Karlsruher Institut für Technologie

Module Handbook
Applied Geosciences Master 2021 (Master of Science (M.Sc.))

SPO 2021

Winter semester 2026/27

Date: 16/09/2026

KIT DEPARTMENT OF CIVIL ENGINEERING, GEO AND ENVIRONMENTAL SCIENCES

Table Of Contents

1. General Information ... 5
1.1. Study program details ... 5
2. Study Program Structure ... 6
2.1. Master's Thesis ... 6
2.2. Specialisation in Geoscience: Sustainable Energy-Resources-Storage ... 6
2.3. Specialisation in Geoscience: Mineralogy and Geochemistry ... 7
2.4. Specialisation in Geoscience: Engineering Geology and Hydrogeology ... 8
2.5. Specific Supplements ... 9
2.6. Additional Examinations ... 11
3. Welcome ... 12
4. Admission Requirements ... 13
5. Profiles and Mobility Period ... 14
6. Recognition ... 18
7. Modules ... 20
7.1. 3D Geological Modelling - M-BGU-105729 ... 20
7.2. Advanced Analysis in GIS [GEOD-MPEA-3] - M-BGU-101053 ... 21
7.3. Advanced Geological Mapping - M-BGU-105736 ... 22
7.4. Applied and Regional Hydrogeology - M-BGU-105793 ... 23
7.5. Applied Mapping and Processing of Geospatial Data - M-BGU-105713 ... 24
7.6. Applied Mineralogy: Clay Science - M-BGU-102444 ... 25
7.7. Applied Mineralogy: Geomaterials - M-BGU-102430 ... 26
7.8. Basin Analysis and Modeling - M-BGU-105773 ... 28
7.9. Borehole Technology - M-BGU-105745 ... 30
7.10. Chemistry of Interfaces [bauiM1S55-BCHEM2] - M-BGU-107660 ... 32
7.11. Current Research Topics in Hydrogeology and Engineering Geology - M-BGU-105506 ... 34
7.12. Diagenesis and Cores - M-BGU-103734 ... 35
7.13. Earthworks and Foundation Engineering [bauiM5P2-ERDGB] - M-BGU-100068 ... 37
7.14. Electron Microscopy I - M-PHYS-103760 ... 39
7.15. Electron Microscopy II - M-PHYS-103761 ... 40
7.16. Engineering Geology: Laboratory and Field Methods - M-BGU-105731 ... 41
7.17. Engineering Geology: Mass Movements and Modelling - M-BGU-102442 ... 42
7.18. Environmental Geochemistry - M-BGU-105766 ... 43
7.19. Environmental Geology: Radio- & Chemotoxic Elements - M-BGU-102455 ... 44
7.20. Environmental Geotechnics [bauiM5S09-UMGEOTEC] - M-BGU-100079 ... 45
7.21. Field Seminar - M-BGU-105746 ... 47
7.22. Fundamentals of Foundation Engineering [bauiBFP9-GRUNDB] - M-BGU-106523 ... 48
7.23. Fundamentals of Project Management - M-BGU-106717 ... 50
7.24. Fundamentals of Soil Mechanics [bauiBFP8-BODMECH] - M-BGU-106521 ... 51
7.25. Geochemical and Petrological Modeling - M-BGU-105747 ... 53
7.26. Geochemical Processes and Analytical Methods - M-BGU-103995 ... 55
7.27. Geodata Analysis II – Big Data and Machine Learning - M-BGU-105634 ... 56
7.28. Geological Storage of Gas - M-BGU-102445 ... 57
7.29. Geology - M-BGU-105744 ... 58
7.30. Geospatial Data Analysis I – Programming and Geostatistics - M-BGU-105505 ... 60
7.31. Geotechnical Engineering [bauiBFP7-GEOING] - M-BGU-103698 ... 61
7.32. Geothermics I: Energy and Transport Processes - M-BGU-105741 ... 63
7.33. Geothermics II: Application and Industrial Use - M-BGU-105742 ... 64
7.34. Geothermics III: Reservoir Engineering and Modeling - M-BGU-105743 ... 65
7.35. Ground Water and Earth Dams [bauiM5S04-GWDAMM] - M-BGU-100073 ... 66
7.36. Hydrogeology: Groundwater Modelling - M-BGU-102439 ... 67
7.37. Hydrogeology: Hydraulics and Isotopes - M-BGU-105726 ... 68
7.38. Industrial Minerals and Environment - M-BGU-103993 ... 69
7.39. Internship - M-BGU-103996 ... 71
7.40. Introduction to Ceramics - M-BGU-105222 ... 72
7.41. Introduction to Computational Geodynamics: Part 1 - M-BGU-106898 ... 73
7.42. Introduction to Geohazard Analysis - M-BGU-107656 ... 75
7.43. Introduction to Paleontology - M-BGU-106693 ... 77
7.44. Isotope Geochemistry and Geochronology - M-BGU-106025 ... 78
7.45. Karst Hydrogeology - M-BGU-105790 ... 79

7.46. Master's Thesis - M-BGU-105845 ... 80
7.47. Mineral Exploration - M-BGU-105357 ... 81
7.48. Mineral Materials - M-BGU-102453 ... 83
7.49. Mineralogical Analytics - M-BGU-105765 ... 84
7.50. Numerical Methods in Geosciences - M-BGU-105739 ... 85
7.51. Ore Geology of Metals - M-BGU-103994 ... 87
7.52. Petrology - M-BGU-102452 ... 89
7.53. Petrophysics - M-BGU-105784 ... 90
7.54. Physical Chemistry for Applied Geosciences - M-CHEMBIO-104581 ... 91
7.55. Project Study - M-BGU-102438 ... 92
7.56. Raw Materials and Environment - M-BGU-105963 ... 93
7.57. Reserve Modeling - M-BGU-105759 ... 95
7.58. Reservoir Geology - M-BGU-103742 ... 96
7.59. Rock Mechanics and Rock Engineering [bauiM5P5-FMFB] - M-BGU-107001 ... 98
7.60. Sedimentary Petrology - M-BGU-103733 ... 100
7.61. Seismic Interpretation - M-BGU-105777 ... 101
7.62. Shallow Geothermal Energy - M-BGU-105730 ... 103
7.63. Structural and Phase Analysis - M-BGU-105236 ... 104
7.64. Structural Geology - M-BGU-102451 ... 105
7.65. Supplementary Studies on Science, Technology and Society - M-FORUM-106753 ... 107
7.66. Surface and Subsurface Contaminant Transport [bauiM2S54-HY10] - M-BGU-107003 ... 111
7.67. Tunneling and Underground Construction [bauiM5S11-TBUHB] - M-BGU-107002 ... 113
7.68. Water – Energy – Environment Nexus in a Circular Economy: Research Proposal Preparation - M-CIWVT-106680 ... 115
7.69. Water and Energy Cycles [bauiM2P8-WATENCYC] - M-BGU-103360 ... 116
7.70. Water Chemistry and Water Technology - M-CIWVT-103753 ... 118
7.71. X-ray Fluorescence Analysis in Geosciences – Fundamentals and Practice - M-BGU-107579 ... 119

8. Module components ... 120
8.1. 3D Geological Modelling - T-BGU-111446 ... 120
8.2. Advanced Analysis in GIS - T-BGU-101782 ... 121
8.3. Advanced Clay Mineralogy - T-BGU-104840 ... 122
8.4. Advanced Geological Mapping - T-BGU-111455 ... 123
8.5. Application and Industrial Use - T-BGU-111468 ... 124
8.6. Applied and Regional Hydrogeology - T-BGU-111593 ... 125
8.7. Applied Mapping - T-BGU-111444 ... 126
8.8. Applied Mineralogy: Geomaterials - T-BGU-104811 ... 127
8.9. Basic Seminar Supplementary Studies on Science, Technology and Society - Self Registration - T-FORUM-113579 ... 128
8.10. Basin Analysis and Modeling - T-BGU-111543 ... 129
8.11. Borehole Technology - T-BGU-111471 ... 130
8.12. Brownfield Sites - Investigation, Evaluation, Rehabilitation - T-BGU-100089 ... 131
8.13. Chemistry of Interfaces - T-BGU-115007 ... 132
8.14. Clay Mineralogy Introduction - T-BGU-104839 ... 133
8.15. Coursework ‘Rock Mechanics and Rock Engineering’ - T-BGU-113963 ... 134
8.16. Current Research Topics in Hydrogeology and Engineering Geology - T-BGU-111067 ... 135
8.17. Diagenesis - T-BGU-107559 ... 136
8.18. Earthworks and Foundation Engineering - T-BGU-100068 ... 137
8.19. Elective Specialization Supplementary Studies on Science, Technology and Society / About Knowledge and Science - Self-Registration - T-FORUM-113580 ... 138
8.20. Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Public Debates - Self Registration - T-FORUM-113582 ... 139
8.21. Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Society - Self-Registration - T-FORUM-113581 ... 140
8.22. Electron Microscopy I - T-PHYS-107599 ... 141
8.23. Electron Microscopy II - T-PHYS-107600 ... 142
8.24. Energy and Transport Processes - T-BGU-111466 ... 143
8.25. Engineering Geologie: Laboratory and Field Methods - T-BGU-111448 ... 144
8.26. Engineering Geology: Mass Movements - T-BGU-110724 ... 145
8.27. Engineering Geology: Modelling - T-BGU-110725 ... 146
8.28. Environmental Geochemistry - T-BGU-111525 ... 147
8.29. Environmental Geology: Radio- & Chemotoxic Elements - T-BGU-107560 ... 148
8.30. Field Course Applied Structural Geology - T-BGU-107508 ... 149
8.31. Field Seminar - T-BGU-111472 ... 150

8.32. Field Trip Karst Hydrogeology - T-BGU-110413 ... 151
8.33. Fundamentals of Foundation Engineering - T-BGU-112815 ... 152
8.34. Fundamentals of Project Management - T-BGU-113492 ... 153
8.35. Fundamentals of Soil Mechanics - T-BGU-112814 ... 154
8.36. Geochemical and Petrological Modeling - T-BGU-111473 ... 155
8.37. Geochemical Processes and Analytical Methods - T-BGU-108192 ... 156
8.38. Geodata Analysis II – Big Data and Machine Learning - T-BGU-111268 ... 157
8.39. Geological Storage of Gas - T-BGU-104841 ... 158
8.40. Geology - T-BGU-111470 ... 159
8.41. Geospatial Data Analysis I – Programming and Geostatistics - T-BGU-111066 ... 160
8.42. Geothermal Exploitation – Field Exercise - T-BGU-111469 ... 161
8.43. Geothermics in the Rhine Graben – Field Exercise - T-BGU-111467 ... 162
8.44. GIS Cartography - T-BGU-111445 ... 163
8.45. Ground Water and Earth Dams - T-BGU-100091 ... 164
8.46. Hydrogeology: Groundwater Modelling - T-BGU-104757 ... 165
8.47. Hydrogeology: Hydraulics and Isotopes - T-BGU-111402 ... 166
8.48. Industrial Minerals and Environment - T-BGU-108191 ... 167
8.49. Internship - T-BGU-108210 ... 168
8.50. Introduction into Paleontology - T-BGU-113458 ... 169
8.51. Introduction to Ceramics - T-MACH-100287 ... 170
8.52. Introduction to Computational Geodynamics – Part 1 - T-BGU-113836 ... 171
8.53. Introduction to Geohazard Analysis - T-BGU-115036 ... 172
8.54. Introduction to Reflection Seismics, Prerequisite - T-PHYS-113453 ... 173
8.55. Isotope Geochemistry and Geochronology - T-BGU-112211 ... 174
8.56. Karst Hydrogeology - T-BGU-111592 ... 175
8.57. Laboratory Work in Physical Chemistry - T-CHEMBIO-109395 ... 176
8.58. Landfills - T-BGU-100084 ... 177
8.59. Lecture Series Supplementary Studies on Science, Technology and Society - Self Registration - T-FORUM-113578 178
8.60. Master's Thesis - T-BGU-111758 ... 179
8.61. Microstructures - T-BGU-107507 ... 180
8.62. Mineral and Rock Physics - T-BGU-104838 ... 181
8.63. Mineral Exploration - T-BGU-110833 ... 182
8.64. Mineral Materials - T-BGU-104856 ... 183
8.65. Mineralogical Analytics - T-BGU-111524 ... 184
8.66. Numerical Methods in Geosciences - T-BGU-111456 ... 185
8.67. Ore Geology of Metals - T-BGU-109345 ... 186
8.68. Petrology - T-BGU-104854 ... 187
8.69. Physical Chemistry - T-CHEMBIO-103385 ... 188
8.70. Project Study - T-BGU-104826 ... 189
8.71. Radiogeochemical Field Excercise and Seminar - T-BGU-107623 ... 190
8.72. Raw Materials and Environment - T-BGU-112118 ... 191
8.73. Registration for Certificate Issuance - Supplementary Studies on Science, Technology and Society - T-FORUM-113587 192
8.74. Reserve Modeling - T-BGU-111499 ... 193
8.75. Reservoir Engineering and Modeling Exercises - T-BGU-111523 ... 194
8.76. Reservoir Geology - T-BGU-107563 ... 195
8.77. Reservoir-Analogs and Core Description - T-BGU-107624 ... 196
8.78. Rock Mechanics and Rock Engineering - T-BGU-113962 ... 197
8.79. Sedimentary Petrology - T-BGU-107558 ... 198
8.80. Seismic & Sequence Stratigraphy - T-BGU-111720 ... 199
8.81. Seismic Interpretation, Examination - T-BGU-113474 ... 200
8.82. Shallow Geothermal Energy - T-BGU-111447 ... 201
8.83. Structural and Phase Analysis - T-MACH-102170 ... 202
8.84. Student Research Project 'Earthworks and Foundation Engineering' - T-BGU-100178 ... 203
8.85. Surface and Subsurface Contaminant Transport - T-BGU-113965 ... 204
8.86. Tunneling and Underground Construction - T-BGU-113964 ... 205
8.87. Water – Energy – Environment Nexus in a Circular Economy: Research Proposal Preparation - T-CIWVT-113433 206
8.88. Water and Energy Cycles - T-BGU-106596 ... 207
8.89. Water Chemistry and Water Technology - T-CIWVT-107585 ... 208
8.90. X-ray Fluorescence Analysis in Geosciences – Fundamentals and Practice - T-BGU-114845 ... 209

1 General Information

1.1 Study program details

KIT-Department	**KIT Department of Civil Engineering, Geo and Environmental Sciences**
Academic Degree	**Master of Science (M.Sc.)**
Examination Regulations Version	**2021**
Regular semesters	**4 semesters**
Maximum semesters	**8 semesters**
Credits	**120**
Language	
Grade calculation	**Weighted by (Weight * CP)**
Additional Information	**Link to study program** www.agw.kit.edu

2 Study Program Structure

Mandatory	
Master's Thesis	**30 CP**
Specialisation in Geosciences (Elective: 1 item)	
Specialisation in Geoscience: Sustainable Energy-Resources-Storage	**70 CP**
Specialisation in Geoscience: Mineralogy and Geochemistry	**70 CP**
Specialisation in Geoscience: Engineering Geology and Hydrogeology	**70 CP**
Mandatory	
Specific Supplements	**20 CP**
Voluntary	
Additional Examinations ***This field will not influence the calculated grade of its parent.***	

2.1 Master's Thesis

Credits
30

ID	Name	Language	Term offered	Credits
Mandatory				
M-BGU-105845	Master's Thesis	**DE**	**WT+ST**	**30 CP**

2.2 Specialisation in Geoscience: Sustainable Energy-Resources-Storage

Credits
70

ID	Name	Language	Term offered	Credits
Mandatory				
M-BGU-105739	Numerical Methods in Geosciences	**EN**	**WT**	**5 CP**
M-BGU-105744	Geology	**EN**	**WT**	**5 CP**
M-BGU-105745	Borehole Technology	**EN**	**WT+ST**	**5 CP**
M-BGU-105736	Advanced Geological Mapping	**DE/EN**	**ST**	**5 CP**
Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules (Elective: at least 50 credits)				
M-BGU-105741	Geothermics I: Energy and Transport Processes	**EN**	**WT**	**5 CP**
M-BGU-103993	Industrial Minerals and Environment	**EN**	**WT**	**5 CP**
M-BGU-105759	Reserve Modeling	**EN**	**WT**	**5 CP**
M-BGU-105742	Geothermics II: Application and Industrial Use	**EN**	**ST**	**5 CP**
M-BGU-102445	Geological Storage of Gas	**DE/EN**	**ST**	**5 CP**
M-BGU-103742	Reservoir Geology	**EN**	**ST**	**5 CP**
M-BGU-102451	Structural Geology	**EN**	**ST**	**5 CP**
M-BGU-105746	Field Seminar	**EN**	**ST**	**5 CP**
M-BGU-103994	Ore Geology of Metals	**EN**	**WT**	**5 CP**
M-BGU-105743	Geothermics III: Reservoir Engineering and Modeling	**EN**	**WT**	**5 CP**
M-BGU-103734	Diagenesis and Cores	**EN**	**WT**	**5 CP**
M-BGU-105357	Mineral Exploration	**EN**	**ST**	**5 CP**
M-BGU-105730	Shallow Geothermal Energy	**EN**	**WT**	**5 CP**
M-BGU-105777	Seismic Interpretation	**DE**	**ST**	**5 CP**
M-BGU-105773	Basin Analysis and Modeling ***First usage possible from Oct 01, 2022.***	**EN**	**WT**	**5 CP**

2.3 Specialisation in Geoscience: Mineralogy and Geochemistry

Credits
70

ID	Name	Language	Term offered	Credits
Mandatory				
M-BGU-103995	Geochemical Processes and Analytical Methods	**DE**	**ST**	**5 CP**
M-BGU-102430	Applied Mineralogy: Geomaterials	**EN**	**WT**	**5 CP**
M-BGU-105747	Geochemical and Petrological Modeling	**DE/EN**	**WT**	**5 CP**
M-BGU-105765	Mineralogical Analytics	**DE**	**ST**	**5 CP**
Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules (Elective: at least 50 credits)				
M-BGU-102444	Applied Mineralogy: Clay Science	**DE/EN**	**WT**	**5 CP**
M-PHYS-103760	Electron Microscopy I	**EN**	**WT**	**5 CP**
M-PHYS-103761	Electron Microscopy II	**DE/EN**	**WT**	**5 CP**
M-BGU-103733	Sedimentary Petrology	**DE/EN**	**WT**	**5 CP**
M-BGU-102452	Petrology	**DE**	**ST**	**5 CP**
M-BGU-105357	Mineral Exploration	**EN**	**ST**	**5 CP**
M-BGU-105222	Introduction to Ceramics	**DE**	**WT**	**6 CP**
M-CHEMBIO-104581	Physical Chemistry for Applied Geosciences	**DE**	**WT+ST**	**15 CP**
M-BGU-105784	Petrophysics	**DE/EN**	**ST**	**5 CP**
M-BGU-102455	Environmental Geology: Radio- & Chemotoxic Elements	**DE/EN**	**WT**	**5 CP**
M-BGU-105736	Advanced Geological Mapping	**DE/EN**	**ST**	**5 CP**
M-BGU-102453	Mineral Materials	**DE**	**WT+ST**	**5 CP**
M-BGU-105766	Environmental Geochemistry	**DE/EN**	**WT**	**5 CP**
M-BGU-102451	Structural Geology ***First usage possible from May 31, 2022.***	**EN**	**ST**	**5 CP**
M-BGU-105746	Field Seminar ***First usage possible from May 31, 2022.***	**EN**	**ST**	**5 CP**
M-BGU-103993	Industrial Minerals and Environment ***First usage possible from May 31, 2022.***	**EN**	**WT**	**5 CP**
M-BGU-103994	Ore Geology of Metals ***First usage possible from May 31, 2022.***	**EN**	**WT**	**5 CP**
M-BGU-106025	Isotope Geochemistry and Geochronology ***First usage possible from Oct 01, 2022.***	**EN**	**ST**	**5 CP**
M-BGU-105963	Raw Materials and Environment ***First usage possible from Oct 01, 2022.***	**DE/EN**	**WT**	**5 CP**
M-BGU-107579	X-ray Fluorescence Analysis in Geosciences – Fundamentals and Practice ***First usage possible from Oct 01, 2025.***	**DE**	**WT**	**5 CP**
M-BGU-107660	Chemistry of Interfaces ***First usage possible from Apr 01, 2026.***	**DE**	**ST**	**6 CP**

