admission requirements: none	**Recommended previous knowledge:** Petrology and microscopy of minerals and rocks
Language: English, German	**Person responsible for module:** Prof. Dr. Thomas Müller Dr. Dominik Sorger
Course frequency: once a year	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

twice	from 1
Maximum number of students: 15	

Georg-August-Universität Göttingen **Modul M.EES.308: Experimental Petrology** *English title: Experimental Petrology*	6 C 5 SWS

Lernziele/Kompetenzen: In the first part, methods of experimental petrology are presented and practically applied with the help of selected experiments on petrological issues. The experimentally produced samples are then analysed using X-ray analysis, petrographic and spectroscopic methods. In the second part, for example, analyses are carried out using FT-IR and Raman spectrometers or the electron microprobe and laser ablation ICPMS. Students will learn how to use the large-scale equipment so that they can carry out sophisticated analyses independently.	**Arbeitsaufwand:** Präsenzzeit: 70 Stunden Selbststudium: 110 Stunden

Lehrveranstaltung: Methods of experimental Petrology (Vorlesung, Übung) At least one of the following 3 courses must be successfully completed:	3 SWS
Lehrveranstaltung: Application of infrared and Raman spectroscopy in petrology (Vorlesung, Übung)	2 SWS
Lehrveranstaltung: From module M.301 Mikroanalytical Methods and Apllications, LV 2: Advanced Application of the electron microprobe EPM (Vorlesung, Übung)	2 SWS
Lehrveranstaltung: From module M.EES.301 Mikroanalytical Methods and Apllications, LV 3: Application of the laser-ablation ICPMS (Vorlesung, Übung)	2 SWS
Prüfung: Mündlich (ca. 30 Minuten) **Prüfungsvorleistungen:** Regular participation in the exercises; for 1) term paper, max. 10 pages; for 2) regular participation in the exercises; for 3) and 4) see M.EES.301	6 C

Prüfungsanforderungen: Students are able to apply analytical methods independently and present the results.	

Zugangsvoraussetzungen: none	**Empfohlene Vorkenntnisse:** none
Sprache: Englisch, Deutsch	**Modulverantwortliche[r]:** Burkhard Schmidt
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 2 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** ab 1
Maximale Studierendenzahl: 6	

Georg-August-Universität Göttingen **Module M.EES.309: Cosmochemistry and Planetary Science**	6 C 4 WLH

Learning outcome, core skills: Students are introduced to the basics of cosmochemistry. They learn to understand processes before (nucleosynthesis, stellar recycling, presolar grains, condensation, formation of CAIs, chondrules and matrix), during (accretion, collisions) and after the formation of the first planetesimals and planets (impacts, core formation, crust formation) and to categorise them in terms of time. Students learn to understand and critically reflect on current discourses in the field of cosmochemistry. In the practical part, students will carry out their own experiments in petrogrphic and isotopic classification of meteorites. Here, students learn how to design, carry out and document laboratory work with regard to a specific question from the field of cosmochemistry.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Cosmochemistry (Lecture) Lehrende: A.Pack (GZG), T.Kleine (MPS), C. Burkhard (MPS)	2 WLH
Course: Exercises in Cosmochemistry (Exercise)	2 WLH
Examination: Oral examination (approx. 30 minutes)	6 C

Examination requirements: Understanding of the cosmochemistry content taught in the lecture, correct conception, realisation and documentation of the practical exercises	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of geochemistry and isotope geology
Language: English, German	**Person responsible for module:** Prof. Dr. Andreas Pack
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 12	

Georg-August-Universität Göttingen **Module M.EES.401: Geodynamics**	6 C 6 WLH

Learning outcome, core skills: This module provides advanced insight into the dynamics of the continental and oceanic lithosphere on scales ranging from the global plate tectonic perspective to local case studies. Selected modern fields and methods of research in structural geology are introduced. An overarching theme is the evolution of sedimentary basins. Deepened knowledge is provided on sedimentation processes, the distribution and transport of sediment in time and space, and the interplay of controlling factors such as regional tectonics/subsidence, climate, sea level and sediment flux.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Sedimentology and basin analysis (Lecture)	2 WLH
Course: Exercises in basin analysis (Exercise)	1 WLH
Course: Tectonics of sedimentary basins and orogens (Lecture)	2 WLH
Course: Exercises in tectonics (Exercise)	1 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** Regular participation in exercise courses and completion of exercises	6 C

Examination requirements: Students understand the processes linking deformation, sedimentary basin formation, erosion, sediment transport and deposition. They are familiar with modern concepts and methods in stratigraphy, basin analysis and tectonics.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Hilmar Freiherr von Eynatten Prof. Dr. Jonas Kley
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 65	

