



DIRECTORY OF MODULES OFFERED IN ENGLISH LANGUAGE

COURSES OFFERED IN ENGLISH AT THE UNIVERSITY OF GÖTTINGEN
ACADEMIC YEAR 2017/2018

FACULTY OF GEOSCIENCE AND GEOGRAPHY



GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN

A very warm welcome!

The University of Göttingen features an outstanding study environment for both exchange and full-degree students. All courses of study benefit from an excellent research-oriented environment formed by a broad network including five Max Planck Institutes, the German Primate Centre, the German Aerospace Centre and the Academy of Science and Humanities: the Göttingen Campus. An increasing number of lectures and courses are taught in the English language attracting more and more international students. This catalogue provides an impression of what is available.

This catalogue of courses taught in English varies from faculty to faculty and the courses available to you depend on whether you are an exchange student coming to Göttingen for a semester or an academic year, or whether you are a full degree student coming to Göttingen to complete an entire degree programme. You may take most courses in the programme you are enrolled in, however in a few cases restrictions may apply. Selecting courses from other subjects or other departments might require negotiations. If you have any questions, please contact the study advisor in charge of your subject.

Prior to their arrival in Göttingen exchange students have to set up a learning agreement. In some cases restrictions will apply, e.g. signing up for certain laboratory courses may not be possible. Generally exchange students are required to take at least half of the lectures and courses within their chosen subject.

Full degree students must first apply for a study place. Links to websites with application guidelines and deadlines are provided by some subjects/faculties. If not stated otherwise please visit:

<http://www.uni-goettingen.de/en/3811.html>

In any case, you are very welcome to browse through this catalogue to find/check out courses that suit your interests! For the complete course catalogue of the University of Göttingen see:

<https://univz.uni-goettingen.de/qissserver/>

We look forward to welcoming you in Göttingen!

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Georg-August-Universität Göttingen		8 C
Module M.HEG.12: Hydrogeology I		6 WLH
<p>Learning outcome, core skills: This module is intended to convey the fundamentals of the theory of groundwater flow and transport and to apply them in practical exercises in the field and in the laboratory. The students should be able to organise and conduct test procedures as well as to assess the specific hydrogeological site conditions. The contents of the module comprise the hydrological water balance, groundwater recharge estimation techniques, groundwater hydrology, pumping test evaluation and principles of solute transport. Relevance of this fundamental material is illustrated with examples from the hydrogeological practice, e.g. water resources exploration, and groundwater remediation. A field seminar will introduce the students into the most important field techniques of the daily practice of a hydrogeologist. During the “Advanced Hydrogeological Investigation Techniques” course, new assessment techniques for the hydraulic characterisation of aquifers are presented and demonstrated using practical examples. The advanced course on “Aquifersystems” will concentrate on the specifics of fractured aquifers and the particulars of the large variety of aquifer systems in Northern Germany. They can be regarded as representative for a large number of aquifer types.</p>		<p>Workload: Attendance time: 84 h Self-study time: 156 h</p>
<p>Courses:</p> <p>1. Introduction to Hydrogeology (Lecture, Exercise)</p> <p>2. Advanced Hydrogeological Investigation Techniques (Lecture)</p> <p>3. Geology of Aquifer systems (Lecture, Excursion)</p> <p>4. Well Design and Construction (Lecture)</p>		<p>3 WLH</p> <p>1 WLH</p> <p>1 WLH</p> <p>1 WLH</p>
Examination: Written examination (60 minutes)		8 C
<p>Examination requirements: Theory and practice of groundwater flow and solute transport processes, implementation in the field.</p>		
<p>Admission requirements: none</p>	<p>Recommended previous knowledge: none</p>	
<p>Language: English</p>	<p>Person responsible for module: Dr. rer. nat. Jannes Kordilla Prof.Dr. Martin Sauter</p>	
<p>Course frequency: each winter semester</p>	<p>Duration: 1 semester[s]</p>	
<p>Number of repeat examinations permitted: twice</p>	<p>Recommended semester: 1</p>	
<p>Maximum number of students: 25</p>		

Georg-August-Universität Göttingen		6 C
Module M.HEG.13: Hydrogeochemistry		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 the aquatic environment and is accompanied by simple and complex calculations of real world problems as well as coursework. The second lecture focuses on the classification of organic compounds and pollutants in the subsurface. Relevant properties are discussed together with property-structure-relationships. The environmental and subsurface behaviour of organic compounds is introduced in terms of relevant distribution equilibria and kinetically controlled processes. Complex examples are provided partially as coursework helping to apply gained knowledge. The isotope hydrology course is intended to provide the techniques to differentiate between different types of water of variable origins. Fundamentals of fractionation effects and the limitations of the methods are discussed.		Workload: Attendance time: 70 h Self-study time: 110 h
Courses: 1. Inorganic Hydrogeochemistry (Lecture) 2. Organic Hydrogeochemistry (Lecture) 3. Exercise in Hydrogeochemistry (Exercise)		2 WLH 2 WLH 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, isotope hydrology		
Admission requirements: none	Recommended previous knowledge: Basic knowledge in chemistry	
Language: English	Person responsible for module: PD Dr. rer. nat. Tobias Licha Prof. Dr. Martin Sauter	
Course frequency: each winter semester	Duration: 1 semester[s]	
Number of repeat examinations permitted: twice	Recommended semester: 1	
Maximum number of students: 25		