2.4 Specialisation in Geoscience: Engineering Geology and Hydrogeology

Credits
70

ID	Name	Language	Term offered	Credits
Mandatory				
M-BGU-105505	Geospatial Data Analysis I – Programming and Geostatistics	**DE**	**WT**	**5 CP**
M-BGU-105731	Engineering Geology: Laboratory and Field Methods	**DE**	**WT**	**5 CP**
M-BGU-105793	Applied and Regional Hydrogeology	**DE**	**WT**	**5 CP**
Internship or Project Study (Elective: 1 item)				
M-BGU-103996	Internship	**DE/EN**	**Irreg.**	**5 CP**
M-BGU-102438	Project Study	**DE/EN**	**Irreg.**	**5 CP**
Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules (Elective: at least 50 credits)				
M-BGU-102442	Engineering Geology: Mass Movements and Modelling	**DE**	**WT**	**5 CP**
M-BGU-105790	Karst Hydrogeology	**DE**	**WT**	**5 CP**
M-BGU-105506	Current Research Topics in Hydrogeology and Engineering Geology	**DE**	**WT+ST**	**5 CP**
M-BGU-105634	Geodata Analysis II – Big Data and Machine Learning	**DE**	**ST**	**5 CP**
M-BGU-105713	Applied Mapping and Processing of Geospatial Data	**DE**	**ST**	**5 CP**
M-BGU-105726	Hydrogeology: Hydraulics and Isotopes	**DE**	**ST**	**5 CP**
M-BGU-105730	Shallow Geothermal Energy	**EN**	**WT**	**5 CP**
M-BGU-102439	Hydrogeology: Groundwater Modelling	**DE**	**WT**	**5 CP**
M-BGU-105729	3D Geological Modelling	**DE/EN**	**WT**	**5 CP**
M-BGU-103995	Geochemical Processes and Analytical Methods	**DE**	**ST**	**5 CP**
M-BGU-105741	Geothermics I: Energy and Transport Processes	**EN**	**WT**	**5 CP**
M-BGU-105963	Raw Materials and Environment ***First usage possible from Nov 10, 2023.***	**DE/EN**	**WT**	**5 CP**
M-BGU-100079	Environmental Geotechnics ***First usage possible from Nov 10, 2023.***	**DE**	**WT**	**6 CP**
M-BGU-107001	Rock Mechanics and Rock Engineering ***First usage possible from Apr 01, 2025.***	**DE**	**ST**	**6 CP**
M-BGU-102455	Environmental Geology: Radio- & Chemotoxic Elements ***First usage possible from Apr 10, 2025.***	**DE/EN**	**WT**	**5 CP**
M-BGU-103360	Water and Energy Cycles ***First usage possible from Apr 01, 2026.***	**EN**	**WT**	**6 CP**
M-BGU-107003	Surface and Subsurface Contaminant Transport ***First usage possible from Apr 01, 2026.***	**EN**	**ST**	**6 CP**

2.5 Specific Supplements

Credits
20

ID	Name	Language	Term offered	Credits
Compulsory Elective Modules Specific Supplements (Elective: at least 10 credits)				
M-BGU-105729	3D Geological Modelling	**DE/EN**	**WT**	**5 CP**
M-BGU-101053	Advanced Analysis in GIS	**DE/EN**	**ST**	**4 CP**
M-BGU-105506	Current Research Topics in Hydrogeology and Engineering Geology	**DE**	**WT+ST**	**5 CP**
M-BGU-102430	Applied Mineralogy: Geomaterials	**EN**	**WT**	**5 CP**
M-BGU-102444	Applied Mineralogy: Clay Science	**DE/EN**	**WT**	**5 CP**
M-BGU-105793	Applied and Regional Hydrogeology	**DE**	**WT**	**5 CP**
M-BGU-105713	Applied Mapping and Processing of Geospatial Data	**DE**	**ST**	**5 CP**
M-BGU-105773	Basin Analysis and Modeling ***First usage possible from Oct 01, 2022.***	**EN**	**WT**	**5 CP**
M-BGU-103996	Internship	**DE/EN**	**Irreg.**	**5 CP**
M-BGU-105745	Borehole Technology	**EN**	**WT+ST**	**5 CP**
M-BGU-103734	Diagenesis and Cores	**EN**	**WT**	**5 CP**
M-BGU-106693	Introduction to Paleontology ***First usage possible from Apr 01, 2024.***	**DE**	**ST**	**5 CP**
M-BGU-106898	Introduction to Computational Geodynamics: Part 1 ***First usage possible from Oct 01, 2024.***	**EN**	**WT**	**3 CP**
M-PHYS-103760	Electron Microscopy I	**EN**	**WT**	**5 CP**
M-PHYS-103761	Electron Microscopy II	**DE/EN**	**WT**	**5 CP**
M-BGU-100068	Earthworks and Foundation Engineering	**DE**	**WT**	**6 CP**
M-BGU-107001	Rock Mechanics and Rock Engineering ***First usage possible from Apr 01, 2025.***	**DE**	**ST**	**6 CP**
M-BGU-105746	Field Seminar	**EN**	**ST**	**5 CP**
M-BGU-106717	Fundamentals of Project Management ***First usage possible from Apr 01, 2024.***	**DE**	**see notes**	**1 CP**
M-BGU-103995	Geochemical Processes and Analytical Methods	**DE**	**ST**	**5 CP**
M-BGU-105747	Geochemical and Petrological Modeling	**DE/EN**	**WT**	**5 CP**
M-BGU-105505	Geospatial Data Analysis I – Programming and Geostatistics	**DE**	**WT**	**5 CP**
M-BGU-105634	Geodata Analysis II – Big Data and Machine Learning	**DE**	**ST**	**5 CP**
M-BGU-102445	Geological Storage of Gas	**DE/EN**	**ST**	**5 CP**
M-BGU-105736	Advanced Geological Mapping	**DE/EN**	**ST**	**5 CP**
M-BGU-107656	Introduction to Geohazard Analysis ***First usage possible from Apr 01, 2026.***	**DE**	**ST**	**3 CP**
M-BGU-105744	Geology	**EN**	**WT**	**5 CP**
M-BGU-103698	Geotechnical Engineering	**DE**	**ST**	**10 CP**
M-BGU-105741	Geothermics I: Energy and Transport Processes	**EN**	**WT**	**5 CP**
M-BGU-105742	Geothermics II: Application and Industrial Use	**EN**	**ST**	**5 CP**
M-BGU-105743	Geothermics III: Reservoir Engineering and Modeling	**EN**	**WT**	**5 CP**
M-BGU-106521	Fundamentals of Soil Mechanics ***First usage possible from Sep 11, 2024.***	**DE**	**ST**	**5 CP**
M-BGU-106523	Fundamentals of Foundation Engineering ***First usage possible from Sep 11, 2024.***	**DE**	**WT**	**5 CP**
M-BGU-100073	Ground Water and Earth Dams	**DE**	**ST**	**6 CP**
M-BGU-102439	Hydrogeology: Groundwater Modelling	**DE**	**WT**	**5 CP**
M-BGU-105726	Hydrogeology: Hydraulics and Isotopes	**DE**	**ST**	**5 CP**
M-BGU-105731	Engineering Geology: Laboratory and Field Methods	**DE**	**WT**	**5 CP**
M-BGU-102442	Engineering Geology: Mass Movements and Modelling	**DE**	**WT**	**5 CP**
M-BGU-106025	Isotope Geochemistry and Geochronology ***First usage possible from Oct 01, 2022.***	**EN**	**ST**	**5 CP**
M-BGU-105790	Karst Hydrogeology	**DE**	**WT**	**5 CP**
M-BGU-105222	Introduction to Ceramics	**DE**	**WT**	**6 CP**
M-BGU-105357	Mineral Exploration	**EN**	**ST**	**5 CP**
M-BGU-103994	Ore Geology of Metals	**EN**	**WT**	**5 CP**

ID	Name	Language	Term offered	Credits
M-BGU-102453	Mineral Materials	**DE**	**WT+ST**	**5 CP**
M-BGU-105765	Mineralogical Analytics	**DE**	**ST**	**5 CP**
M-BGU-103993	Industrial Minerals and Environment	**EN**	**WT**	**5 CP**
M-BGU-105739	Numerical Methods in Geosciences	**EN**	**WT**	**5 CP**
M-BGU-102452	Petrology	**DE**	**ST**	**5 CP**
M-BGU-105784	Petrophysics	**DE/EN**	**ST**	**5 CP**
M-CHEMBIO-104581	Physical Chemistry for Applied Geosciences	**DE**	**WT+ST**	**15 CP**
M-BGU-102438	Project Study	**DE/EN**	**Irreg.**	**5 CP**
M-BGU-105759	Reserve Modeling	**EN**	**WT**	**5 CP**
M-BGU-103742	Reservoir Geology	**EN**	**ST**	**5 CP**
M-BGU-105963	Raw Materials and Environment ***First usage possible from Oct 01, 2022.***	**DE/EN**	**WT**	**5 CP**
M-BGU-107579	X-ray Fluorescence Analysis in Geosciences – Fundamentals and Practice ***First usage possible from Oct 01, 2025.***	**DE**	**WT**	**5 CP**
M-BGU-103733	Sedimentary Petrology	**DE/EN**	**WT**	**5 CP**
M-BGU-105777	Seismic Interpretation	**DE**	**ST**	**5 CP**
M-BGU-105730	Shallow Geothermal Energy	**EN**	**WT**	**5 CP**
M-BGU-102451	Structural Geology	**EN**	**ST**	**5 CP**
M-BGU-105236	Structural and Phase Analysis	**DE**	**WT**	**4 CP**
M-BGU-107002	Tunneling and Underground Construction ***First usage possible from Oct 01, 2025.***	**DE**	**WT**	**6 CP**
M-BGU-105766	Environmental Geochemistry	**DE/EN**	**WT**	**5 CP**
M-BGU-102455	Environmental Geology: Radio- & Chemotoxic Elements	**DE/EN**	**WT**	**5 CP**
M-BGU-100079	Environmental Geotechnics	**DE**	**WT**	**6 CP**
M-CIWVT-103753	Water Chemistry and Water Technology	**DE/EN**	**WT**	**10 CP**
M-BGU-103360	Water and Energy Cycles	**EN**	**WT**	**6 CP**
M-CIWVT-106680	Water – Energy – Environment Nexus in a Circular Economy: Research Proposal Preparation ***First usage possible from Apr 01, 2024.***	**EN**	**ST**	**5 CP**

2.6 Additional Examinations

ID	Name	Language	Term offered	Credits
Additional Examinations (Elective: at most 30 credits)				
M-FORUM-106753	Supplementary Studies on Science, Technology and Society ***First usage possible from Oct 01, 2024.***	**DE**	**WT+ST**	**16 CP**

2. Welcome

We are pleased that you are interested in the Master's program in Applied Geosciences at the KIT Faculty of Civil Engineering, Earth and Environmental Sciences have decided and wish you a good start into the new semester!

If you have any questions about modules and partial services, please do not hesitate to contact us:

Lisa Schäfer

Program coordination

consultation hours:
By appointment
Build. 50.40, room 122
Phone: +49 721 608 44172
lisa.schaefer@kit.edu

Mirja Lohkamp-Schmitz

Coordination exams, courses and field exercises

consultation hours: see website
Build. 50.40, room 117
Phone: +49 721 608 43316
mirja.lohkamp-schmitz@kit.edu

About the module handbook

Welcome to the Applied Geosciences at the University of Excellence KIT, one of the few institutes in Germany to achieve top positions in international rankings. Here, at one of the largest technical research institutions in Europe, you will receive an excellent education and get to know your lecturers personally.
Karlsruhe, one of the sunniest cities in south-west Germany, offers you a high quality of life in one of Europe's strongest economic regions.The field of Applied Geosciences contributes to the applied topics of energy, storage, groundwater and raw materials. The innovative environment at KIT enables you to advance your career in industry and research.

All information about the legal and official framework of your study can be found in the respective study and examination regulations for your program. This legally binding information can be found in the KIT official announcements (https://www.sle.kit.edu/english/amtlicheBekanntmachungen.php) and at https://www.agw.kit.edu/english/9269.php.
In addition to the module handbook, information on the course of the individual courses is compiled in the course catalog (online). Information about the exams offered during the semester is stored in the student portal.

3. Admission Requirements

Excerpt from the "Statutes for the admission in the Master program in Applied Geosciences at the Karlsruhe Institute of Technology (KIT)" official announcement number 64, dated November 30, 2022:

§5 (1) An outstanding Bachelor's degree in Applied Geosciences or a related scientific field. The completed study program needs to include a minimum of 180 ECTS.

§5 (2) Necessary ECTS in the following fields need to be included in the completed study program

- Geosciences: min. 20 ECTS, geoscientific subjects like structural geology, mineralogy, petrology, hydrogeology, engineering geology, geochemistry, paleontology, geophysics, geological field exercises and geological mapping
- Physics and/ or Chemistry: min. 10 ECTS,
- Mathematics: min. 10 ECTS,
- Furthermore min. 30 ECTS in mathematical-scientific or geoscientific fields.

§5 (4) Language skills:

- German Skills according to the KIT admission and enrollment regulations
- or English Skills according to the Statutes for the Admission in the Master Program in Applied Geoscience at KIT:

  Overview (translated from the original in German language):
  - Very good proficiency in the English language corresponding to level B2 of the Common European Framework of Reference for Languages (GER), as confirmed by the
  - Test of English as a Foreign Language (TOEFL), with a result of at least 90 points
  - International English Language Testing Service (IELTS), with a result of at least 6.5 points and no partial examination worse than 5.5 points
  - University of Cambridge Certificate in Advanced English (CAE) or University of Cambridge Certificate of Proficiency in English (CPE)
  - UNIcert at least level II.

  For the following cases the proof of the B2 proficiency can be omitted:
  - A university degree of a studies program with English as the only teaching language (documented in the Diploma Supplement, the Transcipt of Records or a final certificate)
  - The University Entrance Qualification Certificate with the English course having been attended by the applicant for at least five years until graduation and the final or average grade of the last two years of the language class corresponding at least to the German grade 4 (sufficient) or at least 5 points.

4. Profiles Applied Geosciences

The MSc degree program in Applied Geosciences has three profile areas: Sustainable Energy Resources Storage (ERS), engineering and hydrogeology as well as mineralogy and geochemistry. The MSc course in the ERS profile can be studied entirely in English.

Sustainable Energy-Resources-Storage (ERS)

At KIT, the Applied Geosciences MSc profile "ERS" provides you with an understanding of Sustainable Energy, Resources and Storage. The ERS profile enables you to explore and unlock energy sources with a low carbon footprint in order to provide a sustainable supply of energy. Develope sustainable solutions for the increasing raw materal demand in the context of the emerging energy transtition. Learn about subsurface storage systems to secure a countries energy supply. You will develop analytical and soft skills to perform in an international and interdisciplinary environment.

The ERS profile is closely linked to our KIT research in the Helmholtz program for GeoEnergy and Storage, and the national ThinkTank Industrial Resources Strategies on raw materials supply. Helmholtz's geothermal energy program strives for internationally visible large scale infrastructures. The institute hosts the State's Research Unit on Geothermics evaluating wells and well logging tools. It offers world-class analytical facilities, such as geochemical and petrophysical laboratories, and IT infrastructure.

The profiel is taught in English language.

MSc AGW / Sustainable Energy-Resources-Storage			
1. Semester	2. Semester	3. Semester	4. Semester
Numerical Methods in Geosciences **5LP***	Advanced Geological Mapping **5 LP***	Borehole Technology **5 LP***	
Geology **5 LP***			
Geothermics 1: Energy and Transport Processes **5 LP***	Geothermics 2: Application and Industrial Use **5 LP***	Geothermics 3: Reservoir Engineering and Modeling **5 LP***	
Ore Geology of Metals **5 LP***	Structural Geology **5 LP***	Basin Analysis and Modeling **5 LP***	
Industrial Minerals and Environment **5 LP***	Geological Storage of Gas **5 LP***	Diagenesis and Cores **5 LP***	
Reserve Modeling **5 LP**	Reservoir Geology **5 LP***	Shallow Geothermal Energy **5 LP**	**Master Thesis 30 LP**
	Mineral Exploration **5 LP**		
	Field Seminar **5 LP**		
	Seismic Interpretation **5 LP**		
Elective Module **5 LP***	Elective Module **5 LP***	Elective Module **5 LP***	
		Elective Module **5 LP***	
Sum 30 LP & 6 exams (modules marked with *)	Sum 30 LP & 6 exams (modules marked with *)	Sum 30 LP & 6 exams (modules marked with *)	30 LP
120 LP			
Subject 1: Specialisation in Geosciences, compulsory modules 20 LP			
Subject 1: Specialisation in Geosciences, elective modules 50 LP (10 out of 15 modules)			
Subject 2 : Specific supplements 20 LP			

Profile Engineering- and Hydrogeology

As part of the Master's program in Applied Geosciences, the Hydrogeology and Engineering Geology (HYDRO-ING) profile can be selected. The profile includes the basics, applications and methods of engineering and hydrogeology, from sampling and data acquisition in the field to state-of-the-art laboratory analysis and experimental techniques to numerical modeling of groundwater flow, heat and pollutant transport as well as mass movements and underground structures. The application of artificial intelligence in water, environmental and georesearch is one of our new focuses in research and teaching.

The diverse research projects at home and abroad as well as the intensive cooperation with institutions from professional practice enable students to complete a variety of exciting and professionally qualifying master's theses. Our graduates work in engineering offices, consulting companies, construction companies, offices, state and federal authorities in the areas of applied geology, water, construction and the environment, as well as in development cooperation, at water suppliers and in research, both in Germany and internationally.

The profile is taught in German language.

MSc AGW / Hydro-/Ing.			
1. Semester	2. Semester	3. Semester	4. Semester
Geodatenanalyse I - Programmierung und Geostatistik **5LP***		Projektstudie oder Berufspraktikum **5 LP***	
Angewandte und Regionale Hydrogeologie **5LP***			
Ingenieurgeologie: Labor- und Geländemethoden (Prüfung im SS) **5LP***			
2 LP* Ingenieurgeologie: Massenbewegungen und Modellierung (Prüfung im SS) **2 LP***		Shallow Geothermal Energy **5 LP***	
3 LP* Karsthydrogeologie (Prüf im WS) **2 LP***		Hydrogeologie: Grundwassermodellierung **5 LP***	
Geothermics 1: Energy and Transport Processes **5 LP**	Hydrogeologie: Gelände- und Labormethoden **5LP***	3D Geologische Modellierung **5 LP***	
	Geodatenanalyse II - Big Data und Maschinelles Lernen **5 LP***	Aktuelle Forschungsthemen der Hydrogeologie und Ingenieurgeologie **5 LP***	**Masterarbeit 30 LP**
	Hydrogeologie: Hydraulik & Isotope 5 LP*		
	Angewandter Kartierkurs und GIS-Kartografie **5 LP***		
	Geochemische Prozesse und Analytik **5 LP**		
	Felsmechanik und Tunnelbau (Import) **6 LP**		
Wahlmodul **5 LP***	Wahlmodul **5 LP***	Wahlmodul **5 LP***	
Wahlmodul **5 LP***			
Summe 28 LP & 5 Prüfungen (Module mit *)	Summe 32 LP & 7 Prüfungen (Module mit *)	Summe 30 LP & 6 Prüfungen (Module mit *)	30 LP
120 LP			
Fach 1: Geowissenschaftliche Spezialisierung, Pflicht 20 LP			
Fach 1: Geowissenschaftliche Spezialisierung, Wahlpflicht 50 LP (10 aus 13 Modulen)			
Fach 2: Fachbezogene Ergänzung 20 LP (beispielhafte Kombination)			

Profile Mineralogy and Geochemistry

The “Mineralogy and Geochemistry” profile is aimed at students with a particular interest in the physical and chemical properties of crystals, minerals, rocks and materials. At the end of the master's degree, you will have a high level of competence in mineralogical-geochemical analysis methods to describe processes in the earth system and in relation to the human environment and will be able to apply these to various questions.

The spectrum ranges from modern high-performance ceramics to pollutants in the ecosystem. Thanks to the lecturers involved and the collaboration between the university and the large research area at KIT, various focal points in the mineralogy and geochemistry profile can be deepened.

Bachelor's and master's theses are offered in the specified subject areas, which are often integrated into national and international research collaborations or take place in close collaboration with industry but also with museums, for example. Modern mineralogy and geochemistry are characterized by a great diversity of content and range of methods in application and basic research, which is offered broadly and in-depth at the Karlsruhe location.

The profile is taught in German language.

MSc AGW / MiG			
1. Semester	2. Semester	3. Semester	4. Semester
Angewandte Mineralogie: Geomaterialien **5 LP***	Geochemische Prozesse und Analytik **5 LP***		Masterarbeit 30 LP
Geochemisch-Petrologische Modellierung **5 LP***	Mineralogische Analytik **5 LP***		
3 LP* Angewandte Mineralogie: Tone & Tonminerale **2 LP***		Sedimentpetrologie **5 LP***	
2 LP* Umweltgeochemie 3 **LP***		Elektronenmikroskopie 1 **5 LP***	
9 LP* Physikalische Chemie für AGW **6 LP***		Rohstoffe und Umwelt **5 5 LP***	
3 LP* Umweltgeologie: Radio- und chemotoxische Elemente **2 LP***			
Keramik Grundlagen (Voraussetzung Strukturkeramiken) **5 LP***	**2 LP*** Mineralisch gebundene Werkstoffe im Bauwesen 3 **LP***		
Field Seminar **5 LP**	Elektronenmikroskopie 2 **5 LP**		
Nichtmetallische Rohstoffe **5 LP**	Strukturkeramiken **5 LP**		
Metallische Rohstoffe **5 LP**	Petrologie **5 LP**		
	Lagerstättenexploration **5 LP**		
	Petrophysik **5 LP**		
	Geol. Kartierübung für Fortgeschrittene **5 LP**		
	Isotopengeochemie und Geochronologie **5 LP**		
	Structural Geology **5 LP**		
Wahlmodul **5 LP***	Wahlmodul **5 LP**	Wahlmodul **5 LP***	
		Wahlmodul **5 LP***	
		Wahlmodul **5 LP***	
Summe 28 LP & 5 Prüfungen (Module mit *)	Summe 32 LP & 7 Prüfungen (Module mit *)	Summe 30 LP & 6 Prüfungen (Module mit *)	30 LP
120 LP			

Fach 1: Geowissenschaftliche Spezialisierung, Pflicht 20 LP

Fach 1: Geowissenschaftliche Spezialisierung, Wahlpflicht 50 LP (10 aus 13 Modulen)

Fach 2: Fachbezogene Ergänzung 20 LP (beispielhafte Kombination)

Mobility period

A possible time for a stay abroad is in the 3rd semester, as the 4 modules of the compulsory area of geoscience specialization can be completed here, depending on your choice. In the compulsory elective areas, it is possible to have comparable achievements from abroad recognized.