Additional notes and regulations:

Georg-August-Universität Göttingen **Module M.EES.402: Sedimentary Petrology and Economic Deposits**	6 C 5 WLH

Learning outcome, core skills: The module aims at the petrographic and geochemical composition of clastic sedimentary basin fills, its variation in space and time and meaning for tectonic and climatic control factors, and the potential for economically relevant resources. This includes microscopic exercises on thin sections and heavy mineral separates as well as the integration of petrographic and geochemical data to obtain a comprehensive view on sandstone composition and provenance. The significance of climate, tectonics, weathering and diagenesis for the formation of economic deposits in sedimentary environments (e.g., bauxite, Ni-laterite, placer deposits, hydrocarbons) is investigated and illustrated by several examples.	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: Sedimentary Petrology and Geochemistry (Lecture, Exercise)	3 WLH
Course: Economic Deposits in Sedimentary Environments (Lecture, Exercise)	2 WLH

Examination: Written examination (120 minutes) **Examination prerequisites:** Class work and regular attendance, written report (<10 pages) as homework in Course 1.	6 C

Examination requirements: Understanding sandstones as a complex system of framework (detrital) and authigenic constituents. Using hands-on microscopic techniques to quantify sandstone composition and integrate these data with geochemical and heavy mineral data from the same samples. Interpretation of case study results and report writing. Knowledge of the major economical-statistical evaluation methods in economic geology. Gaining specific knowledge of selected typical deposits and their geological-geochemical context. Understanding environmental impacts for the major types of raw materials	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Hilmar Freiherr von Eynatten
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 16	

Georg-August-Universität Göttingen **Module M.EES.403: Diagenesis, Temperature and Time in sedimentary Basins**	6 C 5 WLH

Learning outcome, core skills: The module aims at conveying principal knowledge on the toolkit available for the analysis of the thermal evolution of sedimentary basins, which is crucial for understanding the basin's geological setting, its relevance as paleo-environmental archive and in exploration for natural resources. In the theoretical part we review the major analytical methods used for the determination of the time-temperature conditions of the burial history (e.g. organic maturation: vitrinite reflectance, Raman spectroscopy, RockEval; diagenetic indicators: clay mineralogy, sonic velocity; thermochronology: fission track, [U-Th]/He; sediment-specific geochronology: OSL, ESR, K/Ar, U/Pb, #18O and cosmogenic nuclides). The diagenetic pathways of silica and carbonate are discussed and how stable isotope ratios (Si, O, Mg, Ca) are affected. In the practical part the students gain experience through microscopic work (e.g. macerals), laboratory demonstrations (FT, [U-Th]/He, Raman), introduction to basin modelling software (PetroMod), and the compilation of reports and proposals using the respective methods and software.	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: Thermometry and low-temperature thermochronology (Lecture)	2 WLH
Course: Applications in hydrocarbon and geothermal exploration (Exercise)	2 WLH
Course: Silica and carbonates in diagenesis (Lecture)	1 WLH
Examination: Written examination (90 min), term papers for Course 2 (max.15 pages) and Course 3 (max. 5 pages) **Examination prerequisites:** Class work and regular attendance	5 C

Examination requirements: Understanding the concepts and analytical methods used in thermometry and thermochronology of sedimentary basins; application of these skills to the thermal evolution of sedimentary basins in time and space. Knowledge on the applicability, sensitivity ranges and uncertainties of the studied methods including practical experience (microscopy, laboratory methods, modelling experiments). Understand and evaluate raw data relevant to basin analysis and integrate the results with geological facts of the study area. Exercises in writing 'industry style' reports and project proposals. Understanding of the archiving potential of paleo-environmental vs. diagenetic conditions in chemical sediments (cherts and carbonate rocks) including state-of-the-art isotopic techniques.	

Admission requirements: none	**Recommended previous knowledge:** Microscopy of minerals and rocks
Language: English, German	**Person responsible for module:** Dr. rer. nat. Istvan Dunkl
Course frequency:	**Duration:**

each summer semester	1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 2
Maximum number of students: 16	

Georg-August-Universität Göttingen **Module M.EES.404: Sedimentary Provenance Analysis**	6 C 4,5 WLH

Learning outcome, core skills: The module aims at conveying deep knowledge and experience regarding the concepts and specific methods applied in sedimentary geology and petrology with distinct focus on the provenance of clastic detritus. State-of-the-art approaches and techniques including Raman spectroscopy, mineral chemistry and geochronology are to be elaborated and presented by the students. Concepts and methods will be presented and discussed in a field-based case study.	**Workload:** Attendance time: 63 h Self-study time: 117 h