<p>Georg-August-Universität Göttingen Module M.HEG.14: Hydrology and GIS</p>	<p>6 C 6 WLH</p>
<p>Learning outcome, core skills: The first course in submodule 1 gives an overview about the fundamentals of surface water hydrology. The main topics are precipitation, evapotranspiration, snow, runoff generation and soil water. Furthermore, the course provides theoretical concepts of models and related exercises. The second course comprises a practical introduction to hydrological models, the delineation of watersheds using GIS, the hydrological model setup, sensitivity analysis, calibration and validation. The third course concerns urban hydrology and groundwater management issues, concentrating on the science and engineering of urban groundwater, including for example the impact of urban development on groundwater, sustainable management and protection of groundwater resources in urban environments, and innovative management concepts. The first course in submodule 2 provides knowledge about basic GIS techniques (e.g. spatial data models, data input techniques, spatial analysis) applied in hydrologic, geological and environmental studies. Students gain practical skills by computer exercises with state of the art software. The second course offers the opportunity to become acquainted with basic remote sensing techniques (correction, composites, ratios, indices, PCA, classification) using common multispectral datasets. Students will mainly work on practical exercises that focus on the application of digital image processing in geological, hydrologic and environmental case studies.</p>	<p>Workload: Attendance time: 84 h Self-study time: 96 h</p>
<p>Courses: 1. Introduction to Surface Hydrology (Lecture, Exercise) 2. Surface Water Modeling (Lecture, Exercise) 3. Urban Hydrology and Groundwater Management (Lecture, Exercise)</p>	<p>1 WLH 1 WLH 1 WLH</p>
<p>Examination: Written examination to course 1 and 2 (45 minutes) Examination prerequisites: Course 3: Term paper (max. 15 pages) Examination requirements: Understanding of basic principles and application of state of the art methods in surface water and urban hydrology.</p>	<p>3 C</p>
<p>Courses: 1. Geographic Information Systems (GIS) (Exercise) 2. Applied Remote Sensing Techniques (Exercise)</p>	<p>2 WLH 1 WLH</p>
<p>Examination: Presentation of the project work (approx. 10 min.) Examination requirements: Practical application of GIS and Remote Sensing techniques on provided datasets.</p>	<p>3 C</p>
<p>Examination requirements:</p>	

Understanding of basic principles and application of state of the art methods in surface water hydrology and applied statistics.		
Admission requirements: none	Recommended previous knowledge: Basic knowlegde in Geology, Computer Literacy, Cartography, Geography	
Language: English	Person responsible for module: Dr. rer. nat. Bianca Wagner	
Course frequency: each winter semester	Duration: 1 semester[s]	
Number of repeat examinations permitted: twice	Recommended semester: 1	
Maximum number of students: 25		

Georg-August-Universität Göttingen		6 C
Module M.HEG.22: Groundwater Modeling I		5 WLH
Learning outcome, core skills: This module introduces the student to the commonly used mathematical tools as well as to state-of-the-art numerical groundwater modeling techniques, including visualization of the results. Groundwater modeling allows a consistent assembly of multiple types of data from laboratory and field investigations, environmental system analysis, process understanding, planning of water management and remedial activities, risk assessment, decision making etc.. The first and second course focus on the numerical modeling of flow and non-reactive as well as reactive transport in porous media (aquifers). It includes topics such as model design, mathematical process formulation (process equations) and numerical methods for solving the governing equations. Simple modeling problems will be discussed and exercised by the students using computer codes in tutorials to complement the presentations given in the lecture. The third course deals with special advanced modeling techniques. The focus will be on basin scale integrated hydrosystem modeling, covering porous and fractured media, saturated and unsaturated zones, surface water - groundwater interaction, surface water modeling, hillslope hydrological aspects, including reactive contaminant transport. Students will gain hands on experience with models through computer exercises.		Workload: Attendance time: 70 h Self-study time: 110 h
Courses: 1. Groundwater Flow Modeling (Lecture, Exercise)		2 WLH
2. Groundwater Transport Modeling (Lecture, Exercise, Seminar)		2 WLH
Examination: Term Paper (max. 10 pages) Examination prerequisites: Compulsory attendance in the exercises		5 C
Course: Advanced Modeling Techniques (Lecture, Exercise)		1 WLH
Examination: Presentation of Course Work (approx. 15 min.), not graded Examination prerequisites: Compulsory attendance in the exercise		1 C
Examination requirements: Knowledge about theoretic background and state of the art techniques in groundwater modelling, understanding of main concepts of integrated hydrosystem modelling and practical skills.		
Admission requirements: M.HEG.11, M.HEG.12, M.HEG.13	Recommended previous knowledge: none	
Language: English	Person responsible for module: Prof. Dr.-Ing. habil. Thomas Ptak-Fix Prof. Dr. Martin Sauter	
Course frequency: each summer semester	Duration: 1 semester[s]	