Below is an example of a study plan with mobility in the 3rd semester.

MSc AGW / Auslandsaufenthalt			
1. Semester	2. Semester	3. Semester	4. Semester
Pflichtmodul **5LP**	Pflichtmodul **5LP**	MOBILITÄTSSEMESTER	Masterarbeit 30 LP
Pflichtmodul **5LP**	Pflichtmodul **5LP**		
Wahlpflichtmodul **5 LP**	Wahlpflichtmodul **5 LP**	Wahlpflichtmodul 5 LP	
Wahlpflichtmodul **5 LP**	Wahlpflichtmodul **5 LP**	Wahlpflichtmodul 5 LP	
Wahlpflichtmodul **5 LP**	Wahlpflichtmodul **5 LP**	Wahlpflichtmodul 5 LP	
	Wahlpflichtmodul **5 LP**		
Wahlmodul **5 LP**		Wahlmodul 5 LP	
		Wahlmodul 5 LP	
		Wahlmodul 5 LP	
Summe 30 LP & 6 Prüfungen	Summe 30 LP & 6 Prüfungen	Summe 30 LP & 6 Prüfungen	30 LP
120 LP			

Fach 1: Geowissenschaftliche Spezialisierung, Pflicht 20 LP
Fach 1: Geowissenschaftliche Spezialisierung, Wahlpflicht 50 LP
Fach 2: Fachbezogene Ergänzung 20 LP (beispielhafte Kombination)

5. Recognition of study and examination achievements within and outside the higher education

The examination regulations of the programs in Applied Geosciences at KIT stipulate that the achievements required in the curriculum of the respective program can also be proven by the recognition of external achievements. A distinction is made between achievements

- within the higher education system (worldwide, all credits earned at a recognised higher education institution in an accredited degree program);
- outside the higher education system (achievements proven at institutions with a standardised quality assurance system)

The prerequisite for recognition is the determination of the equivalence of the acquired competences by expert examiners. This involves comparing the qualification goals in the KIT goal module and the external performance and determining whether they essentially correspond. The scope and depth of external performance should be equivalent. Reasons for refusal (i.e. an externally provided service is not considered equivalent) for the subject examiners may include:

- if there is no equivalence of competences
- if the topicality is no longer given
- if equivalence cannot be determined due to missing documents

The request may be made:

- Applicants for higher semesters (change of study programme or change of location). Please note: In addition to any applications for recognition that may have been submitted, a current grade sheet with all passed and failed grades must be submitted with the application.
- Students on the KIT study program (First semester students who want to have their academic achievements from previous courses of study recognised or students returning from international time studies)
- Please note: For study programs abroad, it is strongly recommended to discuss the possibility of recognition of the intended courses with the respective KIT representative. On this occasion, further recognition details will be determined, e.g. whether a grade will be awarded (standard default) or not. The agreement reached is recorded in writing. Should there be any changes in the program on site later, these should be clarified immediately with the KIT Institute, e.g. by e-mail. In case of Erasmus, the Learning Agreement must be drawn up in advance with the Erasmus coordinator at KIT.

Form of application:

1. Applications must be submitted within the 1st semester after enrolment.
2. Compare your external performance with the local, scheduled performance via the module handbook.
3. Contact the responsible subject examiners (usually those responsible for the module) and clarify which documents are required for recognition.
4. Print and complete the application form:
   a) Application form (for services outside the Erasmus+ programme)
   b) Application form (for services provided during an Erasmus+ stay)
5. A separate application must be made for each benefit for which recognition is sought
6. Fill in page 1 of the form completely and copy it according to the number of services to be recognised
7. Please complete page 2 of the application for each achievement you wish to have recognised.
8. For each achievement, attach a copy of the first page and the completed page 2 of the achievement to be recognised and enclose with each application all documents required for recognition (e.g. copy of the certificate, transcript of records, extracts from the module handbook), on which the examination achievements on which recognition is based are documented. For documents that are not available in German or English, an officially certified translation may be required.
9. Submit all documents to the examiner as agreed. If equivalence exists with regard to the acquired competences (qualification objectives), this will be confirmed by the examiner with a stamp and signature.

The final recognition is made by the examination board on the basis of the opinion of the responsible subject examiner.

5 ANERKENNUNG VON LEISTUNGEN

Please hand in the completed and signed application form to the examination secretariat (Ms. Lohkamp-Schmitz).
10. Enclose a copy of the confirmation of the service provided.
11. The examination board will inform you about the decision by e-mail.
12. The achievements are usually entered a few weeks later by the Studiengangservice Bau-Geo-Umwelt or the *Prüfungssekretariat* Angewandte Geowissenschaften.
13. Please check whether the achievements have been entered correctly.

7 Modules

M 7.1 Module: 3D Geological Modelling [M-BGU-105729]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	German/English	5	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111446	3D Geological Modelling	**WT**	**5 CP**	**Blum**

Assessment
Written Report (approx. 15 Pages)

Prerequisites
none

Competence Goal
The students will have the required qualification to create an own 3D geological model and get an overview on available software and recent developments of these programmes. For the control of success, the students will create their own 3D geological model, which will be marked in form of a written report.

Content
The course deals with the theory and application of various software programmes for 3D geological modelling. Furthermore, an overview of various software programmes and their applications and possibilities is provided. The course will be complemented by practical exercises using a suitable software for 3D geological modelling (3 SWS in winter term).

In addition to the two courses, the students create their own 3D geological models using an available case study and document their results in a final report.

Module Grade Calculation
The grade of the module is the grade of the written report.

Additional Information
none

Workload
45h attendance time, 105 h self-study time

Recommendations
keine

Teaching and Learning Methods
Lecture, exercise, report and self-study

Base For
none

M 7.2 Module: Advanced Analysis in GIS (GEOD-MPEA-3) [M-BGU-101053]

Coordinators: Dr. Susanne Benz
Prof. Dr. Martin Breunig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
4 CP	graded	Each summer term	1 term	German/English	4	3

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-101782	Advanced Analysis in GIS	**ST**	**4 CP**	**Benz, Breunig**

Assessment
The assessment consists of an oral exam (about 20 min.)

Prerequisites
None

Competence Goal
The students explain the advanced concepts of spatial analysis and 2D interpolation procedures. Especially the different aspects of statistical reasoning are analyzed. They can categorize all analysis problems with spatial background and estimate possible solutions.

Content
After an introduction to analysis in GIS in general, this lecture is dealing with the specific approaches of statistical analysis of spatial data. Among them, in particular, the different methods of pattern analysis. This also encompasses the test strategies inherent to the aforementioned methods. Another topic is data mining, which is introduced as an extension of the point pattern analysis. Furthermore the 2D interpolation procedures are discussed (e. g. Natural Neighbor Interpolation, Kriging, …).

Module Grade Calculation
The grade of the module is the grade of the oral exam in T-BGU-101782 Advanced Analysis in GIS.

Workload
Contact hours: 30 hours

- courses plus course-related examination

Self-study: 90 hours

- consolidation of subject by recapitulation of lectures
- processing of exercises
- consolidation of subject by use of references and by own inquiry
- preparations for exam

M 7.3 Module: Advanced Geological Mapping [M-BGU-105736]

Coordinators: apl. Prof. Dr. Kirsten Drüppel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (mandatory)
Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements
Prerequisite for: M-BGU-105845 - Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	German/English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111455	Advanced Geological Mapping	**ST**	**5 CP**	**Drüppel**

Assessment
The assessment consists of an examination of another type, including field work, preparation of a geological mal and a mapping report.

Prerequisites
At least 7 days of mapping experience (min.)

- Geoscientific mapping work
- Basics of mineral and rock identification
- Basics of recording geological structures in the field

Competence Goal
The students are able to carry out a geological investigation of an unknown area independently and to create a geological map using GPS data. They can interpret the data and use it to evaluate the potential of possible geological resources.

Content
Introduction to the geology of the mapping area

Instructions for mapping of sedimentary, igneous and metamorphic rocks and analysis of their structural features

Drawing of geological profiles

Interpretation of a geological map

Assessment of the potential of existing georesources

Production of a digital geological map

Assessment and analysis of geodata with a geological background

Management of geospatial data according to established standards

Module Grade Calculation
The grade of the “examination of another type” is the module grade

Additional Information
The practical part of this course is carried out face-to-face. The field exercises are essential for the participants' progress in their studies.

Workload
70h fieldwork and 80h self studying time

Literature
Walter Maresch, Hans-Peter Schertl, Olaf Medenbach (2012): Gesteine: Systematik, Bestimmung, Entstehung. Schweizerbart, 359 S.

M 7.4 Module: Applied and Regional Hydrogeology [M-BGU-105793]

Coordinators: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111593	Applied and Regional Hydrogeology	**WT**	**5 CP**	**Goldscheider**

Assessment
Oral examination (approx 30 minutes)

Additional Information
It is mandatory to choose the module "Applied and Regional Hydrogeology" as a requirement for the module "MBGU-102439 – Hydrogeology: Groundwater Modelling", since it addresses their theoretical and practical background".

Workload
150 h, of which 50 h attendance time and 100 h self-study time

M 7.5 Module: Applied Mapping and Processing of Geospatial Data [M-BGU-105713]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111444	Applied Mapping	**ST**	**4 CP**	**Blum**
T-BGU-111445	GIS Cartography	**ST**	**1 CP**	**Menberg**

Assessment
The assessment consists of an examination of another type, consisting of:
- the geological map
- a report of 15 pages
- an oral presentation of results of approx 15 minutes duration,
and four unmarked exercise sheets for GIS cartography.

Prerequisites
Study profile Engineering and Hydrogeology

Competence Goal
The students are able to perform geological mapping campaigns in an unknown area and generate a geological map based on GPS data and GIS. The students can answer engineering and hydrogeological questions with respect to the mapped field site. They are able to interpret the data.

Content

- Geological, engineering and hydrogeological introduction to the mapping area
- Mapping of the geology and structure, as well as the engineering and/or hydrogeological features
- Geological cross-sections
- Introduction to GIS-based processing of engineering and/or hydrogeological questions
- Guidance for producing digital engineering and/or hydrogeological maps
- Evaluation and analysis of geodata with geological background

Module Grade Calculation
The module grade is the grade of the examination of another type.

Workload
150 h, of which 55 h attendance time, 95 h self-study time

Teaching and Learning Methods
Field Exercises, Exercises

M 7.6 Module: Applied Mineralogy: Clay Science [M-BGU-102444]

Coordinators: apl. Prof. Dr. Katja Emmerich
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	2 terms	German/English	4	2

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-104839	Clay Mineralogy Introduction	**WT**	**2 CP**	**Emmerich**
T-BGU-104840	Advanced Clay Mineralogy	**ST**	**3 CP**	**Emmerich**

Assessment
The assessment consists of a written ungraded test (Clay Mineralogy Introduction, 90 min. To pass 70 % of 100 % must be correct) and an examination of another type (Advanced Clay Mineralogy, graded report, ca. 12 pages, submission till 4 weeks after the end of the lecture period).

Prerequisites
None

Competence Goal
The students are able to classify clays and clay minerals and to identify processes and process parameters in (geo)technical systems.
Students are able to plan and perform clay mineralogical analyses. They are able to evaluate the results, present them in a structured way and critically evaluate them with regard to consistency.

Content

- Building blocks and ideal structure of 1:1 and 2:1 layer silicates, types of clays
- Real structure (layer charge, polytypes, interstratifications) of clay minerals.
- Analytical methods: X-ray diffraction, thermal analysis (with examples to learn how to evaluate the measurement curves), methods for determination of cation exchange capacity and layer charge, infrared spectroscopy, electron microscopy, methods for the determination of surfaces, complex phase analysis
- Material properties and process variables in technical and geotechnical applications of clays are discussed using examples of current research
- Analytical methods are applied to real samples in the laboratory

Module Grade Calculation
grade of the module is the grade of the T-BGU-104840 Advanced Clay Mineralogy

Additional Information
Depending on the auditorium, this module is held in German or English

The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

Workload
contact hours: 60

self study time: 90

M 7.7 Module: Applied Mineralogy: Geomaterials [M-BGU-102430]

Coordinators: Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	English	5	3

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-104811	Applied Mineralogy: Geomaterials	**WT**	**5 CP**	**Schilling**

Assessment
The assessment consists of an examination of another type (worksheets, reports).

To pass the worksheets and reports, at least 50% of the points must be achieved.

Prerequisites
keine

Competence Goal
The students are qualified to apply basic mineralogical approaches to describe and targeted use of geomaterials.

The students have knowledge of basic methods of applied mineralogy:

- about the basics of crystallography, this includes the detailed consideration from point to space groups.
- to describe and visualise the structures of relevant geomaterials.
- to analyse group-subgroup relationships and phase transitions of different geo-materials.

They master basic crystallographic methods and are able to apply these to a technically important group of minerals, the zeolites. The students have:

- a deep understanding of the crystal chemistry of microporous mineral phases.
- advanced knowledge of framework structures and their physico-chemical properties.
- basic knowledge of modern functional materials with key applications in industry.
- the competence to investigate and characterize materials using diffraction techniques.

Content
Modern geoscientific materials research focuses on the relationship between structure and (thus mostly) anisotropic material behaviour. Therefore, a profound understanding of symmetry and structure relationships is the focus of the course, in addition to a detailed process understanding of the mode of action of one of the most important geomaterials - zeolites. These nanoporous materials are of fundamental importance in many technical processes which cannot be imagined without them (from the food industry to petrochemistry).

- Crystallography: from point groups to space groups
- Crystal structures descriptions
- Symmetry relations between crystal structures
- group-subgroup relationships
- phase transitions of different geo-materials
- Zeolite and zeolite-like framework structures
- Industrial applications: molecular sieves, catalysts and ion exchangers.
- Fundamentals of diffraction: Theory and Praxis
- Structural determination of microporous mineral phases

Module Grade Calculation
The module grade results from the evaluation of the worksheets and reports (average of worksheets and reports).

Additional Information
Enthusiasm and commitment to mineralogical questions are expected

The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

Workload
60 hours attendance time and 90 hours self-study

Recommendations
Openess for new ideas and things

Teaching and Learning Methods
- Lectures
- Exercises
- Laboratory Exercises
- Self-study
- Discussions

Literature
Will be discussed during the lectures

Base For
A fulfilled and successful professional life and highly recommended for the module Petrophysics [M-BGU-105784].

M 7.8 Module: Basin Analysis and Modeling [M-BGU-105773]

Coordinators: TT-Prof. Dr. Nevena Tomašević
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules) (Usage from 10/1/2022)
Specific Supplements (Usage from 10/1/2022)

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	English	5	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111543	Basin Analysis and Modeling	**WT**	**5 CP**	**Tomašević**

Assessment
The assessment consists of an end-term examination of another type (graded written report up to 10 pages, submitted 4 weeks after the end of the lecture period and a final oral presentation (and discussion). Each of the two components weighs 50 %.

Prerequisites
Requirements for participation in the module exam: regular participation (max. 2 absences) and the timely submission of all exercises, 80% of them correct.

Competence Goal
The course aims at providing an in-depth understanding of the sedimentary basin evolution by considering external and internal forcing factors, and economically important geo-resources. This course will advance students' knowledge and experiences in analysis and interpretation of geological and geophysical data leading toward building numerical models required to predict and qualitatively assess sedimentary features (e.g., grain size distribution, thickness maps, key stratigraphic surfaces, porosity, permeability, etc.).

At the end of the course, students will: (1) have a physical understanding of the long- and short-term processes operating in the sedimentary basins; (2) be able to conceptualize sedimentary basin-related problems and turn them into modeling strategies; (3) be trained in the qualitative and quantitative analysis of 2D/3D seismic and well dataset; (4) learn how to use and develop parts of numerical models, and (5) critically evaluate their results to respond to specific scientific and industry-related questions.

The course will rely on active student involvement, where exercises will involve data analysis and visualization using Python/ Matlab and geological software and/or open-source codes (e.g., Petrel incl. GPM, OpendTect, landlab) and assignments will be prioritized over lectures. It is meant for students interested in combining numerical modeling and sedimentary basin analysis.

Content
In this module, students will learn about the mechanisms controlling the sedimentary basin architecture and how these can be studied by analyzing available geophysical (2D and 3D seismic lines, well logs) and geological data combined with numerical modeling techniques. The special focus will be on the rift and foreland basins as the most common hosts of ore deposits, hydrocarbons, water, and geothermal and storage sites. Each student will receive an assignment linked to the specific case study during the course.

Module Grade Calculation
The grade of the module is the grade of the examination of another type.

Additional Information
The language of instruction is English. This is a third-semester module, the students are expected to have successfully passed the modules Geology (M-BGU-105744), Seismic Interpretation (M-BGU-105777), and Numerical Methods in Geosciences (M-BGU-105739).

The practical part of this course is carried out in the present. It requires a computer laboratory with the necessary hard- and software.

Workload
contact hours: 60

self study time: 90

Literature

Basin Analysis: Principles and Application to Petroleum Play Assessment
By: Philip A. Allen and John R. Allen, ISBN: 978-0-470-67377-5 August 2013 Wiley-Blackwell 632 Pages

Mathematical Modeling of Earth's Dynamical Systems
By: Slingerland, Rudy and Kump, Lee. Princeton University Press, 2011. ISBN: 978-0-691-14513-3

Seismic Data Analysis
By: Yilmaz, Oz, 2001, Freely available at: https://wiki.seg.org/wiki/Seismic_Data_Analysis

M 7.9 Module: Borehole Technology [M-BGU-105745]

Coordinators: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each term	2 terms	English	4	2

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111471	Borehole Technology	**WT+ST**	**5 CP**	**Kohl**

Assessment
The assessment consists of a written exam (90 min) according to §4 (2) of the examination regulations and a seminar presentation with the associated report.

Prerequisites
none

Competence Goal
- The students are able to characterize reservoirs from logging data.
- The students are able to explain the basics of different drillhole technologies and are able to present results graphically and to evaluate and present them scientifically.

Content
Logging (winter term)
Summary Petrophysics: Density / Porosity / Saturation
Electr. properties of rocks
Electrical survey - Resistivity distribution around Hydrocarbon / geothermal wells
Electrical survey - SP-Log
Electrical survey - Resistivity & Induction
Nuclear logs: Gamma Log
Nuclear logs: Density Log
Nuclear logs: Neutron Log
Image-Logs
Sonic-Logs
Logging software - introduction
Logging software - practical application

Driling (summer term)
Introduction Drill Rig
Blow-out Preventer
Gas Kick
Mud circuit
ROP / Mudlog
Drilling Fluid
Pressure Profile
Drill bit
Directional drilling
Rotary / downhole motor,
BHA Bottom Hole Assembly,
MWD & LWD
Casing design

Module Grade Calculation
The written exam component weights 75% of the overall module grade, the seminar component 25%.

Workload
regular attendance: 60h
seld study including exam: 90h

M 7.10 Module: Chemistry of Interfaces (bauiM1S55-BCHEM2) [M-BGU-107660]

Coordinators: Dr. rer. nat. Andreas Bogner
Dr. Peter Thissen

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 4/1/2026)

Credits	Grading	Recurrence	Duration	Language	Level	Version
6 CP	graded	Each summer term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-115007	Chemistry of Interfaces	**WT+ST**	**6 CP**	**Bogner, Thissen**

Assessment
- module component T-BGU-115007 with oral examination according to § 4 Par. 2 No. 2

details about the learning control, see module component

Prerequisites
none

Competence Goal
The aim of the module Construction Chemistry II is to qualify students for research-oriented work in the fields of interfacial chemistry and materials science. Graduates of the module are able to independently and systematically investigate chemical and physical processes at interfaces. They have acquired in-depth knowledge of surface energy, molecular interactions and important interfacial phenomena such as wetting, adhesion and capillarity. On this basis, they can describe, analyze and explain complex interactions and stability mechanisms in colloids and emulsions.

- Students can independently analyze and experimentally investigate physical and chemical processes at interfaces.
- They have an in-depth understanding of surface energy and its significance for wetting and capillarity phenomena.
- They can explain molecular interactions as well as adhesion and friction effects at interfaces and evaluate their influence on materials.
- They are proficient in modern experimental techniques such as atomic force microscopy and surface tension measurements and use these to investigate interfaces.
- They are able to evaluate the stability of colloids and emulsions and analyze the corresponding interfacial forces.
- Students can describe and evaluate interfacial phenomena in self-organization and pattern formation in materials.
- They have the ability to identify and analytically evaluate applications of chemistry of interfaces in areas such as nanotechnology and biology.
- Students develop analytical thinking and practical research skills to work independently on scientific issues in chemistry of interfaces.
- They are able to holistically understand complex interactions between physical and chemical properties at interfaces and develop proposals for solutions.

Content
The module Chemistry of Interfaces deals with the physical and chemical properties of interfaces. It begins with the basics of surface energy, describes molecular interactions and explains important interfacial phenomena such as wetting and capillarity. Adhesion, friction and the mechanisms that influence these processes are also discussed. Another central topic is the stability of colloids and emulsions as well as the forces acting at interfaces. Modern experimental techniques for the investigation of surfaces, such as atomic force microscopy and surface tension measurements, are also described in detail. The module explains the role of interfaces in processes such as self-organization and pattern formation. Applications in various fields such as materials science and also geology are demonstrated. The module places particular emphasis on practical examples.

Module Grade Calculation
grade of the module is grade of the exam

Additional Information
The module will be offered newly as from summer term 2026.

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendations
none

Literature
[1] Physics and Chemistry of Interfaces, Second Revised and Enlarged Version (2006), Hans-Jürgen Butt, Karlheinz Graf, Michael Kappl, WILEY-VCH GmbH & Co. KGaA.