Course: Seminar on Sedimentary Geology and Petrology (Seminar) *Course frequency:* each semester	1,5 WLH
Course: Field Course on Sedimentation vs. Exhumation (Exercise) *Course frequency:* each summer semester	1 WLH
Course: Applied Provenance Analysis (Lecture, Exercise) *Course frequency:* each summer semester	2 WLH
Examination: Seminar presentation (ca. 20 min) incl. handout (max. 3 pages) in Course 1, written report in Course 2 (max.10 pages), oral examination in Course 3 (ca. 30 min) **Examination prerequisites:** Class work and regular attendance	6 C

Examination requirements: Understanding the main concepts and methodical approaches in sedimentary provenance analysis (SPA); Learning about the latest cutting-edge conceptual and methodological developments in SPA; Presenting a specific methodical or regional topic in SPA within the seminar (literature search and study, oral presentation, handout); Evaluate chemical and geochronological datasets and integrate various datasets towards a comprehensive model of sediment provenance; Transfer of theoretical knowledge from the lab to the “real world” (field course)	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Hilmar Freiherr von Eynatten
Course frequency: once a year	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 2
Maximum number of students: 14	

Georg-August-Universität Göttingen **Module M.EES.405: Rock Deformation across Scales**	6 C 5 WLH

Learning outcome, core skills: Planet Earth is constantly deforming. This module presents insights in deformation processes occurring and structures forming on scales from entire plates to (sub)-microscopic. Course 1, after introducing plate motions, has its emphasis on continental deformation including extensional (rifting) and contractional settings (mountain building). Structures and structure-forming processes will be illustrated and discussed from regional geometries evident on geological maps, satellite imagery and seismic data to those observable in individual outcrops. By integrating these observations and including concepts such as critical taper, geologic histories will be derived. Course 2 takes a close look at microscale deformation. Advanced theoretical concepts and own analyses using different techniques will enable students to determine deformation processes from microstructures and quantitative fabric data, assign them to specific environments and unravel evolutionary steps. As far as possible, both courses will use the same case studies to provide students with an integrated view of rock deformation.	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: Tectonics: Lithospheric plates to outcrops (Lecture, Exercise)	2,5 WLH
Course: Microtectonics (Lecture, Exercise)	2,5 WLH
Examination: Design and present posters (15 minutes) **Examination prerequisites:** Class work and regular attendance, completed exercise sheets.	6 C

Examination requirements: In the course of the module, the student will: • Have gained an understanding of how plate motions induce deformation from regional scale to microscale • Have learned which datasets are required to describe and interpret the structures. • Be able to give overviews of the case studies treated and transfer the underlying concepts to other examples. • Learn how to choose appropriate approaches for fabric analysis in microtectonics and present the results. • Have practiced collaborating in teams of two and as a larger group to create and present a set of thematically related posters.	

Admission requirements: None	**Recommended previous knowledge:** Microscopy of minerals and rocks
Language: English, German	**Person responsible for module:** Prof. Dr. Jonas Elmar Kley
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1

Maximum number of students: 16	

Georg-August-Universität Göttingen **Module M.EES.406: Deformation modelling across Scales**	6 C 5 WLH

Learning outcome, core skills: Very different types of models for the simulation and analysis of rock deformation processes are in use and keep being developed. This module first presents an overview of modelling approaches including conceptual, mathematical and physical background. This is followed by two courses where students learn the basics of specific modelling software packages and build their own models, working on case studies from a variety of regions and geological settings. The software introduced ranges from geometric (3D structure models) and kinematic (plate motions, structure restoration) to analytical (e.g. plate flexure) and numerical (e.g. discrete element) modelling. We put an emphasis on keeping models closely tied to field and other observational geologic data.	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: Introduction to structural modelling techniques (Lecture)	1 WLH
Course: Practical structural modelling I (Lecture, Exercise)	2 WLH
Course: Practical structural modelling II (Lecture, Exercise)	2 WLH
Examination: Completed modelling project with brief report (5 pages) in Courses 2 and 3 **Examination prerequisites:** Class work and regular attendance, completed exercise sheets.	6 C

Examination requirements: In the course of the module, the student will: • Understand different classes of models with their advantages and limitations. - Have gained practical experience with some specific modelling software. - Understand the relations between fundamental processes, simplified modelling concepts, and real-world geologic complexity - Have the opportunity for exploring software by trial-and-error, thus advancing beyond fixed workflows - Be able to use the introduced software packages for own projects and to deepen knowledge and skills via self-study - Be encouraged to use additional sources of knowledge and experience, such as making use of the offer to replace (part of) one of the two practical courses by courses on structural modelling offered by other universities, at meetings, etc.	