Number of repeat examinations permitted: twice	Recommended semester: 2
Maximum number of students: 25	

Georg-August-Universität Göttingen		6 C 4 WLH
Module M.HEG.24: Georeservoirs I - Processes and Characterization		
Learning outcome, core skills: This module intends to convey a general understanding for the relevant processes and the general concepts involved in the exploitation of geothermal energy. The module is subdivided into "Deep Geothermics", concentrating on power and heat production at large depths (> 4000m) "Shallow Geothermics", dealing with heat extraction at shallow depths (< 500m), and the illustration of the use of geothermal energy with case studies. For the assessment and exploitation of geothermal energy, general knowledge of groundwater flow and transport is a prerequisite, provided in modules elsewhere. Course contents of this module comprise some basic principles, the regional assessment of the geothermal potential in Germany and Europe, required site conditions for economical exploitation, generally employed testing procedures, economical assessment methods, fractures and faults, fluid flow in fractured systems, stimulation methods.		Workload: Attendance time: 56 h Self-study time: 124 h
Courses: 1. Fluid flow, Mass and Heat Transport (Lecture, Exercise) 2. Geochemistry and Geomechanics (Lecture, Exercise)		2 WLH 2 WLH
Examination: Written examination (120 minutes)		6 C
Examination requirements: Prerequisites for the economical exploitation of shallow and deep geothermal energy, design of geothermal plants.		
Admission requirements: M.HEG.11, M.HEG.12, M.HEG.13	Recommended previous knowledge: none	
Language: English	Person responsible for module: Dr. rer. nat. Bettina Wiegand Dr. Iulia Ghergut	
Course frequency: each summer semester	Duration: 1 semester[s]	
Number of repeat examinations permitted: twice	Recommended semester: 2	
Maximum number of students: 25		

Georg-August-Universität Göttingen		8 C
Module M.HEG.310: Groundwater Modeling II		5 WLH
Learning outcome, core skills: The module "Georeservoirs II" deals with processes in georeservoirs (geothermal, energy storage, CO ₂ -storage and hydrocarbons), their identification and quantification of process parameters. Processes in georeservoirs comprise hydraulic, thermal, mechanical and chemical processes as well as their coupling. The investigation of georeservoirs is one of the main research focuses in the Applied Geology and nowadays a highly relevant field in energy research issues. During the courses, the methods of the investigation, characterisation and modelling of georeservoirs shall be conveyed to the students, together with illustrations of practical examples of case studies. A field trip shall be conducted to geothermal plants and drilling sites.		Workload: Attendance time: 70 h Self-study time: 170 h
Courses: 1. Modeling of unsaturated Zone Processes (Lecture, Exercise)		2 WLH
2. Simulation of Flow and Transport in Fractured and Karstified Aquifers (Lecture, Exercise)		2 WLH
3. Reactive Transport Processes (Lecture, Exercise)		1 WLH
Examination: Written examination (90 minutes)		8 C
Examination requirements: Prerequisites of the understanding of reservoir functioning and prediction of their future dynamics.		
Admission requirements: M.HEG.11, M.HEG.12, M.HEG.22	Recommended previous knowledge: none	
Language: English	Person responsible for module: Dr. rer. nat. Jannes Kordilla	
Course frequency: each winter semester	Duration: 1 semester[s]	
Number of repeat examinations permitted: twice	Recommended semester: 3	
Maximum number of students: 25		