M 7.11 Module: Current Research Topics in Hydrogeology and Engineering Geology [M-BGU-105506]

Coordinators: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	pass/fail	Each term	2 terms	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111067	Current Research Topics in Hydrogeology and Engineering Geology	**WT+ST**	**5 CP**	**Goldscheider**

Assessment
Attendance at current lecture series, field exercise report(s) (1 page/day), presentation (approx 20 min)

Prerequisites
none

Competence Goal
The students can name and explain current research topics in hydro- and engineering geology. They are able to analyze, discuss and present current research topics. They can recognize relevant phenomena and processes in the field

Content

- Selected lectures on current research topics in hydro- and engineering geology (e.g. Geologisches Fachgespräch, Karst Lecture, International Distinguished Lectures)
- Changing field exercises to current research regions
- Review of a current research topic on the basis of literature, presentation and discussion, accompanying mentoring program

Module Grade Calculation
not marked

Workload
150 h, of which 70 h attendance time and 80 h self-study time

M 7.12 Module: Diagenesis and Cores [M-BGU-103734]

Coordinators: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	English	5	2

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-107559	Diagenesis	**WT**	**3 CP**	**Hilgers**
T-BGU-107624	Reservoir-Analogs and Core Description	**ST**	**2 CP**	**Hilgers**

Assessment
The assessment is a marked written report and an unmarked written report

1. Diagenesis: The assessment is based on a marked written report (10 pages) describing and interpreting a given thin section by independent practical microscopy over 4h on the day after completion of the course. This covers petrographic description of a sedimantary rock in thin section, its interpretation plus thin section images and raw data in the enclosure. Submission of report: 2 weeks after the end of the course.

2. Reservoir-Analogs and Core Description: The assessment is based on a passed report of 2 pages plus digital and hand-written enclosures of a core description (passed/not passed). Submission of report: 2 weeks after the end of the course.

Prerequisites
Entrance to the module examination requires the submission of homework (100%) within the given deadline, of which 80% are passed.

Modeled Prerequisites
The following conditions have to be fulfilled:

1. The module M-BGU-103742 - Reservoir Geology must have been passed.

Competence Goal
After this module, students will be able to apply basic industry standard analyses of sedimentary petrology and diagenesis, and core analysis for reservoir quality assessments.

Course 1: After this course students will be able to apply a industry-standard workflow of petrographic analyses of clastic sediments (description, quantification etc.), sandstone- and carbonate classification, evaporites, provenance, to derive diagenetic processes, evaluate reservoir characteristics and assess resevoir quality. They can critically assess data for sampling campaigns.

Course 2: After this course students are enabled to describe reservoir rocks in the field and in cores according to industry standards. They derive facies models and integrate data into state-of the art software

Content
detrital compenents, authigenic components, provenance assessment, point counting, reservoir quality assessment (geothermal, transitional hydrocarbons)

Module Grade Calculation
The grade of the module is the grade of the exam.

Additional Information
Course 1 Diagenesis: You will work with thin sections from real reservoir rocks and understand the difference between analogs and reservoirs. The course considers to involve an industry expert.

Course 2 Reservoir Analogs and Cores: You will work on real reservoir cores which we obtained from wells in the North Sea and elsewhere.

The practical part of this course is carried out in presence. The attendance is obligatory. The microscopy exercises as well as the field course are essential for the study progress of the participants.

Workload
5CP (150h)

contact time: 45h (3SWS)

self-study time: 105h

Recommendations
The student shall have a basic knowledge of reservoir geology

Literature
• Stonecipher, S.A. 2000. Applied sandstone diagenesis - practical petrographic solutions for a variety of c ommon exploration, development, and production problems. SEPM Short Course No. 50
• Nader, F.H. 2020. Multi-scale Quantitative Diagenesis and Impacts on Heterogeneity of Carbonate Reservoir Rocks. Springer.
• Boggs, S. 2010. Petrology of sedimentary rocks. Cambridge Univ Press

M 7.13 Module: Earthworks and Foundation Engineering (bauiM5P2-ERDGB) [M-BGU-100068]

Coordinators: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
6 CP	graded	Each winter term	1 term	German	4	3

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-100068	Earthworks and Foundation Engineering	**WT+ST**	**4 CP**	**Stutz**
T-BGU-100178	Student Research Project 'Earthworks and Foundation Engineering'	**WT**	**2 CP**	**Stutz**

Assessment
- module component T-BGU-100178 with not graded coursework according to § 4 Par. 3
- module component T-BGU-100068 with written examination according to § 4 Par. 2 No. 1

details about the learning controls, see module components

Prerequisites
none

Competence Goal
With regard to geotechnical constructions the students are able to select and apply appropriate methods for exploration, modelling, dimensioning, realization and control in the case of complex requirements on average. They can apply this knowledge to earthworks and embankment engineering, can identify all geotechnically relevant problems occurring with dams and can apply self-reliantly design and dimensioning rules in outline. They gained geotechnical competence in solving problems for all kind of constructions in and with unconsolidated rocks, also with respect to the managerial organization, expense budgeting, use of documents and presentation of results.

Content
The module deepens the safety concepts in earthworks and foundation engineering and the project design for foundation problems by means of several examples (foundations on soft soil, variants of construction pit supporting system, stabilization and drainage of embankments, slope stabilization, retaining structure, underpinning) and explains the observation method. Basics of earthworks and foundation engineering are presented such as building materials for dams, design requirements, construction of dams, sealing and stability of filled dams. Further basics are computation of seepage and the evaluation of erosion, suffosion, piping, colmatation and joint erosion.

Module Grade Calculation
grade of the module is grade of the exam

Additional Information
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- Foundation Types lecture/exercise: 30 h
- Basics in Earthworks and Embankment Dams lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Foundation Types: 10 h
- preparation and follow-up lecture/exercises Basics in Earthworks and Embankment Dams: 10 h
- preparation of student research project (not graded coursework): 60 h
- examination preparation: 40 h

total: 180 h

Recommendations
basic knowledge of Soil Mechanics and Foundation Engineering;

compilation and submission of student research project as examination preparation until examination date

Literature
[1] Witt. K.J. (2008), Grundbau-Taschenbuch, Teil 1,
[2] Ernst & S. Smoltczyk, U. (2001), Grundbau-Taschenbuch, Teil 2-3,
[3] Ernst & S. Schmidt, H.G. & Seitz, J. (1998), Grundbau , Bilfinger & Berger
[4] Striegler (1998), Dammbau in Theorie und Praxis, Verlag für Bauwesen Berlin
[5] Kutzner (1996), Erd- und Steinschüttdämme für Stauanlagen, Enke Verlag Stuttgart

M 7.14 Module: Electron Microscopy I [M-PHYS-103760]

Coordinators: TT-Prof. Dr. Yolita Eggeler
Organisation: KIT Department of Physics
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-PHYS-107599	Electron Microscopy I	**Irreg.**	**5 CP**	**Eggeler**

Competence Goal
From analogies to light microscopy, students will understand parallels and differences between light microscopy and transmission electron microscopy (TEM) as well as image formation in the transmission electron microscope. Students will be able to describe and explain the interaction between high energy electrons and solids (kinematic diffraction theory and its limitations in electron-solid interaction, dynamic diffraction theory). Using theoretical concepts for dynamic electron diffraction and the imaging process, interpret TEM images (What contrasts arise for perfect solids and defects in solids?). Through application examples from solid state physics and materials research, students will learn and understand the applications and limitations of TEM.

In the practical exercises, the theoretical concepts covered in the lecture, as well as TEM imaging modes, are visualized, practiced, and explored in greater depth through work in small groups.

Content
Transmission electron microscopy (TEM), high-resolution TEM, scanning transmission electron microscopy, kinematic and dynamic electron diffraction in the solid state, TEM contrast generation with application examples from materials and solid state physics, electron holography, transmission electron microscopy with phase plates.

Literature

- D.B. Williams, C.B Carter, Transmission Electron Microscopy, 2nd edition, Springer
- L. Reimer, H. Kohl, Transmission Electron Microscopy, Springer Verlag

M 7.15 Module: Electron Microscopy II [M-PHYS-103761]

Coordinators: TT-Prof. Dr. Yolita Eggeler
Organisation: KIT Department of Physics
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	German/English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-PHYS-107600	Electron Microscopy II	**Irreg.**	**5 CP**	**Eggeler**

Literature

- D.B. Williams, C.B Carter, Transmission Electron Microscopy, 2nd edition, Springer
- L. Reimer, H. Kohl, Transmission Electron Microscopy, Springer Verlag

M 7.16 Module: Engineering Geology: Laboratory and Field Methods [M-BGU-105731]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	2 terms	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111448	Engineering Geologie: Laboratory and Field Methods	**WT+ST**	**5 CP**	**Blum**

Assessment
The assessment consists of an oral exam (20 min) and two non-assessed reports (Laboratory and field methods).

Prerequisites
keine

Additional Information
The practical part of this course is carried out in presence. The field courses and laboratory courses are essential for the progress of the participants.

M 7.17 Module: Engineering Geology: Mass Movements and Modelling [M-BGU-102442]

Coordinators: Dr. Kathrin Menberg
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	2 terms	German	4	2

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-110724	Engineering Geology: Mass Movements	**WT**	**2 CP**	**Menberg**
T-BGU-110725	Engineering Geology: Modelling		**3 CP**	**Blum**

Prerequisites
none

M 7.18 Module: Environmental Geochemistry [M-BGU-105766]

Coordinators: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	2 terms	German/English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111525	Environmental Geochemistry	**WT**	**5 CP**	**Eiche**

Assessment
The assessment consists of an examination of another type (ca. 10 exercise sheets in ILIAS for the lecture, a presentation of 30 min including discussion and a report related to the presentation of 10-20 pages) according to §4 (2) of the examination regulations.

Prerequisites
none

Competence Goal
The students can work out which natural and anthropogenic substance flows are relevant for selected elements. They know how and through which factors and processes the substance flow can change both over time and regionally to globally. They also understand the complex interactions between different spheres and different geochemical processes. They know selected methodological and analytical approaches to characterize substance flow. They are able to apply this knowledge to current environmental geochemical research results and develop well-founded interpretations and solutions. In addition, students can present selected issues of environmental geochemistry in an informative presentation and critically discuss them in a scientifically written seminar paper

Content
- Seminar with annually changing, selected topics that are related to aspects and prob-lems in environmental geochemistry
- Sources, sinks and substance flows of selected environmentally relevant elements such as As, Se, Hg, Cr
- Methods for characterizing the pollutant dynamics in the environment
- Process-oriented interpretation and discussion of current research results with regard to pollutant dynamics, including the development of adapted mitigation measures
- Special features of the pollutant dynamics in estuaries

Module Grade Calculation
The grade of the “ examination of another type ” is the module grade

Additional Information
The course is carried out face-to-face.

Workload
150 h

Teaching and Learning Methods
lecture and exercises

Literature
Alexandre, P. 2021. Practical Geochemistry. Springer Textbooks in Earth Sciences, Geography and Environment. Springer Nature Switzerland AG. https://doi.org/10.1007/978-3-030-72453-5
Holland, H.D., Turekian, K.K. 2014. Treatise on Geochemistry (Vol. 14) – Environmental Geochemistry. Elsevier Science.
Ryan, P. 2014. Environmental and Low Temperature Geochemistry. John Wiley & Sons, Incorporated.
Adriano, D.C. 2001. Trace elements in terrestrial environments: biogeochemistry, bioavailability, and risks of metals. 2nd edition. Springer New York, Berlin, Heidelberg.

M 7.19 Module: Environmental Geology: Radio- & Chemotoxic Elements [M-BGU-102455]

Coordinators: Dr. Frank Heberling
Dr. Volker Metz

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules) (Usage from 4/10/2025)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	2 terms	German/English	5	3

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-107560	Environmental Geology: Radio- & Chemotoxic Elements	**WT**	**3 CP**	**Heberling**
T-BGU-107623	Radiogeochemical Field Excercise and Seminar	**ST**	**2 CP**	**Heberling**

Assessment
The assessment consists of

- a written exam (90 min) about the lecture and

- an ungraded coursework: Seminar as preparation for field excercise (15 min presentation) and report (15-20 pages, submission till 2 months after the excercise)

Prerequisites
None

Additional Information
Depending on the auditorium, this module is held in German or English

The practical part of this course is carried out in presence. The field courses and laboratory courses are essential for the progress of the participants.

M 7.20 Module: Environmental Geotechnics (bauiM5S09-UMGEOTEC) [M-BGU-100079]

Coordinators: Dr.-Ing. Andreas Bieberstein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules) (Usage from 11/10/2023)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
6 CP	graded	Each winter term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-100084	Landfills	**WT**	**3 CP**	**Bieberstein**
T-BGU-100089	Brownfield Sites - Investigation, Evaluation, Rehabilitation	**WT**	**3 CP**	**Bieberstein**

Assessment
- module component T-BGU-100084 with oral examination according to § 4 Par. 2 No. 2
- module component T-BGU-100089 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls, see module components

Prerequisites
none

Competence Goal
The students can describe the legal guidelines regarding the disposal of wastes and the permitted threshold value for brownfields. They can outline the geotechnical concerns in the construction of landfill sites depending on the particular landfill classification, landfill elements, their relevant requirements and necessary certifications. They are able to interlink interdisciplinarily the chemical, mineralogical, biological, hydraulic and geotechnical aspects dealing with brownfileds. They can choose reasonably between the relevant remediation technologies and assess their limits of applications and risks.

Content
The module covers geotechnical techniques in dealing with waste and brownfields. The environmental engineering, scientific and legal basics are discussd. Working steps of project planning, building materials, ways of construction and proofs are presented. Techniques for burning and immobilisation are explained as well as different microbiological, electrokinetic, hydraulic and pneumatic soil remediation methods.

Module Grade Calculation
grade of the module is CP weighted average of grades of the partial exams

Additional Information
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- Landfills lecture/exercise: 30 h
- Brownfield Sites - Investigation, Evaluation, Rehabilitation lecture: 30 h
- Excursion: 10 h

independent study:

- preparation and follow-up lecture/exercises Landfills: 25 h
- examination preparation Landfills (partial examination): 30 h
- preparation and follow-up lectures Brownfield Sites - Investigation, Evaluation, Rehabilitation: 25 h
- examination preparation Brownfield Sites - Investigation, Evaluation, Rehabilitation (partial examination): 30 h

total: 180 h

Recommendations
none

Literature

DGGT, GDA-Empfehlungen – Geotechnik der Deponien und Altlasten, Ernst und Sohn, Berlin
Drescher (1997), Deponiebau, Ernst und Sohn, Berlin
Reiersloh, D und Reinhard, M. (2010): Altlastenratgeber für die Praxis, Vulkan-V. Essen

M 7.21 Module: Field Seminar [M-BGU-105746]

Coordinators: Prof. Dr. Armin Zeh
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 5/31/2022)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	English	5	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111472	Field Seminar	**ST**	**5 CP**	**Zeh**

Assessment
The assessment is the participation of a 10 day (often international) field trip, taking notes in a geological field book, and depending on the respective lecturer a preliminary seminar, daily minutes during the trip, final report or some similar reporting.

Prerequisites
None

Competence Goal
After this module, the student can document and analyse new geological regions, and transfer knowledge.

Content
- Introduction to the geology of the region
- Recognition of rocks and their structures for the assessment of georeservoirs and georesources
- Derivation of geological processes

Module Grade Calculation
The grade of the module is the grade of the written report.

Additional Information
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
Contact time: 100h
Self-study time: 50h

Recommendations
Students are strongly recommended to take this module in their final year of study.

Literature
• Tucker M 2011. Sedimentary rocks in the field. The Geological Field Guide Series.
• Lisle, R. et al 2011. Basic Geological Mapping. The Geological Field Guide Series.
• Jerram D, Petford N 2011. The field description of igneous rocks. The Geological Field Guide Series.
• Fry, N. 1991. The field description of metamorphic rocks. Geol.Soc.Lond.Prof. Handbook Series
• McClay, K. 1991. The mapping of geological structures. Geol.Soc.Lond.Prof. Handbook Series

M 7.22 Module: Fundamentals of Foundation Engineering (bauiBFP9-GRUNDB) [M-BGU-106523]

Coordinators: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements (Usage from 9/11/2024)

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	German	3	2

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-112815	Fundamentals of Foundation Engineering	**WT+ST**	**5 CP**	**Stutz**

Assessment
- module component T-BGU-112815 with written examination according to § 4 Par. 2 No. 1

details about the learning control, see module component

Prerequisites
none

Competence Goal
The students know the usual geotechnical construction methods for standard applications, such as building foundations, construction pit linings and tunnels. With this knowledge they can independently select, designgeotechnical constructions adapted to the respective ground and groundwater conditions as well as describe their construction process. Further, they are able to proof independently ultimate limit states and serviceability limit states of those geotechnical constructions and natural slopes and to evaluate the results critically.

Content
The module imparts theoretical principles for designing of the most common geotechnical constructions. This covers:

- standards, codes and safety concepts in foundation engineering
- seepage and groundwater management
- design of shallow foundations
- earth pressure and earth resistance, design of retaining structures and retaining walls for excavations
- pile foundations, deep foundations and caisson foundations in open water
- methods for soil improvement
- introduction to tunneling
- resource conservation in Geotechnical Engineering

Module Grade Calculation
grade of the module is grade of the exam

Additional Information
Tutorials are offered accompanying to the lectures, the participation is strongly recommended.

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 30 h
- attendance in tutorials: 30 h
- examination preparation: 30 h

total: 150 h

Recommendations
The attendance of the lecture accompanied tutorials (6200517) is recommended.

It is highly recommended to take the module Basics in Soil Mechanics [M-BGU-106521] first.

Literature

Gudehus, G (1981): Bodenmechanik, F. Enke

Grundwissen "Der Ingenieurbau" (1995) Bd. 2: Hydrotechnik – Geotechnik, Ernst u. Sohn

Lang, H-J, Huder, J, Amann, P, Puzrin A.M. (2011): Bodenmechanik und Grundbau, Springer Verlag

Kolymbas, D.: Geotechnik, Springer-Verlag 5. Auflage

M 7.23 Module: Fundamentals of Project Management [M-BGU-106717]

Coordinators: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements (Usage from 4/1/2024)

Credits	Grading	Recurrence	Duration	Language	Level	Version
1 CP	pass/fail	see Annotations	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-113492	Fundamentals of Project Management		**1 CP**	**Hilgers**

Assessment
The assessment of the module consists of

- attending the course 1 (100%) and contributing to discussions and exercises (unmarked).
- submit a written report for course 2 Project Study (marked)

Prerequisites
none.

Content
The module consists of

- the course 1 Fundamentals of Project Management (1SWS): Lectures and exercises (1SWS) are conducted in the first half of the semester
- the course 2 Project Study

M 7.24 Module: Fundamentals of Soil Mechanics (bauiBFP8-BODMECH) [M-BGU-106521]

Coordinators: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements (Usage from 9/11/2024)

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	German	3	2

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-112814	Fundamentals of Soil Mechanics	**WT+ST**	**5 CP**	**Stutz**

Assessment
- module component T-BGU-112814 with written examination according to § 4 Par. 2 No. 1

details about the learning control, see module component

Prerequisites
none

Competence Goal
The students have a scientifically sound understanding of the building material 'soil' with respect to its appearance and mechanical behaviour. They are able to describe the latter on base of soil mechanical and geohydraulic models, to classify and to analyse respective field and laboratory tests. They are able to proof independently ultimate limit states and serviceability limit states of natural slopes and shollow foundations and to evaluate the results critically.

Content
The module imparts theoretical principles of soil behavior. This covers:

- standards, codes and safety concepts in foundation engineering
- subsoil investigation, soil classification, soil properties and soil parameters
- permeability and seepage
- stress distributions in the subsoil, compression behavior and consolidation
- shear resistance of soils, stability of slopes and foundations
- design and settlement calculation of shallow foundations
- earth pressure and earth resistance

Module Grade Calculation
grade of the module is grade of the exam

Additional Information
Tutorials are offered accompanying to the lectures, the participation is strongly recommended.

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 30 h
- attendance in tutorials: 30 h
- examination preparation: 30 h

total: 150 h

Recommendations
The attendance of the lecture accompanied tutorials (6200417) is recommended.

Literature

Gudehus, G (1981): Bodenmechanik, F. Enke

Grundwissen "Der Ingenieurbau" (1995) Bd. 2: Hydrotechnik – Geotechnik, Ernst u. Sohn

Lang, H-J, Huder, J, Amann, P, Puzrin A.M. (2011): Bodenmechanik und Grundbau, Springer Verlag

Kolymbas, D.: Geotechnik, Springer-Verlag 5. Auflage

M 7.25 Module: Geochemical and Petrological Modeling [M-BGU-105747]

Coordinators: Prof. Dr. Armin Zeh
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	German/English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111473	Geochemical and Petrological Modeling	**WT**	**5 CP**	**Drüppel, Eiche, Heberling, Zeh**

Assessment
The assessment consists of an oral examination (approx 30 minutes duration)

Prerequisites
none

Competence Goal
The students have knowledge about fundamental principles of equilibrium thermodynamics and their application in geoscience. They are able to calculate phase diagrams in P-T-X space, and to model ionic speciations, mineral dissolution and -precipitation processes and mineral surface processes by applying appropriate thermodynamic software. Furthermore, the students will be enabled to evaluate calculation results in a geochemical-petrological context.