Admission requirements: None	**Recommended previous knowledge:** Structural geology and tectonics
Language: English, German	**Person responsible for module:** Dr. rer. nat. David Andrew Hindle
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1

Maximum number of students: 16	

Georg-August-Universität Göttingen **Module M.EES.407: Applied Geothermics I**	6 C 6 WLH

Learning outcome, core skills: Applied Geothermics I introduces in both, the natural geothermal field and the variety of geothermal technologies. Students learn the fun-damentals and application of the geothermal play type concept, geo-thermal systems therein and the actual and potential contribution to the energy transition at global and local scales. Insights in socioeco-nomics and risk evaluations are included. The presentation of rele-vant geothermal exploration and exploitation methods is completed by the discussion on site-specific steps of project development and strategies. Focus is on widely used exploration methods as seismic campaigns and drilling including borehole geophysics, presented in lab and field. Basics in 2D/3D reservoir modelling as well as reservoir characterisation and interpretation are trained for further application.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Geothermal Systems and their potential impact on the energy transition (Lecture)	2 WLH
Examination: Multiple choice test (30 minutes)	2 C

Course: Geothermal exploration strategies (Lecture, Excursion, Practical course)	2 WLH
Examination: Report (max. 4 pages)	2 C

Course: Reservoir modelling including economics (Exercise) *Contents*: Computer lab exercises	2 WLH
Examination: Presentation of model with discussion (10 minutes)	2 C

Examination requirements: • Quantitative understanding of geothermal energy resources, their exploration and exploitation and the dynamic reservoir modelling considering economic constraints • Learn about the integrated application of renewable energy • Be encouraged to engage in systemic and interdisciplinary thinking • Present and discuss results in concise formats also to non-specialist audiences	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Inga Moeck Dr. Bernd Leiss
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students:	

16	

Georg-August-Universität Göttingen **Module M.EES.408: Applied Geothermics II**	6 C 4 WLH

Learning outcome, core skills: Complementary to the module Applied Geothermics II, the students learn how to apply analogue studies and their importance and limita-tions. From structural and lithological 3D-field surveys, geological maps as well as data and samples from wells, models on various scales are developed. The qualitative and quantitative lithological characterisation and petrophysical parametrisation of these models is carried out by own measurements of e.g. optical methods and meas-urements of the porosity, permeability, heat transfer and capacity, mechanical data etc. Students will learn to transfer their understand-ing from outcrops to subsurface models, from field analogue to depth equivalent. In an individual case study, the students learn to apply the skills of Applied Geothermics I and II in project based approach to consult a stakeholder under real-life conditions including the transfer and communication of basic research knowledge to the public.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Analogue studies (field excercises and structural modelling) (Exercise) *Contents*: Two day field exercise. One day modelling.	2 WLH
Course: Lithological characterization and petrophysical properties (Practical course)	1 WLH
Course: Own case study (Group project) (Seminar)	1 WLH
Examination: Oral Presentation (approx. 15 minutes) **Examination prerequisites:** Poster presentation of data generated in field, laboratory and modelling	6 C

Examination requirements: · Surveying and understanding lithologies and geological structures in regard to geothermal reservoir modelling and evaluationg their significance · To be able to quantify rock fabrics and physical properties in the lab Being able to apply the methods teached in the Geothermics modules on real-life case studies and to present and discuss results in a concise format also understandable to non-specialist audiences	

Admission requirements: M.EES.407 Applied Geothermics I	**Recommended previous knowledge:** GIS, Structural 3D modelling
Language: English, German	**Person responsible for module:** Dr. Bernd Leiss Prof. Inga Moeck
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 2

Maximum number of students: 16	
Additional notes and regulations:	

Georg-August-Universität Göttingen **Module M.EES.409: Advanced Geological Mapping**	6 C 6 WLH

Learning outcome, core skills: Learning objectives and skills transfer are aimed at recording complex stratigraphic and structural building and storage forms in the field and their visualisation in the form of map images and geometric constructions (2D profiles and 3D block images).	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Advanced Geological Mapping (Exercise)	6 WLH
Examination: Geological map with profiles and explanation (max. 15 pages)	6 C

Examination requirements: Written report with precise textual and graphic presentation of the findings in the mapping area - with geological map and profiles.	

