

**Module Plan for
M.Sc. "Geosciences"
Ruhr-Universität Bochum
Prüfungsordnung 2019 with Addendum 2025
Version October 2025**

Module name and courses within the module	Person responsible for the Module	CP	SWS (weekly hours)	Semester	Language of instruction	Comment (please also consult the handbook for further pre-requisites and information)
Analytical methods in Earth Sciences						
Electron beam microanalysis	Hoffmann / Jöns	6		2		
Electron beam microanalysis (Lecture)			2	SS	English	
Electron beam microanalysis (Practical exercises)			2	SS	English	Block course in September; passed exam is pre-requisite
Geochemical analyses by laser ablation-ICP-mass spectrometry	Schuth	5		3		
Methods of LA-ICPMS (lecture)			2	WS	English	Lecture can be accredited for Complementary module (3 CP); Practical course registration only with passed exam
Practical course in LA-ICPMS			2	WS	English	
Engineering Geology and Rock Mechanics						
Grundlagen des Geoingenieurwesens	Backers	6				
Grundlagen der Ingenieurgeologie			2	WS	German	
Darstellen und Analysieren geotechnischer Informationen			2	WS	German	
Rock mass stress fields	Backers / Bücken			1		
Stress field and rock mass behaviour			2	WS	English	
Stress field modelling and simulation			1	WS	English	
Rock mass mechanics and rock engineering	Duda	5		2		
Rock mass mechanics			2	SS	English	
Rock engineering			2	SS	English	
Rock mass characterisation (Baugrundcharakterisierung Fels)	Backers	5		2, 3		
Rock mass mapping			5 days	SS	Englisch/ German	
Rock mass lab			2	WS	Englisch/ German	
Baugrundcharakterisierung Boden	Backers, Eickhoff	5		2, 3		
Bodenmechanisches und hydraulisches Laborpraktikum			2	WS	German	
Lockergesteinskartierung und hydrogeologisches Feldpraktikum			5 Tage	SS	German	
Geomechanik	Backers	10		3		
Geomechanik und Geotechnik komplexer Systeme			2	WS	German	
geomechanische numerische Simulation			1	WS	German	
Geotechnisches Projekt			1	WS	German	
Engineering geological digital mapping strategies	Duda	5		1		
UAV License				WS	Englisch/ German	
Digitally supported engineering geological mapping				WS	Englisch/ German	
Digital mapping research project	Duda	5		2		
Digital mapping research project				SS	Englisch/ German	
Engineering geology colloquium				SS	Englisch/ German	

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Geological engineering for subsurface energy systems	Backers	10		3		
Reservoir geomechanics			2		English	
Simulation of geological systems			1		English	
Subsurface energy utilisation project			1		English	
Grundbau- und Bodenmechanik	Backers***	6				
Grundbau			3	WS	German	
Bodenmechanik			3	WS	German	
Geotechnische Herausforderungen des Anthropozäns			0.5	SS	German	
Baubetrieb und Management	Backers**	9				
Bauwirtschaft und Bauverträge				WS	German	
Projektmanagement				WS	German	
Betriebswirtschaft im Bauwesen				WS	German	
Umweltgeotechnik	Backers**	6				
Umweltgeotechnik - Deponietechnik				SS	German	
Umgang mit Altlasten				SS	German	
Altbergbau				SS	German	
Seminar Altbergbau				SS	German	
Arbeitssicherheit I / Baustellenorganisation	Backers**	2				
Arbeitssicherheit I / Baustellenorganisation				SS	German	
BWL für Ingenieure	Backers***	4				
BWL für Ingenieure				SS	German	
Boden- und Vegetationsökologie	Backers****	6				
Boden- und Vegetationsökologie I: Bodenschutz				WS	German	
Boden- und Vegetationsökologie II: Vegetation				WS	German	
Crystallography						
Kristallchemie	Schreuer/ Münchhalfen	10		2, 3		
Kristallchemie			2	WS	German	
Realstrukturbau und Phasenumwandlung			2	SS	German	
Edelsteinkunde			2	SS	German	
Kristallisation	Schreuer/ Münchhalfen	10		2, 3		
Mineralization in geothermal systems			4	WS	English	
Synthetische Kristalle			2	SS	German	
Kristallphysik	Schreuer/ Münchhalfen	10		1, 2		
Kristallphysik			2	WS	German	
Physikalische Charakterisierung			4	SS	German	