Content
(Part1) Introduction into geochemical thermodynamics

The components of Gibbs equation (H, S , V), equilibrium constant, excess energy, activity, fugacity, a-X relations, standard state, chemical potential, internally consistent thermodynamic datasets

Calculation of different kinds of thermodynamic equations: (i) simple mineral reactions, (ii) reactions with solid-solutions, (iii) reactions including fluid phases, (iv) Ionar reactions; (v) redox reactions, (vi) surface reactions with fluids

Basis of Gibbs minimization

Basics and terminology of phase diagram calculations

(Part 2) calculation of phase diagrams for petrological applications with software THERMOCALC, THERIAK-DOMINO and PERPLE-X

Basics and differences of the three programs, calculation of T-X diagrams and P-T pseudosections for complex systems comprising volatiles and melts, practical applications

(Part 3) calculation of equilibrium reactions between solids, liquids, and gases at low-T conditions with the software PHREEQC, with application to actual research problems

Module Grade Calculation
The grade of the “oral examination” is the module grade

Additional Information
This module will be held for the first time in the winter term 2022/23.

The course is carried out face-to-face.

Workload
Contact Hours: Approx. 50 hours lectures and exercises

Self studying time:100 hours

Recommendations
none

Teaching and Learning Methods
Lectures (1/3) and exercises (2/3)

Literature

1. Darrell Kirk Nordstrom, James L. Munoz (1985). Geochemical Thermodynamics.

Blackwell Scientific Publications

2. Powell, R. (1978). Equilibrium Thermodynamics in Petrology. An Introduction. Joanna Cotler Books.

3. Holland, T.J.B. & Powell, R. (1999). An internally consistent thermodynamic data set for phases of petrological interest. Journal of Metamorphic Geology, 16, 309-343.

M 7.26 Module: Geochemical Processes and Analytical Methods [M-BGU-103995]

Coordinators: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (mandatory)
Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements
Prerequisite for: M-BGU-105845 - Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	2 terms	German	5	4

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-108192	Geochemical Processes and Analytical Methods	**ST**	**5 CP**	**Eiche**

Assessment
The assessment consists of an examination of another type (approx. 10 exercise sheets on ILIAS for geochemical material cycles; short lecture on an analysis method and final report on a given laboratory project for geochemical analysis).

Prerequisites
none

Additional Information
The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

Recommendations
none

M 7.27 Module: Geodata Analysis II – Big Data and Machine Learning [M-BGU-105634]

Coordinators: Dr. Tanja Liesch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111268	Geodata Analysis II – Big Data and Machine Learning	**ST**	**5 CP**	**Liesch**

Assessment
Other kind: Independent development of a given problem

Prerequisites
Choice of the profile Hydrogeology and Engineering Geology. To register for the exam, the module Geodata Analysis I - Programming and Geostatistics must have been passed.

Modeled Prerequisites
The following conditions have to be fulfilled:

1. The module M-BGU-105505 - Geospatial Data Analysis I – Programming and Geostatistics must have been passed.

Competence Goal
The students can handle large geospatial data sets (e.g. satellite data, climate data). They master basic machine learning methods and are able to program simple application cases independently.

Content

- Advanced programming
- Big data analysis (z.B. Satellitendaten, Klimaprojektionen)
- Google Earth Engine (Programming in Java Script)
- Fundamentals of Machine Learning (Supervised and Unsupervised Learning, Learning Algorithms, Classification and Regression)
- Neural Network Basics (Types on ANN, Learning Algorithms, Training, Validation, Testing, Over- and Underfitting)
- Feature Engineering
- Hyperparameter Tuning, Regularization, Ensembles
- Application Examples (Python)

Workload
50 h attendance time and 100 h self-study time

Teaching and Learning Methods
Combined lecture and computer exercises

M 7.28 Module: Geological Storage of Gas [M-BGU-102445]

Coordinators: Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	German/English	5	2

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-104841	Geological Storage of Gas	**ST**	**5 CP**	**Schilling**

Assessment
The assessment consists of an examination of another type (presentation).

Prerequisites
none

Module Grade Calculation
Module grade ist the grade of the examination of another type.

Additional Information
Depending on the auditorium, this module is held in German or English

Workload
60 h contact time

90 h self studying time

Recommendations
The student shall have a basic knowledge of reservoir geology, mathematics and physics

Literature
IPCC Report zur CO2-Speicherung

EU Richtlinie zur CO2 Speicherung

Jaeger & Cook: Fundamentals of Rock Mechanics. Wiley-Blackwell ISBN 978-0-632-05759-7, 488 S.
Zoback: Reservoir Geomechanics, Cambrige University Press, ISBN 978-0-521-14619-7, 461 S.

M 7.29 Module: Geology [M-BGU-105744]

Coordinators: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	English	5	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111470	Geology	**WT**	**5 CP**	**Hilgers**

Assessment
The assessment is a marked written exam over 120 minutes

Prerequisites
Entrance to the module examination requires the submission of homework (100%) within the given deadline, of which 80% are passed.

Competence Goal
After this module, student can apply structural geology using real world examples. Students will be trained to link rocks and depositional systems in different regional settings.

Content
Applied Structural Geology:
• Stress, Strain & Drilling
• Fractures and Mohr Circle
• Joints, Veins & Effective Stress
• Normal faults & Allen-Diagram
• Thrust faults & Balanced Cross Sections
• Strike slip fault & Scaling
• Inversion & Fault Reactivation
• Strain measurements
• Diapirs & Creep Laws
• Folds & Saddle Reefs
• Cleavage & Shear Zones
• Creep from Microstructures
• Maps / Structural Analysis

Depositional Systems of regions:
• Sea level change
• Sequence stratigraphy
• Overview, description of sediments
• Eolian systems
• Glacial Systems
• Fluvial systems
• Estuaries and incised valleys
• Deltas & Clastic Shorelines
• Evaporites
• Clastic shelves
• Reefs and platforms
• Submarine fans and Turbidites

Module Grade Calculation
The grade of the module is the grade of the written exam

Additional Information
We consider to have one field practical near Karlsruhe.

Workload
60 h attendance time and 90 h self-study time

Literature

• Ameen M.S. 2018. Operational Geomechanics EAGE
• Fossen, H. 2016. Structural Geology. Cambridge Univ Press
• Jackson, M.P.A., Hudec, M.R. 2017. Salt Tectonics, Cambridge Univ Press
• Reading, H.G. 2012. Sedimentary Environments. Blackwell
• James, N.P., Dalrympie, R.W. 2010. Facies Models 4. Geol. Ass. of Canada.
• Boggs, S. 2010. Petrology of sedimentary rocks. Cambridge Univ Press

M 7.30 Module: Geospatial Data Analysis I – Programming and Geostatistics [M-BGU-105505]

Coordinators: Dr. Kathrin Menberg
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105634 - Geodata Analysis II – Big Data and Machine Learning
M-BGU-105845 - Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	German	4	2

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111066	Geospatial Data Analysis I – Programming and Geostatistics	**WT**	**5 CP**	**Menberg**

Assessment
Student research project: programming of a code for data analysis, written documentation (ca. 5 pages)

Prerequisites
Assignment of the profile Hydrogeology and Engineering Geology

Competence Goal
Students can use the Python programming language to apply methods for statistical analysis to different geospatial datasets, prepare the results graphically, and discuss and summarize them.

Content
The course is divided into a lecture (1 SWS) and an exercise (2 SWS). The lecture teaches theoretical basics of programming in Python (program structures, database structures, data ethics & licenses, etc.), as well as methods for geostatistical analysis (regression analysis, uncertainty analysis, etc.) of spatial datasets.

The exercise covers the practical aspects of programming, data analysis, visualization and interpretation.

Workload
45 h attendance time and 105 h self-study time

Recommendations
This module should be attended and completed before the module Geodata Analysis II that builds on it

Teaching and Learning Methods
Lecture and exercise, student research project

Base For
Geodata Analysis II – Big Data and Machine Learning

M 7.31 Module: Geotechnical Engineering (bauiBFP7-GEOING) [M-BGU-103698]

Coordinators: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
10 CP	graded	Each summer term	2 terms	German	3	3

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-112814	Fundamentals of Soil Mechanics	**WT+ST**	**5 CP**	**Stutz**
T-BGU-112815	Fundamentals of Foundation Engineering	**WT+ST**	**5 CP**	**Stutz**

Assessment
- module component T-BGU-112814 with written examination according to § 4 Par. 2 No. 1
- module component T-BGU-112815 with written examination according to § 4 Par. 2 No. 1

details about the learning controls, see module components

Prerequisites
none

Competence Goal
The students have a scientifically sound understanding of the building material 'soil' with respect to its appearance and mechanical behaviour. They are able to describe the latter on base of soil mechanical and geohydraulic models, to classify and to analyse respective field and laboratory tests. The students know the usual geotechnical construction methods for standard applications, such as building foundations, construction pit linings and tunnels. With this knowledge they can independently select, designgeotechnical constructions adapted to the respective ground and groundwater conditions as well as describe their construction process. Further, they are able to proof independently ultimate limit states and serviceability limit states of those geotechnical constructions and natural slopes and to evaluate the results critically.

Content
The module imparts theoretical principles of soil behavior and demonstrates their practical application in designing of the most common geotechnical constructions. This covers:

- standards, codes and safety concepts in foundation engineering
- subsoil investigation, soil classification, soil properties and soil parameters
- permeability, seepage and groundwater management
- stress distributions in the subsoil, compression behavior and consolidation
- shear resistance of soils, stability of slopes and foundations
- design and settlement calculation of shallow foundations
- earth pressure and earth resistance, design of retaining structures and retaining walls for excavations
- pile foundations, deep foundations and caisson foundations in open water
- methods for soil improvement
- introduction to tunneling
- resource conservation in Geotechnical Engineering

Module Grade Calculation
grade of the module is CP weighted average of grades of the partial exams

Additional Information
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- Basics in Soil Mechanics lecture, exercise: 60 h
- Basics in Foundation Engineering lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises Basics in Soil Mechanics: 30 h
- attendance in tutorials Basics in Soil Mechanics: 30 h
- examination preparation Basics in Soil Mechanics (partial examination): 30 h
- preparation and follow-up lectures, exercises Basics in Foundation Engineering: 30 h
- attendance in tutorials Basics in Foundation Engineering: 30 h
- examination preparation Basics in Foundation Engineering (partial examination): 30 h

total: 300 h

Recommendations
The attendance of the lecture accompanied tutorials (6200417, 6200517) is recommended.

Further, it is highly recommended to take the partial examination Basics in Soil Mechanics before taking the partial examination Basics in Foundation Engineering.

Literature
Gudehus, G (1981): Bodenmechanik, F. Enke

Grundwissen "Der Ingenieurbau" (1995) Bd. 2: Hydrotechnik – Geotechnik, Ernst u. Sohn

Lang, H-J, Huder, J, Amann, P, Puzrin A.M. (2011): Bodenmechanik und Grundbau, Springer Verlag

Kolymbas, D.: Geotechnik, Springer-Verlag 5. Auflage

M 7.32 Module: Geothermics I: Energy and Transport Processes [M-BGU-105741]

Coordinators: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements
Prerequisite for: M-BGU-105743 - Geothermics III: Reservoir Engineering and Modeling

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	English	4	2

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111466	Energy and Transport Processes	**WT**	**5 CP**	**Kohl, Schilling**
T-BGU-111467	Geothermics in the Rhine Graben – Field Exercise	**WT**	**0 CP**	**Kohl**

Assessment
The assessment consists of a written exam (45 min) according to §4 (2) of the examination regulations and a non-assessed coursework (participation in field exercise and report) according to §4 (3) of the examination regulations.

Prerequisites
none

Competence Goal
- The students obtain knowledge in the field of geothermics and are able to integrate relevant physical processes into the subject field
- The students are able to apply methods for geothermal subsurface investigations and to make calculations with the obtained data

Content
- Heat budget of the Earth (influence of the sun, humans, stored heat, heat production)
- Heat transport in rocks (phonons, photons, elektrons, advective heat transport)
- Physical understanding of underlying mechanisms and processes
- Introduction into Geothermics, relations and boundaries to other related disciplines
- Energy conservation, thermal and petrophysical properties of rocks, temperature field of the Earth, influence of topography and climate on temperature distribution, Fourier law, stationary/instationary heat conduction, heat ransport in continental and oceanic crust, advection by flow (Darcy law), Kelvin problem, Gauss error function
- Introduction into methods and applications in geothermics: Bullard plot interpretation, measurement, Bottom Hole Temperature data
- Introduction into geophysical geodynamics

Module Grade Calculation
The grade of the module is the grade of the written exam

Additional Information
The date for the excursion and the closing date for the field exercise report will be promptly announced.

The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
45 hours regular attendance
105 hours field exercise, report and self study time

M 7.33 Module: Geothermics II: Application and Industrial Use [M-BGU-105742]

Coordinators: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements
Prerequisite for: M-BGU-105743 - Geothermics III: Reservoir Engineering and Modeling

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111468	Application and Industrial Use	**ST**	**4 CP**	**Kohl**
T-BGU-111469	Geothermal Exploitation – Field Exercise	**ST**	**1 CP**	**Kohl**

Assessment
The assessment consists of a written exam (45min) according to §4 (2) of the examination regulations and a non-assessed coursework (participation in field trip and report), see §4 (3) of the examination regulations.

Prerequisites
none

Competence Goal
- The students develop shallow and deep geothermal projects with cost estimates
- The students are able to explicate examples and case studies in theory and practice

Content
- Introduction into geothermal utilization
- Hydrothermal and enhanced (or engineered) geothermal systems (EGS)
- Stimulation methods
- Geothermal Exploration
- Thermodynamics and power plant processes
- Shallow geothermics
- Examples

Module Grade Calculation
The grade of the module is the grade of the written exam.

Additional Information
The date for the field exercise and the closing date for the field exercise report will be promptly announced.

The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
30 hours regular attendance,

2 days field exercise (30 hours),

90 hours self studying time

M 7.34 Module: Geothermics III: Reservoir Engineering and Modeling [M-BGU-105743]

Coordinators: Dr. Emmanuel Gaucher
Prof. Dr. Thomas Kohl

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	English	4	3

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111523	Reservoir Engineering and Modeling Exercises	**WT**	**5 CP**	**Gaucher**

Assessment
The assessment consists of a written exam (90 min) according to §4 (2) of the examination regulations and a seminar presentation.

Prerequisites
See modeled conditions

Modeled Prerequisites
The following conditions have to be fulfilled:

1. The module M-BGU-105741 - Geothermics I: Energy and Transport Processes must have been passed.
2. The module M-BGU-105742 - Geothermics II: Application and Industrial Use must have been passed.

Competence Goal
- The students will have a sound knowledge of the geothermal context and geothermal systems in the Upper Rhine Graben. - The students will be able to compare and to analyze geothermal systems. - The students will be able to assess and discuss geothermal systems. - The student will be able to acquire and to present in front of their peers specific knowledge of geothermal systems from the literature and to discuss.

Content
- Geothermal energy in the Upper Rhine Graben - Reservoir geology: crystalline and sedimentary rocks, the Upper Rhine Graben context - Fluid-rock interaction in geothermal reservoirs - Hydrochemistry: alteration, scaling, geothermometer, lithium - Geothermal heat transfer - Geophysical exploration methods: gravimetry and electromagnetics - Reservoir stimulation, induced seismicity and passive seismic monitoring - Geothermal reservoir numerical modelling (theory and practice)

Module Grade Calculation
The written exam component weights 60% of the overall module grade, the seminar component 40%.

Additional Information
This module takes the form of a two-week field-course at the beginning of the Winter semester, prior to the start of the lectures. It is usually held in Alsace (FR). It is composed of lectures, exercises, field exercises, seminars. Details are announced at the end of the summer semester and in ILIAS.

Workload
Regular attendance: 60 h Self-study: 90 h

M 7.35 Module: Ground Water and Earth Dams (bauiM5S04-GWDAMM) [M-BGU-100073]

Coordinators: Dr.-Ing. Andreas Bieberstein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
6 CP	graded	Each summer term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-100091	Ground Water and Earth Dams	**WT+ST**	**6 CP**	**Bieberstein**

Assessment
- module component T-BGU-100091 with oral examination according to § 4 Par. 2 No. 2

details about the learning control, see module component

Prerequisites
none

Competence Goal
The students can describe the deepened knowledge about different geotechnical groundwater problems. They can dimension dewatering under very different boundary conditions and demonstrate geohydraulic relationships by example calculations. They are able to develop own solution approaches for dam construction problems, to evaluate construction techniques and to conduct the requested geotechnical proofs.

Content
The module discusses the investigation of the groundwater conditions in laboratory and field. Geohydraulic fundamentals are extended with respect to anisotropy, saturation fronts, air permeability and groundwater drawdown under specific boundary conditions. The construction of flow nets is applied to seepage problems and the underseepage of dams. The hydrologic hydraulic and geotechnical design of dams is deepened. Hereby, the design of artificial sealings and filters is linked to the geo-mechanical proofs such as sliding, spread and uplift stability, deformation and earthquake design. Buried auxiliary structures, dams designed for overtopping as well as metrological monitoring of dams are mentioned, too.

Module Grade Calculation
grade of the module is grade of the exam

Additional Information
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- Geotechnical Ground Water Problems lecture/exercise: 30 h
- Embankment Dams (Advanced) lecture/exercise: 30 h
- field trips: 10 h

independent study:

- preparation and follow-up lecture/exercises Geotechnical Ground Water Problems: 25 h
- preparation and follow-up lecture/exercises Embankment Dams (Advanced): 25 h
- examination preparation: 60 h

total: 180 h

Recommendations
module 'Earthworks and Foundation Engineering'

Literature
[1] Cedergren, H.R. (1989), Seepage, Drainage, and Flow Nets, 3. Aufl. Wiley
[2] Herdt, W. & Arndts, E. (1985), Theorie und Praxis der Grundwasserabsenkung, 2. Aufl. Ernst & S.

M 7.36 Module: Hydrogeology: Groundwater Modelling [M-BGU-102439]

Coordinators: Dr. Tanja Liesch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-104757	Hydrogeology: Groundwater Modelling	**WT**	**5 CP**	**Liesch**

Assessment
The assessment consists of an examination of another type (working on a problem, submission ca. mid-February and a ca. 15 min presentation).

Prerequisites
The choice of the module "Hydrogeology: Methods and Application" (SPO 2016) or "Hydrogeology: Hydraulics & Isotopes" (SPO 2021) as well as the event "Digital Geoinformation Processing" (SPO 2016) or "GIS Cartography" (SPO 2021) is prerequisite for the choice/attendance of this module, as these form the theoretical and practical basis for it.

M 7.37 Module: Hydrogeology: Hydraulics and Isotopes [M-BGU-105726]

Coordinators: Dr. Tanja Liesch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	German	5	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111402	Hydrogeology: Hydraulics and Isotopes	**ST**	**5 CP**	**Liesch**

Assessment
Written exam (90 min)

Competence Goal
The students are able to independently apply methods for the evaluation of hydraulic experiments and discuss their results. They can explain and apply relevant isotope methods in hydrogeology.

Content
- Advanced pump test evaluation
- Slug test, water pressure test
- Isotope methods in theory and practice

Additional Information
The choice of the module "Hydrogeology: Hydraulics and Isotopes" as well as the active participation in it is a prerequisite for the choice/occupation of the modules Hydrogeology: Groundwater Modelling [M-BGU-102439] and Hydrogeology: Field and Laboratory Methods [M-BGU-102441], as it forms the theoretical and practical basis for them.

Workload
150 h, of which 38 h attendance time and 112 h self-study time

Teaching and Learning Methods
Lectures with Exercises

M 7.38 Module: Industrial Minerals and Environment [M-BGU-103993]

Coordinators: Prof. Dr. Jochen Kolb
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 5/31/2022)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-108191	Industrial Minerals and Environment	**WT**	**5 CP**	**Kolb**

Assessment
The assessment consists of an examination of another type (graded module report incl. field seminar report)

Prerequisites
none

Competence Goal
The students know the fundamental characteristics of industrial mineral deposits. They know the different possibilities of industrial application and quality requirements of the respective raw material. They are able to describe samples from industrial mineral deposits, recognize the relevant structure, fabric, texture and mineral assemblage. They can use their observations to make interpretations regarding mineral deposit formation and ore deposit quality. The students know the principle ore deposit models and can use this knowledge in order to interpret their sample set. They are able to decide, which mineral exploration method would be required for exploration of the various deposits and they are able to make basic assumptions about the economy of the deposit. They know how to translate geological observations into key parameters for mineral exploration.

The students know how to analyze short scientific papers and are able to understand and present the main message. They can relate the message in the paper to own observations in the samples and present a joint interpretation.

The students know how to apply their theoretical knowledge in the field. They make interpretations at various scales (thin section, sample, outcrop, deposit, district). They know, how to make meaningful sketches and how to present their observations and interpretation in written and oral formats. They are able to analyze, interpret and discuss their data in conjunction with published ore deposit models and can decide on the style of mineralization and the way of mineral exploration.

The students know different environmental risks related to the extraction of metal ores, industrial minerals and energy resources and assign them to the respective stage (exploration, extraction, processing etc.). They are able to derive the potential environmental hazards of individual types of resources and propose suitable reclamation measures based on a sound knowledge of their geochemical and mineralogical characteristics. They can assess the positive and negative effects of extraction, processing and use of different resources on humans and the environment in a differentiated manner and are thus able to critically evaluate their own behaviour in the context of sustainable use of resources.

Content
The combined lectures and practicals start with an introduction into the industrial minerals raw material market and mineral deposit evaluation. The following lessons combine a lecture about the fundamental processes of deposit formation and the relationship to mineral exploration and quality of the industrial mineral resource with practical study of representative samples. In addition, scientific papers will be read and interpreted in some lessons.