Admission requirements: none	**Recommended previous knowledge:** Geological mapping courses in the Bachelor's programme
Language: English, German	**Person responsible for module:** Dr. rer. nat. Klaus Wemmer Dr. rer. nat. István Dunkl
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.EES.410: Microtectonics and Metamorphism**	6 C 4 WLH

Learning outcome, core skills: Inhalte de	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: * LV neu ***** *Course frequency:* each winter semester	

Examination: Written examination	

Examination requirements: ECTS-Bedingungen de	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Thomas Müller Dr. Bernd Leiss
Course frequency: 1	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 1
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module M.EES.502: Geological Field Studies**	6 C 6 WLH

Learning outcome, core skills: Students should gain an insight into the geology of different regions from field findings. The case studies should differ in their geological history and represent different tectonic situations as well as crustal levels cut at different depths in order to represent a broad spectrum of rocks, degrees of metamorphism and deformation mechanisms. This illustrates the relationship of small-scale field observations with regional geological units and large-scale models. The integration of data on different scales is experienced and practised. Questions of the practical utilisation of raw materials and resources (e.g. metals, salts, groundwater, geothermal energy) are placed in a regional context. In addition to field exercises from the GZG's changing programme, credit is given for participation in conference-related and similar field exercises with a scientifically qualified guide. In order to ensure the desired thematic breadth, at least 3 different field exercises should be completed as a rule.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Case studies of geological field studies Alternating field exercises totalling at least 12 days. *Course frequency:* each semester	6 WLH
Examination: Report (oral approx. 20 minutes or written max. 10 pages) per excursion or field exercise, not graded	6 C

Examination requirements: For each of the 3 excursions or field exercises: Brief and concise description of the main points of the individual stations visited and their regional geological and geodynamic context, using the field book notes.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Jonas Elmar Kley
Course frequency: once a year	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 2
Maximum number of students: 20	

Georg-August-Universität Göttingen **Module M.EES.503: Earth and Environmental Sciences Project**	6 C 1 WLH

Learning outcome, core skills: The students will learn how to plan, conduct, and report a small research project. Under guidance, they will formulate a relevant research question, suggest suitable research methods, organize field and laboratory work, find and obtain access to relevant scientific literature, acquire and prepare suitable samples, schedule the analytical sessions, evaluate the data, prepare figures and tables, and present the project in form of a protocol, that adheres to the common standards for scientific publications (Introduction, Materials and Methods, Results, Discussion, References). The project can be conducted alone or in a small group; always in close collaboration with researchers of their host departments/work groups.	**Workload:** Attendance time: 14 h Self-study time: 166 h

Course: Earth and Environmental Sciences Project Seminar (Seminar)	1 WLH
Examination: Written Report (max. 20 pages) and seminar presentation (15 Min)	

Examination requirements: Learning outcomes, examination requirements: In the course of the module, the student will: • Demonstrate a clear understanding of the scientific background of the research project • Formulate a concrete research question that shall be answered in the project • Obtain and prepare suitable samples (if project is sample-based) • Organize the necessary field, laboratory, modeling, and literature work • Choose and use suitable software tools • Place the own results in context of current scientific literature • Prepare a report that adheres to common standards for scientific manuscripts	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Andreas Pack
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 3
Maximum number of students: not limited	

Georg-August-Universität Göttingen **Module M.EES.504: Aspects of Earth and Environmental Sciences I**	3 C 2 WLH

Learning outcome, core skills: In this module, (external) scientists offer lectures on selected topics in the geosciences. The module offers students the opportunity to gain insights into special fields of research and activity in the geosciences. The module is aimed at Master's and doctoral students with a corresponding specialisation.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Aspects of Earth and Environmental Sciences I (Lecture, Exercise, Seminar) *Course frequency:* Irregular, depending on the offer	2 WLH
Examination: Klausur (60 Min.) oder mündliche Prüfung (ca. 15 Min.) oder Hausarbeit (max. 10 Seiten) oder Seminarvortrag (ca. 15 Minuten), not graded	3 C

Examination requirements: Students provide evidence of their knowledge of the special fields of research and activity in the geosciences taught in the respective course.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Studiengangsreferent
Course frequency: Unregelmäßig nach Angebot	**Duration:** 1 semester[s]
Number of repeat examinations permitted: none	**Recommended semester:** from 1
Maximum number of students: 20	

Additional notes and regulations: Offers for this module will be organised and announced in good time by the degree programme coordinator.

Georg-August-Universität Göttingen **Module M.EES.505: Aspects of Earth and Environmental Sciences II**	6 C 4 WLH

Learning outcome, core skills: In this module, (external) scientists offer lectures on selected topics in the geosciences. The module offers students the opportunity to gain insights into special fields of research and activity in the geosciences. The module is aimed at Master's and doctoral students with a corresponding specialisation.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Aspects of Earth and Environmental Sciences II (Lecture, Exercise, Seminar) *Course frequency:* Irregular according to offer	4 WLH

Examination: Klausur (60 Min.) oder mündliche Prüfung (ca. 15 Min.) oder Hausarbeit (max. 10 Seiten) oder Seminarvortrag (ca. 15 Minuten), not graded	6 C

Examination requirements: Students provide evidence of their knowledge of the special fields of research and activity in the geosciences taught in the respective course.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Studiengangsreferent
Course frequency: Irregular according to offer	**Duration:** 1 semester[s]
Number of repeat examinations permitted: none	**Recommended semester:** from 1
Maximum number of students: 20	

Additional notes and regulations:
Offers for this module will be organised and announced in good time by the programme coordinator.