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Festkörperspektroskopie	Fechtelkord	10		2, 3		
Festkörperspektroskopie I: NMR Spek.			2	SS	German	
Festkörperspektroskopie II: Allg. Spek.			2	WS	German	
Laborübung zu FK I			2	SS	German	
Laborübung zu FK II			2	WS	German	
Crystal structure analysis	Yusenko	10		2, 3		
Crystal structure analysis (Lectures)			2	SS	English	
Single crystal X-ray diffraction: (Practical)			3	WS	English	
Powder X-ray diffraction: (Practical)			3	WS	English	
Geomorphology and Geohazards						
Geomorphology and geohazards	Kranz	10		2,3		
Earth surface processes and environmental change			2	SS	English	
Geohazards: types, causes and strategies			2	WS	English	Pre-requisite: SS course attended
Field course on geomorphology and geohazards			2 days+2 block course	ab WS 26/27	English	Passed exam from SS is pre-requisite
Quaternary geochronology	Kranz	5		2		
Quaternary geochronology			2	SS	English	
Quaternary geochronology (exercises)				SS	English	
Computational analyses in tectonic geomorphology	Prince	5		2		Offered for first time in SS 26; module description available in March 2026
Lecture			1		English	
Exercise			1		English	
Geothermal energy						
Geothermal Drilling Engineering and Subsurface Technologies	Reinsch (IEG)*	5		3, 4		
Geothermal Drilling Engineering and Subsurface Technologies			5	WS	English	
Geothermal energy systems	Reinsch (IEG)*	5				
Geothermal energy systems			5	SS	Englisch	
Applied geothermal energy	Reinsch / Renner	8		1, 2		
Shallow geothermal energy			2	WS	English	Block course at the end of the WS
Deep geothermal energy			3	SS	English	
Geophysics						
Applied geophysics	Renner	10		2		
Reservoir geophysics			3	SS	English	
Rock physics			3	SS	English	
Geophysical field practical	Bedford/Harrington	5		1		
Field exercise			6 days	SS	English	
Data analyses			4 days	SS	English	
Geophysical practical	Bedford, Harrington, Renner	5		2, 3		
Geophysical practical				WS, SS	English	

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Physics of the solid Earth	Renner	10		1, 3		
Continuum mechanics	next time in WS 25/26		3	WS	English	The two courses of this module alternate in the winter semesters.
Physic of Earth materials	next time in WS 26/27		3	WS	English	
Earthquake processes	Harrington	6				
Earthquake seismology and the seismic cycle			4	SS	English	
Geophysical seminar (ab WS25/26)	Bedford, Harrington, Renner	6		1.2		
Deformation mechanisms and tectonics of subduction zones			2	WS	English	
Induced and triggered seismicity seminar			2	SS	English	
Geology and Geohazards in an active Subduction zone	Harrington/Bocchini	5		1		Includes a 7-day field exercise in Crete. Please refer to the handbook for estimated costs and further pre-requisites
Geology and Geohazards in an active Subduction zone			3	SS	English	
Seismotectonics and Seismic Hazard	Harrington/Essing	6		1		
Seismotectonic and Seismic Hazard			4	WS	English	
Python programming for Geosciences	Roth, Essing	10		1, 2		new module from WS 25/26 onwards
Introduction to programming in Python		5	3	WS	English	
Advanced Programming in Python		5	3	SS	English	
Introduction to Programming in Matlab	Harrington	6		2		
Lecture and exercise			4	SS	English	
Measuring Earth surface motions with InSAR and GNSS	Bedford + Q-Stelle	6		1		
Lecture, exercise and seminar			4	WS	English	
Optimization methods for geophysics	Bedford + Q-Stelle	6		2		From SS 26 onwards
Optimization methods for geophysics			4	SS	English	
Gravity and Magnetics/Potential fields	Bedford Q-Stelle/Fischer	5		2		From SS 26 onwards
Gravity and Magnetics/Potential fields			3	SS	English	
Hydrogeology and Environmental Geology						
Groundwater hydraulics	Heinze	12		1		
Introduction to groundwater hydraulics			4	WS	English	
Hydraulic groundwater modelling			4	WS	English	
Field course in applied geology	Schreuer	6		annual		
Field course in applied geology (Europe, South America)			14 days		English	
Hydrogeological field methods (ab SS 2026)	Heinze	6		2		
Hydrogeological field exercises			4 days			Pre-requisite: passed modules "Hydrochemistry" and "Groundwater hydraulics"
Analysis of measurement results (Seminar)			2			
Hydrogeochemical methods I	Hachenberg	6		1		
Isotope hydrogeochemistry (lecture)			2	WS	English	
Isotope hydrogeochemistry (exercise)			2	WS	English	
Hydrogeochemical methods II	Hachenberg/Licha	9		3		
Environmental forensics and tracer development			2	WS	English	
Hydrogeochemical modelling			4	WS	English	