During two days of field work the theoretical and practical skills will be applied in the field in selected industrial mineral deposits. Standard methods of geological field work will be applied and directed towards interpretation of the respective deposit.

It will be looked at different environmental impacts of ore extraction and processing like acid mine drainage, cyanide leaching, amalgamation or oil spillage with specific focus on the hydrosphere, pedosphere, atmosphere, human beings and society. Furthermore, different strategies on how to minimize environmental impacts will be discussed and different examples on renaturation and reclamation will be presented. Also legal aspects of mineral resources exploration and extraction will be addressed.

Module Grade Calculation
The grade of the module is the grade of the module report incl. field seminar report

Additional Information
Students should be aware of harsh conditions during field work and should let the responsible person know, if they would have problems to work underground in old mines.

Depending on the auditorium, the course "Environmental Aspects of Mining" is held in German or English

The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
67.5 hours lectures and practicals and 82.5 self-study time

Teaching and Learning Methods
lecture, exercises, field seminar

Literature
Kesler, S.E. & Simon, A.C. (2015): Mineral Resources, Economics and the Environment. Cambrigde University Press, Cambridge, 434 pp.

Harben, P. (most recent edition): The Industrial Minerals HandyBook, a guide to markets, specifications and prices. Industrial Minerals Division, Metal Bulletin PLC, London.

Bewertungskriterien für Industrieminerale, Steine und Erden. Geologisches Jahrbuch Reihe H. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart. Different publications of various authors; in German with English abstract.

Publications of the Geological Surveys: BGR, DERA, BGS, USGS, etc.

Brown, M., Barley, B., Wood, H. 2002. Mine Water Treatment: technology, application and policy. IWA publishing

Lottermoser, B.G. 2003. Mine wastes. Springer Verlag

M 7.39 Module: Internship [M-BGU-103996]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Internship or Project Study) Specific Supplements
Prerequisite for: M-BGU-105845 - Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Irregular	1 term	German/English	4	2

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-108210	Internship	**Irreg.**	**5 CP**	

Assessment
The assessment consists of

- submission of an internship certificate from the employer with information about the internship, duration and the field of activity

- an examination of another type (graded internship report ca. 10-20 pages, equivalent to the report of the project study, and ca. 20 min presentation).

Prerequisites
The student is responsible for the acquisition and organization of the internship.
The following requirements apply to recognition:

- Before starting the internship, the student has to choose independently a lecturer from the AGW (in in case of doubt, the chairman of the examination board), who

1. confirms the geoscientific relevance based on the submission of a working plan (content, timeframe) which was planned with the company / institution and is responible for the grading of the final report.
2. The submission of an internship certificate from the internship office stating the completed internship, duration and field of activity is mandatory.

Competence Goal
• Students are able to use the skills they have acquired during their studies under realistic conditions.
• You are capable of applying and further developing technical and interdisciplinary skills such as project management in a professional environment.

Content
• Varies depending on the internship position.
• It should essentially be independent work.

Module Grade Calculation
The grading is done by the lecturer who approved the internship.

Additional Information
The premises for the recognition of a professional internship are explained in the requirements.
The professional internship that requires approval can be chosen as one of 2 modules (project study or professional internship).

Workload
At least 4 weeks of full-time internship and preparation of an internship report.

M 7.40 Module: Introduction to Ceramics [M-BGU-105222]

Coordinators: Prof. Dr. Kaline Pagnan Furlan
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
6 CP	graded	Each winter term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-MACH-100287	Introduction to Ceramics	**WT**	**6 CP**	**Pagnan Furlan**

Assessment
The assessment consists of an oral exam (approx 30 min) taking place at a specific date.
The re-examination is offered at a specific date.

Workload
180 h

M 7.41 Module: Introduction to Computational Geodynamics: Part 1 [M-BGU-106898]

Coordinators: Dr. Ali Ismail-Zade
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements (Usage from 10/1/2024)

Credits	Grading	Recurrence	Duration	Language	Level	Version
3 CP	graded	Each winter term	1 term	English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-113836	Introduction to Computational Geodynamics – Part 1		**3 CP**	**Ismail-Zade**

Assessment
The assessment consists of an oral exam (each student will have 30 min to prepare answers to questions and 30 min to present their answers). To pass the exam, students should show their understanding of the lecture course topics and quantitative ways for solving geodynamical problems, comprehension of gained knowledge, and independent thinking.

Prerequisites
Basic knowledge about Earth dynamics, its surface processes, linear algebra, differential equations, tensor analysis.

Competence Goal
The students are able (i) to develop a geodynamic problem and describe the data associated with the problem; (ii) to formulate a mathematical and numerical model to solve the geodynamic problem; (iii) to suggest the computational method(s) for solving the numerical model and justify their choice; and (iv) to analyse the pre-processing, computer performance, and post-processing steps of a numerical simulation.

Content
Introduction to Geodynamics. Plate tectonics, lithosphere subduction, hotspots, tectonic stress and strain, seismicity, and volcanism. Heat transfer in the Earth interior.

Concepts of Fluid Mechanics and Heat Transfer. Basic equations of fluid mechanics and heat transfer. Gravitational and thermal instability. Rock rheology.

Computational Methods. The basic methodologies of computational fluid dynamics. Analytical and numerical modeling. Finite Difference Method. Finite Element Method. Meshless methods. Computational aspects of numerical modeling. Pre- and post-processing and computer performance. Serial versus parallel computing.

Inverse Problems and Data Assimilation. Inverse retrospective modeling. Optimization. Backward advection. Variational (adjoint) method. Quasi-reversibility method. Applications to lithosphere dynamics, lava flow, cloaking and illusion.

AI techniques for geodynamics problems. Computer vision and application to lava dome analysis**.** Machine learning and application to recognition of large earthquakes.

Sedimentary Basins. Formation mechanisms. Salt diapirism. Restoring deformed sedimentary cover. Thermal modeling. Nexus between mantle upwelling, basin evolution, and hydrocarbon (natural hydrogen) generation.

Dynamics of the Lithosphere. Viscoelastic stress modeling. Earthquake simulators. Application to earthquake-prone regions (Carpathians, Sunda arc, Tibet-Himalayan, Caucasus). Seismic hazards.

Module Grade Calculation
Grade of the oral exam is the module grade.

Additional Information
The principal goal of the course is to introduce quantitative and interdisciplinary understanding of and thinking about geodynamical problems rather than just to provideknowledge. Enthusiasm is expected in cooperation, discussions, and debates. So, your physical presence at the lectures is advisable, but online option can be used as well (if required).

Workload
34 hours of attendance time
56 hours of self-study

Recommendations
This module will introduce general concepts of numerical modelling in geodynamics. Module M-BGU-105739 presents more specific knowledge and coding related to the numerical modelling in geothermal studies.

Literature
Textbooks

Ismail-Zadeh, A., and Tackley, P., *Computational Methods for Geodynamics*, Cambridge University Press, 2010.

Ismail-Zadeh, A., Korotkii, A., and Tsepelev, I. *Data-driven Numerical Modeling in Geodynamics: Methods and Applications*, Springer, 2016.

Turcotte, D. L., and Schubert, G., *Geodynamics*, Cambridge University Press, 3rd edition, 2014.

Multi-authored books

Fagents, S.A., Gregg, T.K.P., and Lopes, R.M.C. (eds.) *Modeling Volcanic Processes*. Cambridge University Press, 2021.

Ismail-Zadeh, A., Castelli, F., Jones, D., and Sanchez, S. (eds.) *Applications of Data Assimilation and Inverse Problems in the Earth Sciences*, Cambridge University Press, 2023.

M 7.42 Module: Introduction to Geohazard Analysis [M-BGU-107656]

Coordinators: Dr. Ali Ismail-Zade
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements (Usage from 4/1/2026)

Credits	Grading	Recurrence	Duration	Language	Level	Version
3 CP	graded	Each summer term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-115036	Introduction to Geohazard Analysis	**ST**	**3 CP**	**Ismail-Zade**

Assessment
The assessment consists of an oral exam (each student will have 60 min to prepare answers to questions and 30 min to present their answers). To pass the exam, students should show their understanding of the lecture course topics, and independent thinking

Prerequisites
Basic knowledge about Earth dynamics, its surface processes, linear algebra, differential equations.

Competence Goal
Students are able (i) to develop a problem related to geohazards and describe the data associated with the problem; (ii) to formulate the qualitative and quantitative approaches to solving the problem; and (iii) to analyse the results of hazard assessments.

Content
Geohazards. Concept of natural hazards and hazards classification. Geological hazards: earthquakes, volcanoes, landslides, land subsidence, and tsunamis. Single, compound and cascading geohazards.

Lithosphere dynamics. Basic knowledge about the lithosphere dynamics, hierarchy of blocks, stress analysis, and surface manifestations.

Earthquakes. Why, where and when? Earthquake analysis and its forecasting. Earthquake modeling.

BAFD theory. Basics of the lithospheric block-and-fault dynamics and earthquake simulations.

BAFD applications. BAFD model applications to earthquake-prone regions (e.g., SE-Carpathians, Tibet-Himalaya, Caucasus, Sunda Arc).

Seismic hazards. Deterministic and probabilistic hazard analysis. Data-enhanced seismic hazard analysis. Applications to the Shillong Plateau and Tibet-Himalayan.

Seismic risk analysis. Theory (seismic hazards, physical and social vulnerability, exposure). Application to the Caucasus region.

Volcanos. Introduction to explosive and effusive volcanic activities. Lava dynamics.

Lava flows. Modeling of lava flows. Lava rheology. Crystallization, cooling and flow morphology. Applications to lava flows at Mt. Etna

Lava domes. Modeling of lava dome growths. Effects of heat transfer.

Disaster risk analysis. Interdisciplinary and integrated approaches to risk analysis. Risk perception and understanding. Preparedness and awareness.

Module Grade Calculation
Grade of the oral exam is the module grade.

Additional Information
The principal goal of the course is to introduce interdisciplinary understanding of and thinking about geohazard risk problems. Enthusiasm is expected in cooperation, discussions, and de-bates. So, your physical presence at the lectures is required.

Workload
30 hours of regular attendance and 60 hours of self-studying time

Teaching and Learning Methods
Lecture

Literature
Beer, T. and Ismail-Zadeh, A. (eds.) *Risk Science and Sustainability*, Kluwer Academic Publishers, Dordrecht, 2003.

Fagents, S.A., Gregg, T.K.P., and Lopes, R.M.C. (eds.) *Modeling Volcanic Processes*. Cambridge University Press, 2021.

Ismail-Zadeh, A., Kijko, A., Nekrasova, A., and Shebalin, P. (eds.) *Lithosphere Dynamics and Earthquake Hazard Forecasting*. Springer-Nature, 2022.

Ismail-Zadeh, A., Urrutia Fucugauchi, J., Kijko, A., Takeuchi, K., and Zaliapin, I. (eds.) *Extreme Natural Hazards, Disaster Risks and Societal Implications*, Cambridge University Press, Cambridge, 2014.

Keilis-Borok, V. I., and Soloviev, A. A. (eds.) *Nonlinear Dynamics of the Lithosphere and Earthquake Prediction*, Springer, 2003.

M 7.43 Module: Introduction to Paleontology [M-BGU-106693]

Coordinators: Dr. Julien Kimmig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements (Usage from 4/1/2024)

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-113458	Introduction into Paleontology	**ST**	**5 CP**	**Kimmig**

Assessment
25% written exam, 25% presentation, 25% lab book, 25% work sheets

Prerequisites
none

Content
- Introduction
- Geologic time
- Theory of Evolution
- Beginning of Life
- Life in the Precambrian
- Life in the Paleozoic
- Life in the Mesozoic
- Extinction Events
- Taphonomy
- Quantitative Paleontology
- Biodiversity
  - Live and Climate

Additional Information
The exercise and lecture will take place at the Karlsruhe Natural History Museum.

Workload
Lectures: 60 hours
Self-study: 90 hours

Teaching and Learning Methods
Lecture and lab

Literature
Benton & Harper: Introduction to paleobiology and the fossil record

M 7.44 Module: Isotope Geochemistry and Geochronology [M-BGU-106025]

Coordinators: Dr. Antonin Bilau
Dr. Sara Rose Kimmig

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 10/1/2022)
Specific Supplements (Usage from 10/1/2022)

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-112211	Isotope Geochemistry and Geochronology	**ST**	**5 CP**	**Beranoaguirre**

Assessment
The assessment consists of a written exam (1.5 hours) + mandatory tests

Prerequisites
none

Competence Goal
At the end of the course the student will be able to I) collect and prepare samples independently; II) identify the appropriate isotopic system to use depending on the case of study; and III) evaluate and interpret the data.

Content
The course will provide the student with the knowledge of stable and radiogenic isotopes, which are powerful tools to track natural processes within the different Earth reservoirs. Likewise, the course also aims to allow the student to understand (and apply some of) the most used techniques for the geochronology of rock and minerals. Additionally, good lab practices will also be adquired.

Module Grade Calculation
The grade of the module is the grade of the written exam.

Workload
150 h: 60 hours of presence time (lecture, field and laboratory work), 90 hours of personal work (sample preparation, analysis, evaluation)

M 7.45 Module: Karst Hydrogeology [M-BGU-105790]

Coordinators: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	2 terms	German	4	2

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111592	Karst Hydrogeology	**WT**	**3 CP**	**Goldscheider**
T-BGU-110413	Field Trip Karst Hydrogeology	**ST**	**2 CP**	**Goldscheider**

Assessment
The assessment consists of a written exam (60 min) and a non-assessed coursework (non-assessed field exercise report).

Prerequisites
none

Competence Goal

- The students are able to understand and explain the hydrogeological characteristics of karst aquifer systems and recognize them in the field.
- They are familiar with the relevant investigation methods in karst hydrogeology for scientific research and professional practice.
- They can evaluate the vulnerability of karst groundwater resources and develop concepts for their sustainable management.

Content

- Geomorphology and hydrology of karst landscapes
- Mineralogy, stratigraphy and geologic structure of karst systems
- The carbonate equilibrium, calcite dissolution, karstification and speleogenesis
- Groundwater flow in karst aquifers
- Modeling approaches in karst hydrogeology
- Vulnerability and contaminant transport in karst
- Springs, wells and other drinking water abstraction structures in karst aquifers
- Field exercises in karst hydrogeology: Impact of climate change on karst groundwater resources, drinking water abstraction in karst areas

Additional Information
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

M 7.46 Module: Master's Thesis [M-BGU-105845]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
30 CP	graded	Each term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111758	Master's Thesis	**WT+ST**	**30 CP**	**Blum**

Assessment
The assessment consists of the Master's Thesis and a presentation. The maximum processing time for the Master's Thesis is six months. The presentation should take place within 8 weeks after the submission of the Master's Thesis.

Prerequisites
The prerequisite for admission to the master's thesis module is that the student has successfully passed module examinations for 70 CP, of which at least 10 CP are from the compulsory modules of the choosen profile in the subject “Geoscientific Specialization”.

Modeled Prerequisites
The following conditions have to be fulfilled:

1. You have to fulfill one of 3 conditions:
    1. You have to fulfill 2 of 5 conditions:
        1. The module M-BGU-105505 - Geospatial Data Analysis I – Programming and Geostatistics must have been passed.
        2. The module M-BGU-105731 - Engineering Geology: Laboratory and Field Methods must have been passed.
        3. The module M-BGU-105793 - Applied and Regional Hydrogeology must have been passed.
        4. The module M-BGU-102438 - Project Study must have been passed.
        5. The module M-BGU-103996 - Internship must have been passed.
    2. You have to fulfill 2 of 4 conditions:
        1. The module M-BGU-103995 - Geochemical Processes and Analytical Methods must have been passed.
        2. The module M-BGU-102430 - Applied Mineralogy: Geomaterials must have been passed.
        3. The module M-BGU-105747 - Geochemical and Petrological Modeling must have been passed.
        4. The module M-BGU-105765 - Mineralogical Analytics must have been passed.
    3. You have to fulfill 2 of 4 conditions:
        1. The module M-BGU-105739 - Numerical Methods in Geosciences must have been passed.
        2. The module M-BGU-105744 - Geology must have been passed.
        3. The module M-BGU-105745 - Borehole Technology must have been passed.
        4. The module M-BGU-105736 - Advanced Geological Mapping must have been passed.
2. You need to have earned at least 70 credits in your study program.

M 7.47 Module: Mineral Exploration [M-BGU-105357]

Coordinators: Dr. Simon Hector
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	English	5	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-110833	Mineral Exploration	**ST**	**5 CP**	**Eiche**

Assessment
The students will need to provide a report (~10 pages) on the specific project they have been assigned to. They need to show that they know the right methods of exploration. Deadline for the report is individually scheduled. The first version of the report has to be improved if necessary.

Prerequisites
Students need detailed knowledge on ore forming processes of metallic and non-metallic mineral resources. They also need detailed background in geochemistry and geochemical analytics. Basic knowledge of geophysical exploration methods will be expected.

Competence Goal
The students know the different geochemical methods applied to mineral resources exploration. They can choose the best-suited methods at the different stages of exploration for optimizing ore deposits discovery. They also know which exploration methods to use for specific ore deposit types.
The students know how to interpret geochemical data and how to correlate them with field and sample observations. They know how to write an exploration report.
The students will have the qualifications required for working in the ore mineral industry.

Content
-Theory for mineral exploration at regional, district, area, target and deposit scale (scientific approach, economics…).
-Geochemical distribution of metals and element of interests in the primary environment (i.e. during magmatism, metamorphism and alteration processes…).
-Geochemical dispersion of metals and element of interests in the secondary environment (i.e. soil, gossans, till, laterites…).
-Greenfield methods for exploration such as stream sediments, soil, rock and water survey.
-Brownfield methods for exploration at deposit scale with specific focus on drill core logging.
-Field sampling and laboratory data acquisition.
-Data interpretation from study cases and from data personally acquired by the stu-dents.

Module Grade Calculation
Grade of the report is the module grade.

Additional Information
The course is held in 3 blocks (1. Block short course, 2. Block short course and project preparation, 3. Block data interpretation). See university calendar / course catalogue.

In the summer term 2022 the course Mineral Exploration 6321410 will take place from September 26th to September 30th.

Workload
40h Lectures, 2-3 field work or sample selection (ca. 25h), ca. 25h laboratory work, 60h self-study (report) = 150 h

Recommendations
The students should have done the course of “Ore Geology of Metals” and “Industrial Minerals and Environment” or have background knowledge in ore geology.

Teaching and Learning Methods
Lecture, literature research, fieldwork and labwork, report

Literature
Papers presented in lectures

M 7.48 Module: Mineral Materials [M-BGU-102453]

Coordinators: Dr. Matthias Schwotzer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each term	2 terms	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-104856	Mineral Materials	**WT+ST**	**5 CP**	**Schwotzer**

Assessment
The assessment consists of an oral exam (30 min).

Prerequisites
None

Additional Information
The practical part of this course is carried out in presence. The laboratory courses are essential for the progress of the participants.

M 7.49 Module: Mineralogical Analytics [M-BGU-105765]

Coordinators: apl. Prof. Dr. Kirsten Drüppel
Prof. Dr. Frank Schilling

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (mandatory)
Specific Supplements

Prerequisite for: M-BGU-105845 - Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111524	Mineralogical Analytics	**ST**	**5 CP**	**Drüppel, Schilling**

Assessment
The assessment consists of an examination of another type, including colloquia and short reports for the laboratory exercises and a written examination.

Prerequisites
none

Module Grade Calculation
The grade of the “examination of another type” is the module grade.

Additional Information
The course is carried out face-to-face

Recommendations
none

Teaching and Learning Methods
Lectures (1/3) and exercises (2/3)

M 7.50 Module: Numerical Methods in Geosciences [M-BGU-105739]

Coordinators: Dr. Emmanuel Gaucher
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (mandatory)
Specific Supplements
Prerequisite for: M-BGU-105845 - Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111456	Numerical Methods in Geosciences	**WT**	**5 CP**	**Gaucher**

Assessment
The assessment consists of a written exam (90 min) according to §4 (2) of the examination regulations.

Prerequisites
none

Competence Goal
- The students can perform basic statistical analysis of geoscientific data including spatial statistics (geostatistics).
- The students can code simple programs in Python to process and plot data.
- Students are familiar with partial differential equations applied to fluid circulation in the subsurface and the numerical methods used to solve them (finite differences and finite elements).
- The students applied pre-processing, processing and post-processing steps of numerical simulations.

Content
Part 1
- Basic of algorithmic and programming
- Introduction to Python programming language, basic coding, exercises
- Statistical description of data: 1D, 2D and 3D data representation, comparative statistical testing, hypothesis testing
- Statistical analysis of data: uni-, bi- and multi-variate data analysis, regression, principal component analysis
- Spatial analysis of data: representation, spatial clustering, experimental variogram computation and analytical model fitting.
- Geostatistical kriging and simulation: Kriging theory and application, estimation vs. simulation, modeling strategy

Part 2
- Partial differential equations in geosciences (fluid flow, heat flow)
- Numerical methods: discretization, meshing, finite differences, finite elements
- Numerical modeling procedure: conceptual model, pre-processing, processing and post-processing
- Numerical modeling exercises: meshing, fluid flow (Theis radial flow) and heat flow in porous media

Module Grade Calculation
The module grade is the grade of the written exam.

Additional Information
Python exercises will punctuate the course to illustrate the concepts presented. They are essential for the progress of the participants.

Due to the numerous practical exercises, this course is given primarily on-site unless circumstances require an online course.

Homework required.