Georg-August-Universität Göttingen **Module M.EES.506: Geological Mapping Project**	12 C 3 WLH

Learning outcome, core skills: After an introduction to the spatial task by the supervisor, which usually takes place in the field, the students should map a limited area geologically and/or create a 3D representation or modelling from underground data (seismic, boreholes) completely independently. The results should be documented in the form of a geological map or a 3D model and a corresponding report. With their work, students should demonstrate that they are able to apply the knowledge they have acquired so far in the fields of petrography, structural geology and stratigraphy/sedimentology to characterise a larger geological unit and ultimately to reconstruct a spatio-temporal development model for it.	**Workload:** Attendance time: 42 h Self-study time: 318 h

Course: Geological Mapping Duration of mapping approx. 30 field days; usually 2 days of introduction plus 1 day of intermediate supervision and 1 day of acceptance of the work by the supervisor.	3 WLH
Examination: Practical examination (geological map or 3D model with written report)	12 C

Examination requirements: Independent production of a geological map or 3D model with accompanying report, including derivation of the temporal-spatial development.	

Admission requirements: keine	**Recommended previous knowledge:** Geological mapping exercises
Language: English, German	**Person responsible for module:** Prof. Dr. Jonas Elmar Kley
Course frequency: once a year	**Duration:** 1-2 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** from 2
Maximum number of students: 12	

Georg-August-Universität Göttingen **Module M.EES.601: External Internship for Master Students I**	6 C (incl. key comp.: 6 C)

Learning outcome, core skills: The "External internship for Master's students I" M.EES.601, which lasts at least 4 weeks, can be completed as an elective module in the area of key competences in geoscientific companies, public authorities, non-university research institutions or foreign universities. This voluntary internship should be as closely related as possible to the student's individual profile development. In the final phase of their degree programme, students should gain in-depth insights, knowledge and contacts in specific areas of the geosciences that they intend to pursue as a future career. This is intended to facilitate the transition into the profession and integration into specific operational processes. Students are responsible for organising their own work placement. The teaching staff of the faculty and the study advisor support the students in selecting the internship. The successful completion of the external internship is confirmed by the study advisor.	**Workload:** Attendance time: 0 h Self-study time: 180 h

Course: External Internship for Master Students I (Internship)	
Examination: Internship report (max. 10 pages), not graded	6 C

Examination requirements: A detailed written work report in which the work carried out is listed and described in detail. They must be explained in terms of their geoscientific and operational relevance. The relative proportions of the individual pieces of work in the overall internship must be recognisable. The internship must differ from the internships completed during the Bachelor's programme.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Studiengangsreferent (Studiendekan/in)
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: once	**Recommended semester:** from 1

Georg-August-Universität Göttingen **Module M.EES.602: External Internship for Master Students II**	6 C (incl. key comp.: 6 C)

Learning outcome, core skills: The "External internship for Master's students II" M.EES.602, which lasts at least 4 weeks, can be completed as an elective module in the area of key competences in geoscientific companies, public authorities, non-university research institutions or foreign universities. This voluntary internship should be as closely related as possible to the student's individual profile development. In the final phase of their degree programme, students should gain in-depth insights, knowledge and contacts in specific areas of the geosciences that they intend to pursue as a future career. This is intended to facilitate the transition into the profession and integration into specific operational processes. Students are responsible for organising their own work placement. The lecturers of the faculty and the study advisor support the students in the selection of the work placement. The successful completion of the external internship II is confirmed by the study advisor.	**Workload:** Attendance time: 0 h Self-study time: 180 h

Course: External Internship for Master Students II (Internship)	
Examination: Internship report (max. 10 pages), not graded	6 C

Examination requirements: A detailed written work report in which the work carried out is listed and described in detail. They must be explained in terms of their geoscientific and operational relevance. The relative proportions of the individual pieces of work in the overall internship must be recognisable. The internship must differ from the internships completed during the Bachelor's programme and from the internship completed in M.EES.601.	