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Environmental sciences (ab WS 25/26)	Hachenberg	6		3		
Climate change and water resources			2		English	Block course in February
Toxic trace elements in groundwater			2		English	
Hydrochemistry	Licha	12		1		
Inorganic hydrochemistry			4	WS	English	
Organic hydrochemistry			4	WS	English	
Siedlungswasserwirtschaft	Licha/Import Civil Engineering	5		2		
Siedlungswasserwirtschaft			3	SS	German	
Petrology and Geochemistry						
Basics in Petrology	Fonseca	6		1		
Mineralogy (lecture)			2	WS	English	
Optical mineralogy (Exercise)			2	WS	English	
Igneous petrology	Bissbort	10		1, 3		
Petrology of igneous rocks			2	WS	English	Pre-requisite is passed module "Basics in Petrology" or BSc module "Baumaterial der Erde"
Thin section exercises with igneous rocks			2	WS	English	
Numerical exercises with data from igneous rocks			2	WS	English	
Metamorphic petrology	Jöns/Dziggel	12		2		
Petrology of metamorphic rocks			2	SS	English	Pre-requisites is passed module "Basics in Petrology" or BSc module "Baumaterial der Erde"
Thin section exercises with metamorphic rocks			2	SS	English	
Numerical exercises with data from metamorphic rocks			2	SS	English	
THERMOCALC course			1	SS	English	
Thermodynamics	Dohmen	6		2		
Principles of elementary thermodynamics			2	SS	English	Takes place every year
Solution phase thermodynamics			2	SS	English	
High-temperature geochemistry (ab SS26)	Fonseca	6		2		
High-temperature geochemistry			2	SS	English	Pre-requisite is passed BSc course "Geochemistry"
Practical			2	SS	English	
Mantle petrology	Beyer	5		3, 4		
Petrology of the deep Earth			2	WS	English	
Experimental Petrology: The Earth in the laboratory			2	SS	English	Passed exam from WS is pre-requisite
Sedimentology/Sedimentary Geochemistry						
Sedimentary geochemistry	Riechelmann	10		1, 3		
Isotope geochemistry Principles and applications			4	WS	English	
Laboratory course: Isotope geochemistry			4	WS	English	Block course in February/March; passed exam from lecture is pre-requisite

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Tectonics and Resources						
Field course in tectonics and resources	Dziggel, Hueck	10		2, 3		
Pre-field course seminar			1	SS	English	
Field course			10 days		English	
Economic geology II	Dziggel, Hueck	10		1, 2		
Metallic mineral deposits			2	WS	English	
Non-metallic mineral deposits			1	WS	English	
Research project on ore deposits			3	SS	English	
Economic geology I	Podlaha	10		1, 2		
Petroleum geology I			2	WS	English	
Petroleum geology II			2	SS	English	
Field trip			1 day	SS	English	
Structural geology	Pascal	10		1, 2		
Lectures, seminars, exercises in structural geology			2	WS	English	
Special methods in structural geology			2	WS	English	
Structural geology field camp			8 days	SS	English	
Courses for the Complementary module (max. 15 CP)						
Advanced Programming in Python	Roth, Essing	5	3	SS	English	
Angewandte Karbonatdiagenese	Müller	3	3	WS	German	Last time offered in SS25
Anwendung der NMR-Spektroskopie in der mineralogischen und geowissenschaftlichen Forschung	Fechtelkord	3	3	SS	German	
Anwendungen der NMR-Spektroskopie in der mineralogischen und geowissenschaftlichen Forschung (short course)	Fechtelkord	3	3	SS	German	
Climate change and water resources	Hachenberg	3	2	WS	English	
Continuum mechanics	Renner	5	3	WS	English	
Deep geothermal energy	Renner	5	3	SS	English	
Diffusion chronometry	Dohmen	3	2	SS	English	Block course
Digital rock physics	Saenger (Hochschule Bo)	6	4	SS	English	
Earth surface processes and environmental change	Kranz	3	2	SS	English	
Edelsteinkunde	Schreuer/ Münchhalphen	3	2	SS	German	
Environmental forensics and tracer development	Licha	3	2	WS	English	
Evaporite und deren Nutzung	Gillhaus	2	2	WS	German	
Field course structural geology	Pascal	3	8 days	SS	English	
Geohazards: types, causes and strategies	Kranz	4	2	WS	English	
Hauptseminar Kristallographie	Schreuer	2	2	WS	English	
Hydrogeochemical modelling	Hachenberg	6	4	WS	English	
Introduction to groundwater hydraulics	Heinze	6	4	WS	German	
Introduction to Python programming	Roth, Essing	5	3	WS	English	
Isotope geochemistry Principles and applications	Riechelmann	6	4	WS	German/ English	
Kristallchemie	Schreuer/Münchhalphen	3	2	WS	German	

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Lectures, seminar, exercises in structural geology	Pascal	4	2	WS	English	
Mathematische Methoden der Physik I	Physik-Fak	5		WS	German	
Mathematische Methoden der Physik II	Physik-Fak	5		SS	German	
Methods of LA-ICPMS (lecture)	Schuth	3	2	WS	English	
Mineralization in geothermal systems	Schreuer	6	4	WS	English	
Physic of Earth materials	Renner	5	3	WS alternating	English	next time offered in WS 26/27
Praxistage Felsbau	Duda	1	1	WS	German	
Realstrukturbau und Phasenumwandlung	Schreuer/Münchhalfen	4	2	SS	German	
Reservoir geophysics	Renner	5	3	SS	English	
Rock physics	Renner	5	3	WS	English	
Shallow geothermal energy	Reinsch	3	2	WS	English	
Special methods in structural geology	Pascal	3	2	WS	English	
Synthetische Kristalle	Schreuer/Münchhalfen	4	2	SS	German	
Tektonophysik	Renner	3	2	WS	German	Last time offered in WS25/26
Underground storage	Gillhaus	2	2	SS	English	
Well logging rudiments	Reinsch	4	2	SS	English	Block course end of SS (September)

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