Workload
regular attendance 60 hours

self study time 90 hours

Recommendations
Own laptop/PC

Teaching and Learning Methods
- Lectures
- Exercises
- Self-study

M 7.51 Module: Ore Geology of Metals [M-BGU-103994]

Coordinators: Prof. Dr. Jochen Kolb
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 5/31/2022)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	English	5	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-109345	Ore Geology of Metals	**WT**	**5 CP**	**Kolb**

Assessment
The assessment consists of an oral exam (approx 30 min). A report on the field seminar has to be handed in before the oral exam..

Prerequisites
none

Competence Goal
The students know the fundamental approach of describing samples from ore deposits (hand specimen, drill core) and thin and polished sections. They can analyze the samples and relate them to the specific ore deposit type. They know the specific textures and are able to discuss them in order to develop a model for the mineralization or hydrothermal alteration processes.

The students know the principle ore deposit models and can use this knowledge in order to interpret their sample set that comes from different parts or zones of an ore deposit. They understand the different scales that are involved in ore deposit formation and are able to use their observations to interpret and discuss the scale-dependent processes involved in mineralization.

The students know the principle methods of mineral exploration and are able to translate geological observations into key parameters for mineral exploration.

The students know how to analyze short scientific papers and are able to understand and present the main message. They can relate the message in the paper to own observations and present a joint interpretation.

The students know how to apply their theoretical knowledge in the field. They make interpretations at various scales (thin section, sample, outcrop, deposit, district). They know, how to make meaningful sketches and how to present their observations and interpretation in written and oral formats. They are able to analyze, interpret and discuss their data in conjunction with published ore deposit models and can decide on the style of mineralization and the way of mineral exploration.

Content

- Detailed processes of ore deposit formation, including modern research advances.
- Ore petrology on sample, drill core, thin section and polished section.
- Reading and interpretation of short papers on ore deposit geology.
- Orthomagmatic Ni-PGE-Cu-Au deposits.
- Podiform Chromite deposits.
- Magmatic REE-Nb-Ta deposits.
- Copper Porphyry deposits.
- Epithermal Au-Ag deposits.
- Skarn deposits.
- VMS-SEDEX deposits.
- Orogenic Gold deposits.
- Iron Oxide Copper Gold deposits.
- MVT-SSC deposits.
- Fundamentals of recognizing and describing mineralization in the field.

Module Grade Calculation
The module grade is the grade of the oral exam, including the report on the field seminar.

Additional Information
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
67.5 hours lectures and practicals and 82.5 self-study time

Recommendations
Students should have a basic level of understanding of ore-forming processes from a previous Economic Geology course.

Teaching and Learning Methods
Lecture / Practicals / Field Seminar

(VÜ)

Literature
Books:

Robb, L., 2005: Introduction to Ore-Forming Processes. Blackwell Publishing, Oxford, 373 pp.
Ridley, J., 2013: Ore Deposit Geology. Cambridge University Press, Cambridge, 398 pp.
Guilbert, J.M. & Park, C.F., 2007: The Geology of Ore Deposits. Waveland Press, 985 pp.
Pirajno, F., 2009: Hydrothermal Processes and Mineral Systems. Springer, Heidelberg, 1250 pp.

M 7.52 Module: Petrology [M-BGU-102452]

Coordinators: apl. Prof. Dr. Kirsten Drüppel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-104854	Petrology	**ST**	**5 CP**	**Drüppel**

Assessment
The assessment consists of an examination of another type (graded homework).

Prerequisites

- Basic knowledge of geochemical analysis
- Basic knowledge of microscopy of igneous and metamorphic rocks and the interpretation of rock microstructures

Content
Mineralogical-petrological analysis of unknown rock samples or geomaterials

- Independent preparation of samples for further analysis
- Independent polarization microscopic and electron microscopic examination of the samples, determination and interpretation of the microreaction structures
- Independent geochemical and mineral chemical analysis of the samples and evaluation of the analysis results
- Independent determination of the phase composition of the samples using X-ray powder diffraction
- If necessary, independent calculation of geothermobarometric data as well as calculation and interpretation of phase diagrams
- Independent evaluation and interpretation of the data and their presentation in the form of a final report

Additional Information
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

M 7.53 Module: Petrophysics [M-BGU-105784]

Coordinators: Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	German/English	5	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-104838	Mineral and Rock Physics	**ST**	**5 CP**	**Schilling**

Assessment
The assessment consists of an Examination of another type (partly based on the protocols of the exercises and reports).

Prerequisites
none

Module Grade Calculation
The module grade is the grade of the examination of another type

Additional Information
Depending on the auditorium, this module is held in German or English

The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

Workload
70 hours attendance time and 80 hours self-studying time

Literature
will be communicated in the lecture

M 7.54 Module: Physical Chemistry for Applied Geosciences [M-CHEMBIO-104581]

Coordinators: wechselnde Dozenten, siehe Vorlesungsverzeichnis
apl. Prof. Dr. Andreas-Neil Unterreiner

Organisation: KIT Department of Chemistry and Biosciences

Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
15 CP	graded	Each term	2 terms	German	4	2

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-CHEMBIO-103385	Physical Chemistry		**9 CP**	
T-CHEMBIO-109395	Laboratory Work in Physical Chemistry	**WT**	**6 CP**	

Prerequisites
None

M 7.55 Module: Project Study [M-BGU-102438]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Internship or Project Study) Specific Supplements
Prerequisite for: M-BGU-105845 - Master's Thesis

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Irregular	1 term	German/English	4	3

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-104826	Project Study	**WT+ST**	**5 CP**	**Blum**

Assessment
The assessment consists of an examination of another type (Project Study: graded report and presentation).

Prerequisites
none

Competence Goal
- The students are familiar with the basics of project management.
- You can plan time and resources for a given problem in applied geosciences.
- You work on the given problem according to your own plans.
- You work out the results in the form of a written project report.
- You present the most important results in a presentation.

Content
Project study: Working on a problem. This can be designed differently depending on the department.

Module Grade Calculation
The module grade corresponds to the grade of the project study.

Additional Information
The project study takes the form of an independent piece of work in the course of the 2nd and 3rd semester. Topics will be published on time on the institute's website.

Workload
Project study: 150 hours of self-study (project planning, project processing, preparation of the report, preparation of the presentation)

M 7.56 Module: Raw Materials and Environment [M-BGU-105963]

Coordinators: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 10/1/2022)
Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules) (Usage from 11/10/2023)
Specific Supplements (Usage from 10/1/2022)

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	2 terms	German/English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-112118	Raw Materials and Environment	**WT**	**5 CP**	**Eiche**

Assessment
Oral exam (20-30 min) + report on characterization of mine waste deposit.

Prerequisites
none

Competence Goal
The students are able to name the different phases (exploration, mining, processing, etc.) of raw material extraction. They can assign environmental influences to the respective phases and describe them. In this context, they can present possible methods and strategies for minimizing and remediating the environmental impact and compare the individual options. With this knowledge, they are able to point out the advantages and disadvantages of the individual procedures and strategies and, based on this, to derive and justify selection criteria. The same applies to the selection and design of rehabilitation options, which the students can present and weigh against each other. For all phases of raw material extraction, there are legal bases at German and European level, which the students can name and whose relevance they can recognize.
The extraction of raw materials, especially in developing and emerging countries, is always caught between environmental pollution and social and economic benefits. Also, consumers are faced with the ethical question of how they themselves can contribute to minimizing the environmental and social impact of mining. The students are able to classify, discuss and evaluate various viewpoints and alternatives in this context.
The students can independently create a sampling concept to characterize a selected mining site. They can realize this concept independently in the field. They are able to prepare and analyze the samples with high quality. Furthermore, they are able to use the data to develop a risk assessment for the contaminated site with respect to environment and health and to propose suitable remediation concepts.

Content
- Effects of raw material extraction and processing on the hydrosphere, pedosphere, atmosphere as well as humans and society
- Historical mining and its effects
- Exemplary development of strategies for minimizing environmental impacts through raw material extraction and concepts for rehabilitation
- Effects of salt, lignite and uranium mining in Germany as well as measures to secure, remediate and restore
- Social and ethical aspects of raw material extraction
- Legal aspects of raw material extraction
- Geochemical characterization of contaminated sites including sampling, analysis and evaluation (field and laboratory work, changing locations)

Module Grade Calculation
The module grade is the grade of the oral exam which also covers the report.

Additional Information
The course is carried out face-to-face.

Workload
150 h

Teaching and Learning Methods
Lectures and Practise

Literature

• slides from lecture (webpage)
• Brown, M., Barley, B. & Wood, H. (2002). Mine Water Treatment: technology, application and policy. IWA publishing.
• Lottermoser, B.G. (2003). Mine wastes. Springer. Berlin
• Kausch, P., Ruhrmann, G. (2001). Environmental Management, Environmental Impact Assessment of Mines. Loga Vertragsbuchhandlung Köln
• Craig, J., Vaughan, D.J., Skinner, B.J. (2010). Earth Resources and the Environment. 4. Auflage. Prentice Hall Verlag.

M 7.57 Module: Reserve Modeling [M-BGU-105759]

Coordinators: Dr. Simon Hector
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111499	Reserve Modeling	**WT**	**5 CP**	**Hector, Steinmüller**

Assessment
The assessment consists of an oral examination.

Competence Goal
The students know the fundamental principles of resource and reserve estimation in mining. They learn the rules and the basic approach of calculating resources and reserves. They will be introduced into the relevant topics for pre-feasibility and feasibility studies. They know how to write the respective reports and how to collect the relevant data. They can use their knowledge to evaluate the quality of pre-feasibility and feasibility studies. Based on this, students are able to do a basic economic risk evaluation on various exploration and mining projects. They will be taught by skilled persons from industry in block courses.

Content
The students will be taught the basic principles of resource and reserve estimation. They will learn to do this using at least one software package. They will be introduced to the contents of pre-feasibility and feasibility studies. The different international standards of resource estimation (JORC, National Instrument 43-101, etc.) will be presented. Standard methods of economic risk assessment will be tested with examples. The program will be completed in two targeted block courses with invovlment of skilled persons from industry.

Module Grade Calculation
The module grade is the grade of the the graded module report and presentation

Workload
6320101 Reserve Modeling - Feasibility Study of Mining Projects: 2 days, 35 h self study time

6320104 Economic and Risk Evaluation: 3 days, 65 h self study time

M 7.58 Module: Reservoir Geology [M-BGU-103742]

Coordinators: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements
Prerequisite for: M-BGU-103734 - Diagenesis and Cores

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	English	5	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-107563	Reservoir Geology	**ST**	**5 CP**	**Hilgers**

Assessment
The assessment is a marked written exam over 120 minutes, the participitation in the Field Seminar Reservoir-Geology and the submission of field book.

Prerequisites
Entrance to the module examination requires the submission of homework (100%) within the given deadline, of which 80% are passed.

Competence Goal
After this module, students are enabled to interpret fluid storage and migration in porous and fractured rock in 3D sedimentary bodies and caverns relevant for geothermal energy, renewable energy storage, transitional gas and others. It covers aspects from structural evolution to facies- and porosity-permeability development. Students are enabled to map and characterize sedimentary rocks properties in the field including structural- and petrophysical aspects. They work in teams and critically evaluate own data compared to published literature.

Content
Reservoir conditions from geological maps; methods: petrography, isotopy, microthermometry and cathodoluminescence; burial history and maturation; pore pressures, compaction and water saturation; diagenesis; well correlations; migration and traps; fault seal and top seal; reservoir characterization; reservoir quality prediction; plays and risks. Practical application of reservoir geology in a given field study area with special focus on structure, 3D geometries in sedimentary rocks and diagenesis.

Module Grade Calculation
The grade of the module is the grade of the written exam.

Additional Information
Course Reservoir-Geology: We consider to visit a reservoir in production near Karlsruhe during the lecture.

Field Seminar Reservoir-Geology: The course will be conducted during the semester break, participitation is compulsary. For participants of field seminar Reservoir-Geology: Please mind the visa regulations e.g. if the trip is scheduled to SW-England.

Workload
5 CP =150 h

contact time: 90h (incl. Field seminar)

self-study time: 60h

Recommendations
The student shall have a basic knowledge of sedimentology and structural geology, such as presented in the module Geologie (Geology), MSc 1st semester

Teaching and Learning Methods
lectures, exercises and field seminar

Literature
• Bjorlykke, K. 2015. Petroleum Geoscience. From sedimentary environments to rock physics. Springer

• Emery, D. & Robinson, A. 1993. Inorganic geochemistry geosciencece.

Base For
This course is required to enroll to the module Diagenesis and Cores M-BGU-103734

M 7.59 Module: Rock Mechanics and Rock Engineering (bauiM5P5-FMFB) [M-BGU-107001]

Coordinators: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules) (Usage from 4/1/2025)
Specific Supplements (Usage from 4/1/2025)

Credits	Grading	Recurrence	Duration	Language	Level	Version
6 CP	graded	Each summer term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-113963	Coursework 'Rock Mechanics and Rock Engineering'	**ST**	**1 CP**	**Stutz**
T-BGU-113962	Rock Mechanics and Rock Engineering	**WT+ST**	**5 CP**	**Stutz**

Assessment
- module component T-BGU-113963 with not graded coursework according to § 4 Par. 3
- module component T-BGU-113962 with written examination according to § 4 Par. 2 No. 1

details about the learning controls, see module components

Prerequisites
Module must not selected together with the modules 'Rock Mechanics and Tunneling' (M-BGU-100069) and 'Rock Engineering and Underground Construction' (M-BGU-10074) not offered anymore.

Competence Goal
Students acquire a solid understanding of the essential strength and deformation properties of rock. They are able to apply basic analytical methods to solve simplified problems in surface and underground rock engineering. They can also apply rock mechanics methods and the necessary static proofs independently. Furthermore, students can plan, construct and measure securing systems for slopes and hillsides in rock. They can analyse interfaces, identify critical failure mechanisms and carry out corresponding stability analyses.

Content
The fundamentals of rock mechanics include rock and rock mass classification, estimation of in situ stresses, and experimental determination of the stress-strain behaviour and resistance of rock, jointed rock and discontinuities. The analytical relationships for the stress distribution and the deformations around the circular and elliptical tunnel cross-section and at the shaft are derived with and without plastification.

In rock engineering, basic knowledge of analysing and interpreting joint data in rock using the stereographic projection analysis is deepened. For sliding failure of rock slopes, graphical as well as analytical methods are derived and practised. Support systems for individual blocks and slopes and rock excavation techniques are explained.

Module Grade Calculation
grade of the module is grade of the exam

Additional Information
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- Basics in Rock Mechanics lecture/exercise: 30 h
- Rock Engineering lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Basics in Rock Mechanics: 20 h
- preparation and follow-up lecture/exercises Rock Engineering: 20 h
- preparation of the coursework (not graded): 20 h
- examination preparation: 60 h

total: 180 h

Recommendations
basic knowledge of Soil Mechanics and Foundation Engineering (respective topics of the bachelor study progam 'Civil Engineering' are required);

basic knowledge of Engineering Geology;

basic knowledge of Technical mechanics;

basic knowledge of Building Materials/Material Science;

Literature
[1] Brady, B.H.G. & Brown, E.T. (2004), Rock Mechanics for Underground Mining, 3rd Ed., Kluwer.
[2] Fecker, Edwin, 1997: Geotechnische Messgeräte und Feldversuche im Fels, Ferdinand Enke Verlag Stuttgart.
[3] Hoek, Evert, 2007: Practical Rock Engineering (kostenloser Download unter http://www.rocscience.com/education/hoeks_corner)
[4] Wittke, W.: Rock Mechanics Based on an Anisotropic Jointed Rock Model (AJRM), Ernst & Sohn, 2014

M 7.60 Module: Sedimentary Petrology [M-BGU-103733]

Coordinators: Prof. Dr. Armin Zeh
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	German/English	5	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-107558	Sedimentary Petrology	**WT**	**5 CP**	**Zeh**

Assessment
The assessment consists of a written exam (90 min).

Prerequisites
none

Module Grade Calculation
grade of the module is grade of the exam

Additional Information
Depending on the auditorium, this module is held in German or English

Workload
contact hours: 60h (lecture and exercises)

self study time: 90h incl. exam

M 7.61 Module: Seismic Interpretation [M-BGU-105777]

Coordinators: TT-Prof. Dr. Nevena Tomašević
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	German	5	3

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111720	Seismic & Sequence Stratigraphy	**ST**	**1 CP**	**Tomašević**
T-PHYS-113453	Introduction to Reflection Seismics, Prerequisite	**ST**	**1 CP**	**Bohlen**
T-BGU-113474	Seismic Interpretation, Examination		**3 CP**	**Tomašević**

Assessment
The assessment consists of a graded end-term written exam (120 min) which will include knowledge obtained while attending lectures and exercises in the first and second brick, i.e. Reflective Seismic and Seismic & Sequence Stratigraphy.

Regular attendance of lectures and exercises; submission of exercises and/or homework assignments in which at least 60% of the total number of points available must be achieved for each Brick (Seismic & Sequence Stratigraphy, Introduction to Reflection Seismics).

Prerequisites
Requirements for participation in the graded exam: submission of all exercises on time, 60% of them correct for each Brick (Seismic & Sequence Stratigraphy, Introduction to Reflection Seismics).

Competence Goal
The course aims at providing students with the tools and methods required to (1) define architectural elements of the sedimentary basin fill and (2) be able to predict the location and quality of the targeted sedimentary body (e.g., reservoir).

At the end of the course, students will: (1) understand the fundamental concepts of seismic wave propagation, seismic data acquisition, and seismic data processing/imaging including method limitations and pitfalls; (2) be trained in the interpretation of seismic lines; (3) understand fundamental concepts of seismic and sequence stratigraphy, and (4) be able to define system tracts and sequences using the seismic and well log data.

Content

Part 1: Introduction to Reflection Seismics

(50%; Lecturers Thomas Bohlen & Thomas Hertweck): Lecture is followed by practical exercises.

In this part of the course students learn about the reflection seismic method, that means the general approach of generating and using seismic waves in applied geophysics to create an image of the subsurface. In order to achieve this, the course covers on the one hand basic theoretical concepts in physics that are required to understand seismic wave propagation or signal processing. On the other hand, the course deals with many practical aspects such as concepts of marine and land data acquisition, typical sources and receivers used in the field, the most important seismic data processing steps and ways to create a high-quality image of the subsurface.

Part 2: Seismic & sequence stratigraphy

(50%; LecturesNevena Tomašević): Lecture is followed by practical exercises.

This part of the course provides a link between seismic interpretation and high-resolution sequence analysis. The subject is tackled from a practical point of view with hands-on experience in the form of exercises. Both methods combine different scales of observation. The seismic interpretation is done basin wide, while individual outcrops have been the traditional starting point for high-resolution sequence stratigraphy. There is a considerable overlap of the methods because seismic stratigraphy corresponds more or less to low-resolution sequence stratigraphy. The merger between both methods provides the geoscientist both with concepts and a powerful prediction tool for the amount of geological change between and beyond subsurface calibration points.

Module Grade Calculation

The grade of the module is the grade of the graded written end-term exam.

Additional Information

The language of instruction is English. This is a second semester module. The students are expected to haveattended the module Geology (old number M-BGU-102431, new number M-BGU-105744), which is offered in the winter term.

The lecture will be accompanied by exercises that help students to understand the various aspects of dealing with seismic data. The practical part of this course is carried out in presence.

Workload

Regular attendance: 60 hours

self-studying time: 90 hours

Literature

- O. Yilmaz, “Seismic Data Analysis”, 2001: Society of Exploration Geophysicists.
- R. E. Sheriff and L. P. Geldart, “Exploration Seismology”, 1995: Cambridge University Press.
- Catuneanu, O. (2006): Principles of Sequence Stratigraphy, Elsevier, Amsterdam, The Netherlands.
- Vail, P. A. et. al. (1993): Sequence Stratigraphy – A Global Theory for Local Success; Oilfield Review, 1/93, p. 51-62; Elsevier, Amsterdam, NL.
- Van Wagoner, J. C. et. al. (1990): Siliciclastic Sequence Stratigraphy in Wells, Cores, and Outcrops: Concepts for High-Resolution Correlation of Time and Facies; AAPG Methods in Exploration Series 7; Tulsa, Okl., USA.

M 7.62 Module: Shallow Geothermal Energy [M-BGU-105730]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	English	5	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-111447	Shallow Geothermal Energy	**WT**	**5 CP**	**Blum**

Assessment
Oral exam (approx. 15 min)

Prerequisites
none

Competence Goal
The students will have the qualifications required for working in an environmental and energy consultancy, dealing with shallow geothermal energy. Furthermore, recent case studies will be presented (e.g. visiting a drill site of a ground source heat pump system).

Content
The basic course deals with the theory and application of shallow geothermal energy (2 SWS in winter term).

The basic course will be complemented by laboratory and field exercises for the determination of groundwater temperatures and thermal heat conductivities. In addition, heat transport modelling and energy planning will be performed. (1 SWS in winter term)

Module Grade Calculation
The grade of the module is the grade of the oral exam

Additional Information
none

Workload
45h attendance time, 105h self-study time

Recommendations
The students should also take the course M-BGU-102439 “Hydrogeology: Groundwater Modelling”.

Teaching and Learning Methods
Lecture, exercise and self-study

Literature
Stauffer et al. (2014) Thermal Use of Shallow Groundwater

Base For
none

M 7.63 Module: Structural and Phase Analysis [M-BGU-105236]

Coordinators: Dr.-Ing. Susanne Wagner
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
4 CP	graded	Each winter term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-MACH-102170	Structural and Phase Analysis	**ST**	**4 CP**	**Wagner**

Assessment
The assessment consists of an oral exam (20-30 min) taking place at the agreed date (according to Section 4(2), 2 of the examination regulation).

The re-examination is offered upon agreement.