Admission requirements: M.EES.601 none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Studiengangsreferent (Studiendekan/in)
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: once	**Recommended semester:** from 1

Georg-August-Universität Göttingen **Modul M.Geg.02: Ressourcennutzungsprobleme** *English title: Resource Utilisation Problems*	6 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden können die Bedeutung der Ressourcen Boden und Wasser als Bestandteile von Ökosystemen und Lebensgrundlage des Menschen aufzeigen und das globale sowie regional differenzierte Ausmaß der Gefährdung und Degradation dieser Ressourcen benennen. Sie sind in der Lage, das DPSIR-Konzept, durch das die Beziehungen Drivers – Pressures – State – Impacts – Responses verdeutlicht werden können, auf verschiedene Ressourcennutzungsprobleme anzuwenden. Sie kennen die Reference Soil Groups der World Reference Base for Soil Resources, sowie die spezifischen Bodeneigenschaften und daraus resultierenden Nutzungsmöglichkeiten, –einschränkungen und Gefährdungen der verschiedenen Böden. **Modulinhalte:** Eigenschaften, Nutzungsmöglichkeiten und –probleme verschiedener Böden (mit Schwerpunkt auf feuchte Tropen und Subtropen sowie Trockengebiete), Bodengefährdungen, Faktoren und Prozesse der Bodendegradation, Ursachen, Ausmaß und Arten der Bodendegradation in Europa, Desertifikation, regional differenzierte Auswirkungen des Klimawandels auf die Ressourcen Boden und Wasser, globale Verteilung von Wasserangebot und –nachfrage, Wasserverbrauch nach Sektoren, Wassermangel, Ursachen und Ausmaß von Problemen mangelnder Wasserqualität, regionale Unterschiede in der Versorgung mit sanitären Anlagen und sauberem Trinkwasser.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Ressourcennutzungsprobleme (Vorlesung)	2 SWS
Lehrveranstaltung: Ressourcennutzungsprobleme (Seminar) Inkl. Geländetage zur Bearbeitung einer Fragestellung im Rahmen eines kleinen Projekts.	2 SWS
Prüfung: Klausur (90 Minuten) **Prüfungsvorleistungen:** Regelmäßige Teilnahme am Seminar; Referat mit schriftl. Ausarbeitung bzw. schriftlichem Beitrag zum Projektbericht oder Poster (ca. 30 Min., max. 20 S. bzw. 1 DIN A 0 Poster) **Prüfungsanforderungen:** Die Studierenden erbringen den Nachweis, dass sie Probleme der Boden- und Wassernutzung überblicken und spezifische Degradationsursachen sowie -prozesse verstehen. Sie zeigen, dass sie geeignete situationsbezogene Verfahren des nachhaltigen Umgangs mit Böden und Wasser kennen. Die Erstellung des Beitrags zum Projektbericht oder die Postererstellung als Prüfungsvorleistung machen die Mitwirkung bei der Projektbearbeitung erforderlich.	6 C

Zugangsvoraussetzungen:	**Empfohlene Vorkenntnisse:**

keine	Grundlagen der Bodengeographie
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Daniela Sauer
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** ab 2
Maximale Studierendenzahl: 42	

Georg-August-Universität Göttingen **Modul M.Geg.06: Quartäre Klima- und Landschaftsentwicklung** *English title: Quaternary Climate and Landscape Evolution*	5 C 3 SWS

Lernziele/Kompetenzen: Die Studierenden kennen die Grundzüge der quartären Klima- und Landschaftsentwicklung global und in Mitteleuropa. Sie verstehen die Wirkungsweisen verschiedener Steuergrößen auf die Klima- und Landschaftsentwicklung und deren Relevanz für gegenwärtige und künftige Dynamiken. Die Studierenden haben einen Überblick über Archive der Landschaftsentwicklung und darin enthaltene Proxies, die zur Rekonstruktion der Klima- und Landschaftsgeschichte herangezogen werden können. Sie sind mit den wichtigsten in der Quartärforschung zum Einsatz kommenden Untersuchungsmethoden und Datierungsverfahren vertraut.	**Arbeitsaufwand:** Präsenzzeit: 42 Stunden Selbststudium: 108 Stunden

Lehrveranstaltung: Landschaftsentwicklung (Vorlesung)	1 SWS
Lehrveranstaltung: Archive und Proxies zur Rekonstruktion der Landschaftsentwicklung (Seminar)	2 SWS
Prüfung: Referat (ca. 30 Min.) mit schriftlicher Ausarbeitung (max. 20 S.) ODER Referat (ca. 30 Min.) mit mündlicher Prüfung (ca. 20 Min.) **Prüfungsvorleistungen:** Regelmäßige Teilnahme am Seminar	5 C