Georg-August-Universität Göttingen Module M.HEG.320: Georeservoirs II - Environments and Applications	5 C 4 WLH
Learning outcome, core skills: The module "Georeservoirs II" deals with processes in georeservoirs (geothermal, energy storage, CO ₂ -storage and hydrocarbons), their identification and quantification of process parameters. Processes in georeservoirs comprise hydraulic, thermal, mechanical and chemical processes as well as their coupling. The investigation of georeservoirs is one of the main research focuses in the Applied Geology and nowadays a highly relevant field in energy research issues. During the courses, the methods of the investigation, characterisation and modelling of georeservoirs shall be conveyed to the students, together with illustrations of practical examples of case studies. A field trip shall be conducted to geothermal plants and drilling sites.	Workload: Attendance time: 56 h Self-study time: 94 h
Courses: 1. Deep Geothermics (Lecture, Exercise) 2. Georeservoirs Engineering (Lecture, Exercise)	2 WLH 2 WLH
Examination: Written examination (60 minutes)	5 C
Examination requirements: Prerequisites of the understanding of reservoir functioning and prediction of their future dynamics.	
Admission requirements: M.HEG.12, M.HEG.22, M.HEG.24	Recommended previous knowledge: Good knowledge of hydraulic and tracer test methods and insight into coupled THMC processes.
Language: English	Person responsible for module: Dr. rer. nat. Iulia Ghergut
Course frequency: each winter semester	Duration: 1 semester[s]
Number of repeat examinations permitted: twice	Recommended semester: 3
Maximum number of students: 25	

Georg-August-Universität Göttingen	8 C 5 WLH
Module M.HEG.330: Advanced methods in Hydrogeology	
Learning outcome, core skills: The first course focuses on innovative investigation and monitoring techniques. Both integral and high resolution point scale, non-invasive and invasive investigation techniques are presented, and scale-heterogeneity relationship issues are discussed. The second course addresses the problem of salinity in groundwater, characterisation, mapping, modelling and the management of groundwater resources in presence of salinity, including coastal aquifers and inland aquifers with saline water bodies. The third course provides knowledge about remote sensing techniques (e.g. remote sensing scanning techniques, image processing, interpretation) applied in hydrologic and environmental studies. Finally the module is supplemented with the basics of well construction and completion.	Workload: Attendance time: 70 h Self-study time: 170 h
Courses:	
1. Isotope Hydrology (Lecture, Exercise)	2 WLH
2. Application of Indicators and Tracers (Lecture, Exercise)	1 WLH
Examination: Written examination (90 minutes)	5 C
Course: Investigation Techniques and Monitoring (Lecture, Exercise)	2 WLH
Examination: Written examination (60 minutes)	3 C
Examination requirements: Investigation and monitoring techniques, seawater intrusion control, remote sensing techniques, basic principles of well construction.	
Admission requirements: M.HEG.11, M.HEG.12, M.HEG.13, M.HEG.21, M.HEG.22	Recommended previous knowledge: Basic knowledge in Hydrochemistry, Geology, Hydrogeology und Transport processes
Language: English	Person responsible for module: PD Dr. rer. nat. Tobias Licha Prof. Dr.-Ing Thomas Ptak-Fix
Course frequency: each winter semester	Duration: 1 semester[s]
Number of repeat examinations permitted: twice	Recommended semester: 3
Maximum number of students: 25	

Georg-August-Universität Göttingen		3 C
Module M.HEG.340: Selected Topics in Hydrogeology		2 WLH
<p>Learning outcome, core skills: Lecture topics vary depending on current innovative research trends in hydrogeology. Courses for example can include those given below:</p> <p>1. Operations research applications in the field of integrated water resources management (IWRM). The lecture specifically treats: multi-criteria-analysis and multi-objective optimization procedures and their application to specific IWRM topics, such as irrigation planning and management, surface water reservoir planning and operation or Managed Aquifer Recharge. The application of decision support systems in IWRM is discussed, too. Social, political, legal and institutional aspects of IWRM, transboundary and conflict management are treated on an introductory level as well. A part of the course will be organized as seminar organized by the students.</p> <p>2. The problem of salinity in groundwater, characterization, mapping, modelling and the management of groundwater resources in the presence of salinity, including coastal aquifers and inland aquifers with saline water bodies.</p> <p>The courses can be modified ad hoc to take into account current new topics and scientific methods or to integrate specialised expertise of visiting scientists.</p>		<p>Workload: Attendance time: 28 h Self-study time: 62 h</p>
<p>Courses:</p> <p>1. Operations Research in IWRM (Lecture, Exercise)</p> <p>2. Saline Groundwater (Lecture, Exercise)</p>		<p>1 WLH</p> <p>1 WLH</p>
Examination: Written examination (60 minutes)		3 C
<p>Examination requirements: Knowledge as presented in the course on selected topics in the field of integrated water resources management and salinity problems in groundwater.</p>		
<p>Admission requirements: M.HEG.11, M.HEG.12, M.HEG.13</p>	<p>Recommended previous knowledge: none</p>	
<p>Language: English</p>	<p>Person responsible for module: Prof. Dr. Martin Sauter</p>	
<p>Course frequency: each winter semester</p>	<p>Duration: 1 semester[s]</p>	
<p>Number of repeat examinations permitted: twice</p>	<p>Recommended semester: 3</p>	
<p>Maximum number of students: 25</p>		