Prüfungsanforderungen: Die Studierenden erbringen den Nachweis, dass sie die Bedeutung von Archiven und Proxies im Kontext der Rekonstruktion der Klima- und Landschaftsentwicklung verstanden haben und dass sie in der Lage sind, unter Einbindung englischsprachiger Primärliteratur die Relevanz der vergangenen Klima- und Landschaftsentwicklung wissenschaftlich adäquat darzustellen. Anhand eines selbst gewählten Archivs und eines selbst gewählten Proxies aus diesem Archiv erbringen sie weiterhin den Nachweis, dass sie in der Lage sind, anhand geeigneter Primärliteratur Stärken und Schwächen von Archiven und Proxies herauszuarbeiten und kritisch zu reflektieren.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Elisabeth Dietze
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** ab 1
Maximale Studierendenzahl: 40	

Georg-August-Universität Göttingen **Modul SK.Geo.100: Gremienarbeit in der Fakultät für Geowissenschaften und Geographie** *English title: Committee work in the Faculty of Earth Sciences and Geography*	3 C (Anteil SK: 3 C)

Lernziele/Kompetenzen:	**Arbeitsaufwand:**
Kenntnis der Organisationsstrukturen und Entscheidungsprozesse in der (stud.) Selbstverwaltung einer Fakultät. Befähigung zur Mitarbeit als stud. Mitglied in den Gremien der Fakultät und zur Vertretung studentischer Anliegen in diesen Gremien. Einblicke, Kenntnis- und Fähigkeitenerwerb in: • Dialog- und Diskursfähigkeit, • Meinungsbildung hierdurch • Rhetorik / freie Rede • Moderationstechniken und Gesprächsführung • Kritische Reflektion der Gremienarbeit • Aufbau, Prozesse, Funktion einer Fakultät und/oder anderen Organisationeinheiten bzgl. Studium und Lehre, Forschung und Verwaltung Planung und Durchführung eigener stud. Projekte in diesen Bereichen	Präsenzzeit: 45 Stunden Selbststudium: 45 Stunden

Lehrveranstaltung: Gremienarbeit	SWS
Prüfung: Tätigkeitsbericht (max. 3 Seiten), unbenotet	3 C

Prüfungsanforderungen: Befähigung zur Vertretung und zum Vortragen der Anliegen von Statusgruppen (hier der Studierendenschaft) in den zuständigen Gremien.	

Zugangsvoraussetzungen: Nachweis der Tätigkeit und Mitgliedschaft in einem Gremium der Fakultät für Geowissenschaften und Geographie	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Studiendekan
Angebotshäufigkeit: jedes Semester	**Dauer:** 2 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	

Georg-August-Universität Göttingen **Modul SK.Geo.200: Ehrenamtliches Engagement** *English title: Civic engagement / charitable activities*	6 C (Anteil SK: 6 C)

Lernziele/Kompetenzen: Viele Bereiche des öffentlichen und sozialen Lebens können ohne ehrenamtliches Engagement nur schwerlich existieren. Studierende der Fakultät für Geowissenschaften tragen bereits in vielfältiger Weise dazu bei und können mit diesem Modul explizit ihre Sozial- und Selbstkompetenzen diesbezüglich erweitern. Indem die Studierenden freiwillig Tätigkeiten ausüben, die am Gemeinwohl orientiert sind und zur Verbesserung von gesellschaftlichen Problemlagen beitragen, erlangen sie allg. Praxiserfahrung, ggf. Kenntnis von Organisationsstrukturen, Arbeitsabläufen und Entscheidungsprozessen, erweitern ggf. ihr Fach- und Methodenwissen (auch in Bezug auf das Studium), und fördern insbesondere ihre Persönlichkeitsentwicklung durch die kritische Selbstreflexion ihres altruistischen Handelns, aber auch ihres eigenen Nutzengewinns aus der ehrenamtlichen Tätigkeit. Bsp.: Betreuung von Kindern, Kranken und alten und bedürftigen Menschen in verschiedenen Kontexten/Einrichtungen (bspw. Hausaufgabennachhilfe, in Altenpflege- und Behindertenhilfe-Einrichtungen, Telefonseelsorge, Obdachlosenhilfe, Dienste bei Jugendorganisationen, Suppenküchen u.a.), Tätigkeiten in der Berg- und Seerettung, bei der Freiwilligen Feuerwehr, im Natur- und Umweltschutz	**Arbeitsaufwand:** Präsenzzeit: 0 Stunden Selbststudium: 180 Stunden

Lehrveranstaltung: Ehrenamtliches Engagement	SWS
Prüfung: Tätigkeitsbericht (max. 3 Seiten), unbenotet	6 C

Prüfungsanforderungen: Fähigkeit, die eigene ehrenamtliche Tätigkeit sachgemäß darzustellen und kritisch zu reflektieren	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Studiendekan
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: nicht begrenzt	