Competence Goal
The students know the fundamentals of crystallography, the generation and detection of x-rays as well as their interaction with the microstructure of crystalline materials. They have detailed knowledge about the different methods of x-ray diffraction measurements and are able to analyse x-ray spectra using modern methods of x-ray analysis both qualitatively and quantitatively.

Content
The course gives an overview to generation and detection of x-rays as well as their interaction with matter. It provides an introduction to crystallography and describes modern measurement and analysis methods of x-ray diffraction.

It is arranged in the following units:

- Generation and properties of X-Ray's
- Crystallography
- Fundamentals and application of different measuring methods
- Qualitative and quantitative phase analysis
- Texture analysis (pole figures)
- Residual stress measurements

Module Grade Calculation
The grade of the module is the grade of of the oral examination.

Workload
regular attendance: 30 hours
self-study: 90 hours

Literature
Moderne Röntgenbeugung - Röntgendiffraktometrie für Materialwissenschaftler, Physiker und Chemiker, Spieß, Lothar / Schwarzer, Robert / Behnken, Herfried / Teichert, Gerd B.G. Teubner Verlag 2005
H. Krischner: Einführung in die Röntgenfeinstrukturanalyse. Vieweg 1990.
B.D. Cullity and S.R. Stock: Elements of X-ray diffraction. Prentice Hall New Jersey, 2001.

M 7.64 Module: Structural Geology [M-BGU-102451]

Coordinators: apl. Prof. Dr. Agnes Kontny
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Sustainable Energy-Resources-Storage (Specialisation in Geosciences: Sustainable Energy-Resources-Storage Elective Modules)
Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 5/31/2022)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	English	4	2

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-107507	Microstructures	**ST**	**3 CP**	**Kontny**
T-BGU-107508	Field Course Applied Structural Geology	**ST**	**2 CP**	**Kontny**

Assessment
The success control in this module is carried out:

1. in form of an approx. 20 min graded presentation in the course microstructure at the end of the course.

Content: Geological framework, description of the microstructures and derivation of the deformation history based on exercise thin sections.

2. Participation in the field course (5-6 days) and ungraded presentation of a topic relevant to the geological field area (from literature and your own field data) depending on the location of the field course. The presentation is given either during the field course or approx. 4-6 weeks afterwards. The presentation consists either of a poster presentation or a 5-10 minutes talk with an approx. 8-page report. The revised field book records are necessary to pass the course.

Prerequisites
none

Competence Goal
• Students will be trained in microstructural analysis in order to gain fundamental understanding of rock deformation. They learn to evaluate their own observation in relation to a tectonic context.
• Practical application of structural analysis in a given field study area.

Content
• Microstructures: The students learn to describe and evaluate small scale structures in deformed rocks. They are enabled to describe and interprete rock fabric elements, foliation development, polyphase deformation, deformation mechanisms, porphyroblast growth-deformation relationship and shear zone fabrics.
• Field course Applied Structural Geology: The students learn to describe and interprete large scale structures in the field. They characterize the development of normal faults, folds, thrust systems, unconformities and explain polyphase deformation in space and time in different orogenic belts.

Module Grade Calculation
Module grade corresponds to grade from course microstructure

Additional Information
The practical part of this course is carried out in presence. The field and microscopy exercises are essential for the participants to progress in their studies.

Workload
30h lecture,

50h field work as well as two presentations and report / field documentation

70h self studying time

Recommendations
Knowledge of basics in petrology and optical determination of rock-forming minerals

Literature

Passchier, C.W., Trouw, R.A.J. (2005): Microtectonics, 366 S., Springer.
Vernon, R.H. (2004): A practical guide to rock microstructure, 594 S., Cambridge.

Further references to the field course will be delivered in advance

M 7.65 Module: Supplementary Studies on Science, Technology and Society [M-FORUM-106753]

Coordinators: Dr. Christine Mielke
Christine Myglas

Organisation: General Studies. Forum Science and Society (FORUM)

Part of: Additional Examinations (Usage from 10/1/2024)

Credits	Grading	Recurrence	Duration	Language	Level	Version
16 CP	graded	Each term	3 terms	German	4	1

Election Notes
Students have to self-record the achievements obtained in the Supplementary Studies on Science, Technology and Society in their study plan. FORUM (formerly ZAK) records the achievements as "non-assigned" under "ÜQ/SQ-Leistungen". Further instructions on self-recording of achievements can be found in the FAQ at https://campus.studium.kit.edu/ and on the FORUM homepage at https://www.forum.kit.edu/english/. The title of the examination and the amount of credits override the modules placeholders.

If you want to use FORUM achievements for both your Interdisciplinary Qualifications and for the Supplementary Studies, please record them in the Interdisciplinary Qualifications first. You can then get in contact with the FORUM study services (stg@forum.kit.edu) to also record them in your Supplementary Studies.

In the Advanced Unit you can choose examinations from three subject areas: "About Knowledge and Science", "Science in Society" and "Science in Social Debates". It is advised to complete courses from each of the three subject areas in the Advanced Unit.

To self-record achievements in the Advanced Unit, you have to select a free placeholder partial examination first. The placeholders' title do *not* affect which achievements the placeholder can be used for!

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-FORUM-113578	Lecture Series Supplementary Studies on Science, Technology and Society - Self Registration	**ST**	**2 CP**	**Mielke, Myglas**
T-FORUM-113579	Basic Seminar Supplementary Studies on Science, Technology and Society - Self Registration	**ST**	**2 CP**	**Mielke, Myglas**
Advanced Unit Supplementary Studies on Science, Technology and Society (Elective: at least 12 credits)				
T-FORUM-113580	Elective Specialization Supplementary Studies on Science, Technology and Society / About Knowledge and Science - Self-Registration	**WT+ST**	**3 CP**	**Mielke, Myglas**
T-FORUM-113581	Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Society - Self-Registration	**WT+ST**	**3 CP**	**Mielke, Myglas**
T-FORUM-113582	Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Public Debates - Self Registration	**WT+ST**	**3 CP**	**Mielke, Myglas**
Mandatory				
T-FORUM-113587	Registration for Certificate Issuance - Supplementary Studies on Science, Technology and Society	**WT+ST**	**0 CP**	**Mielke, Myglas**

Assessment
The monitoring is explained in the respective partial achievement.

They are composed of:
- Protocols
- Reflection reports
- Presentations
- Preparation of a project work
- An individual term paper
- An oral examination
- A written exam

Upon successful completion of the supplementary studies, graduates receive a graded report and a certificate issued by the FORUM.

Prerequisites
The course is offered during the course of study and does not have to be completed within a defined period. Enrollment is required for all assessments of the modules in the supplementary studies.
Participation in the supplementary studies is regulated by § 3 of the statutes. KIT students register for the supplementary studies by selecting this module in the student portal and booking a performance themselves. Registration for courses, assessments, and exams is regulated by § 8 of the statutes and is usually possible shortly before the start of the semester.
The course catalog, module description (module manual), statutes (study regulations), and guidelines for creating the various written performance requirements can be downloaded from the FORUM homepage at https://www.forum.kit.edu/begleitstudium-wtg.php.

Registration and exam modalities
PLEASE NOTE:
Registration on the FORUM, i.e. additionally via the module selection in the student portal, enables students to receive up-to-date information about courses or study modalities. In addition, registering on the FORUM ensures that you have proof of the credits you have earned. As it is currently (as of winter semester 24-25) not yet possible to continue additional credits acquired in the Bachelor's programme electronically in the Master's programme, we strongly advise you to digitally secure the credits you have earned by archiving the Bachelor's transcript of records yourself and by registering on FORUM.
In the event that a transcript of records of the Bachelor's certificate is no longer available - we can only assign the achievements of registered students and thus take them into account when issuing the certificate.

Competence Goal
Graduates of the Supplementary Studies on Science, Technology, and Society gain a solid foundation in understanding the interplay between science, the public, business, and politics. They develop practical skills essential for careers in media, political consulting, or research management. The program prepares them to foster innovation, influence social processes, and engage in dialogue with political and societal entities. Participants are introduced to interdisciplinary perspectives, encompassing social sciences and humanities, to enhance their understanding of science, technology, and society. The teaching objectives of this supplementary degree program include equipping participants with both subject-specific knowledge and insights from epistemological, economic, social, cultural, and psychological perspectives on scientific knowledge and its application in various sectors. Students are trained to critically assess and balance the implications of their actions at the intersection of science and society. This training prepares them for roles as students, researchers, future decision-makers, and active members of society.

Through the program, participants learn to contextualize in-depth content within broader frameworks, independently analyze and evaluate selected course materials, and communicate their findings effectively in both written and oral formats. Graduates are adept at analyzing social issues and problem areas, reflecting on them critically from a socially responsible and sustainable standpoint.

Content
The Supplementary Studies on Science, Technology and Society can be started in the 1st semester of the enrolled degree programme and is not limited in time. The wide range of courses offered by FORUM makes it possible to complete the program usually within three semesters. The supplementary studies comprises 16 or more credit points (LP). It consists of **two modules: the Basic Module (4 LP) and the Advanced Module (12 LP).**

The **basic Module** comprises the compulsory courses 'Lecture Series Supplementary Studies on Science, Technology and Society' and a basic seminar with a total of 4 LP.

The **Advanced Module** comprises courses totalling 12 LP in the humanities and social sciences subject areas 'On Knowledge and Science', 'Science in Society' and 'Science in Public Debates'. The allocation of courses to the accompanying study programme can be found on the homepage https://www.forum.kit.edu/wtg-aktuelland in the printed FORUM course catalogue.

The 3 thematic subject areas:

Subject area 1: About Knowledge and Science

This is about the internal perspective of science: students explore the creation of knowledge, distinguishing between scientific and non-scientific statements (e.g., beliefs, pseudo-scientific claims, ideological statements), and examining the prerequisites, goals, and methods of knowledge generation. They investigate how researchers address their own biases, analyze the structure of scientific explanatory and forecasting models in various disciplines, and learn about the mechanisms of scientific quality assurance.

After completing courses in the "Knowledge and Science" area, students can critically reflect on the ideals and realities of contemporary science. They will be able to address questions such as: How robust is scientific knowledge? What are the capabilities and limitations of predictive models? How effective is quality assurance in science, and how can it be improved? What types of questions can science answer, and what questions remain beyond its scope?

Subject area 2: Science in Society

This focuses on the interactions between science and different areas of society, such as how scientific knowledge influences social decision-making and how social demands impact scientific research. Students learn about the specific functional logics of various societal sectors and, based on this understanding, estimate where conflicts of goals and actions might arise in transfer processes—for example, between science and business, science and politics, or science and journalism. Typical questions in this subject area include: How and under what conditions does an innovation emerge from a scientific discovery? How does scientific policy advice work? How do business and politics influence science, and when is this problematic? According to which criteria do journalists incorporate scientific findings into media reporting? Where does hostility towards science originate, and how can social trust in science be strengthened?

After completing courses in the "Sciene in Society" area, students can understand and assess the goals and constraints of actors in different societal sectors. This equips them to adopt various perspectives of communication and action partners in transfer processes and to act competently at various social interfaces with research in their professional lives.

Subject area 3: Science in Public Debates

The courses in this subject area provide insights into current debates on major social issues such as sustainability, digitalization, artificial intelligence, gender equality, social justice, and educational opportunities. Public debates on complex challenges are often polarized, leading to oversimplifications, defamation, or ideological thinking. This can hinder effective social solution-finding processes and alienate people from the political process and from science. Debates about sustainable development are particularly affected, as they involve a wide range of scientific and technological knowledge in both problem diagnosis (e.g., loss of biodiversity, climate change, resource consumption) and solution development (e.g., nature conservation, CCS, circular economy).

By attending courses in "Science in Public Debates," students are trained in an application-oriented way to engage in factual debates—exchanging arguments, addressing their own prejudices, and handling contradictory information. They learn that factual debates can often be conducted more deeply and with more nuance than is often seen in public discourse. This training enables them to handle specific factual issues in their professional lives independently of their own biases and to be open to differentiated, fact-rich arguments.

Supplementary credits:
Additional LP (supplementary work) totalling a maximum of 12 LP can also be acquired from the complementary study programme (see statutes for the WTG complementary study programme § 7). § 4 and § 5 of the statutes remain unaffected by this. These supplementary credits are not included in the overall grade of the accompanying study programme. At the request of the participant, the supplementary work will be included in the certificate of the accompanying study programme and marked as such. Supplementary coursework is listed with the grades provided for in § 9.

Module Grade Calculation
The overall grade of the supplementary course is calculated as a credit-weighted average of the grades that were achieved in the advanced module.

Additional Information
Climate change, biodiversity crisis, antibiotic resistance, artificial intelligence, carbon capture and storage, and gene editing are just a few areas where science and technology can diagnose and address numerous social and global challenges. The extent to which scientific findings are considered in politics and society depends on various factors, such as public understanding and trust, perceived opportunities and risks, and ethical, social, or legal considerations.
To enable students to use their expertise as future decision-makers in solving social and global challenges, we aim to equip them with the skills to navigate the interfaces between science, business, and politics competently and reflectively. In the Supplementary Studies, they acquire foundational knowledge about the interactions between science, technology, and society.

They learn:
- How reliable scientific knowledge is produced,
- how social expectations and demands influence scientific research, and
- how scientific knowledge is adopted, discussed, and utilized by society.

The program integrates essential insights from psychology, philosophy, economics, social sciences, and cultural studies into these topics. After completing the supplementary studies programme, students can place the content of their specialized studies within a broader social context. This prepares them, as future decision-makers, to navigate competently and reflectively at the intersections between science and various sectors of society, such as politics, business, or journalism, and to contribute effectively to innovation processes, public debates, or political decision-making.

Workload
The workload is made up of the number of hours of the individual modules:

- Basic Module approx. 120 hours
- Advanced Module approx. 360 hours
> Total: approx. 480 hours

In the form of supplementary services, up to approximately 360 hours of work can be added.

Recommendations
It is recommended to complete the supplementary study program in three or more semesters, beginning with the lecture series on science, technology, and society in the summer semester. Alternatively, you can start with the basic seminar in the winter semester and then attend the lecture series in the summer semester.

Courses in the Advanced Module can be taken simultaneously. It is also advised to complete courses from each of the three subject areas in the advanced unit.

Teaching and Learning Methods
- Lectures
- Seminars/Project Seminars
- Workshops

M 7.66 Module: Surface and Subsurface Contaminant Transport (bauiM2S54-HY10) [M-BGU-107003]

Coordinators: Prof. Dr.-Ing. Erwin Zehe
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules) (Usage from 4/1/2026)

Credits	Grading	Recurrence	Duration	Language	Level	Version
6 CP	graded	Each summer term	1 term	English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-113965	Surface and Subsurface Contaminant Transport	**WT+ST**	**6 CP**	**Zehe**

Assessment
- module component T-BGU-113965 with oral examination according to § 4 Par. 2 No. 2

details about the learning control, see module component

Prerequisites
Module must not selected together with the module 'Subsurface Flow and Contaminant Transport' (M-BGU-103872) not offered anymore.

Competence Goal
Students are able to explain processes of transport and decomposition related to nutrients and pollutants in surface runoff and in the unsaturated zone of rural catchments.

Students are able to independently apply analytical and process-based models: estimation of model parameters from field investigations, estimation of water and substance fluxes and balance in the critical zone, statements on the risks related to contaminant mobilization in natural soils.

Students are able to evaluate the limits of applicability of modeling approaches in natural, heterogeneous soils.

Content
Transport processes in the unsaturated zone related to infiltration, surface runoff, and movement of soil water:

- advective-dispersive transport in homogeneous and heterogeneous soils
- particulate transport by erosion
- adsorption
- chemical and microbial processes of reaction and decay in soils
- modeling contaminant transport (e.g. pesticides) in soils using analytical models
- risk assessment for pesticides in soils (transport, residence times, adsorption, decay)
- estimation of model parameters from field exploration
- parameterization of adsorption isotherms
- breakthrough curve

Computer exercise:

- simulation of water and substance transport with process-based models
- independently conducted risk-assessments for pesticides using simple simulation techniques

Module Grade Calculation
grade of the module is grade of the exam

Additional Information
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 60 h
- examination preparation: 60 h

total: 180 h

Recommendations
modules Water and Energy Cycles (M-BGU-103360) and Hydrological Measurements in Environmental Systems (M-BGU-103763);
knowledge of programming with Matlab; otherwise, it is strongly recommended to attend the course 'Introduction to Matlab' (6224907)

Literature
Jury, W. and Horton, R. (2004): Soil physics. John Wiley
Hillel, D. (1995): Environmental Soil Physics. Academic Press
Fritsche, W. (1998) Umweltmikrobiologie, Grundlagen und Anwendungen. Gustav Fischer Verlag, 248pp.

M 7.67 Module: Tunneling and Underground Construction (bauiM5S11-TBUHB) [M-BGU-107002]

Coordinators: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specific Supplements (Usage from 10/1/2025)

Credits	Grading	Recurrence	Duration	Language	Level	Version
6 CP	graded	Each winter term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-113964	Tunneling and Underground Construction	**WT+ST**	**6 CP**	**Stutz**

Assessment
- module component T-BGU-113964 with written examination according to § 4 Par. 2 No. 1

details about the learning control, see module component

Prerequisites
Module must not selected together with the modules 'Rock Mechanics and Tunneling' (M-BGU-100069) and 'Rock Engineering and Underground Construction' (M-BGU-10074) not offered anymore.

Competence Goal
Students learn to select fundamental construction methods and designs for tunnelling. They develop comprehensive geotechnical problem-solving skills, considering factors such as design variants, costs, construction operations, and safety aspects when working in solid rock. They are able to explain the structure and function of tunnel boring machines and excavation methods, drawing from practical experience, and can make informed choices regarding tunnelling techniques.

Students acquire in-depth knowledge of strength and deformation properties, as well as methods for advance and accompanying exploration, which they can apply to the repair of existing tunnels. They can explain the structure and function of tunnel boring machines and support systems based on their own experience and demonstrate the ability to select appropriate tunnelling techniques. Furthermore, they can effectively apply their expertise in strength and deformation properties and exploration methods to maintain and repair existing tunnels.

Content
The course introduces students to tunnel structures, covering various types of tunnels and their purposes, as well as providing an overview of tunnel construction methods, tunnelling techniques, and support measures. Students practice deriving tunnel driving classes and support requirements based on rock exploration and classification, as well as instrumenting tunnels.

The course also presents the functioning and limitations of different mechanical tunnelling methods and pipe jacking techniques, including shield driving, compressed air support, and fluid and earth pressure methods. Students explore calculation approaches for tunnel statics and deformation forecasts, particularly for tunnels in loose rock near the surface.

The principles of tunnelling are further developed with a focus on sealing, shell design, and tunnel safety. Additionally, the inspection and repair of existing tunnels are covered, equipping students with the skills to address real-world challenges in tunnel maintenance.

Module Grade Calculation
grade of the module is grade of the exam

Additional Information
Module will be offered newly as from summer term 2025.

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- lecture/exercise: 60 h
- field trips: 10 h

independent study:

- preparation and follow-up lecture/exercises: 50 h
- examination preparation: 60 h

total: 180 h

Recommendations
basic knowledge of Soil Mechanics and Foundation Engineering (respective topics of the bachelor study progam 'Civil Engineering' are required);

basic knowledge of Engineering Geology;

basic knowledge of Technical mechanics;

basic knowledge of Building Materials/Material Science;

basic knowledge of Rock Mechanics and Rock Engineering;

Literature
[1] Maidl, B. 1997: Tunnelbau im Sprengvortrieb
[2] Müller, L. 1978: Der Felsbau, Bd. 3 Tunnelbau
[3] Maidl, B; Herrenknecht, M.;, Maidl, U.; Wehrmeyer, G. 2011: Maschineller Tunnelbau im Schildvortrieb

M 7.68 Module: Water – Energy – Environment Nexus in a Circular Economy: Research Proposal Preparation [M-CIWVT-106680]

Coordinators: Prof. Dr. Andrea Iris Schäfer
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specific Supplements (Usage from 4/1/2024)

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each summer term	1 term	English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-CIWVT-113433	Water – Energy – Environment Nexus in a Circular Economy: Research Proposal Preparation	**ST**	**5 CP**	

Assessment
The Learning control is an examination of another type:
Research proposal of 10 pages and an oral presentation of 10 minutes (individual work). The grade will be a composite of the proposal (submission in week 13 before class) and oral & poster presentation (all day workshop with researcher participation).

Competence Goal
The goal of this course is to get an overview of current challenges in the circular economy focused on the water – energy – environment nexus. Based on individual student interest a topic will be identified and a research plan developed encompassing a thorough background research to establish the state-of-the-art, identification of a specific research problem and research questions suitable to solve this problem. Concepts of novelty and excellence will be explored in an international context. Following the individual topic choice, the research proposal will be developed individually in a tutor group (divided into water, energy, environment) while lectures on required skills will accompany this process. As an outlook beyond this course, criteria to consider when looking for research careers such as applying for funding/scholarships, considering choices in research environment and supervision, performance indicators in research and university rankings will be introduced to enable informed decisions. The proposal will be communicated in writing, as a brief presentation and as a poster, which equips students brilliantly not only for a masters thesis but also a future research publication or a PhD.

Content
In a time of limiting resources, climate change and ever increasing demand for resources the concept of a circular economy is inevitable to create a more sustainable utilization of our key resources, water, energy and ‘environment’. Concepts of zero liquid discharge, water reuse, carbon net zero, resource recovery and environmental pollution reduction are all part of this concept where where waste is returned to use. The water – energy – environment nexus is the particular focus of ths course. Global water issues, water and wastewater treatment, desalination, water reuse, micropollutants, decentralized systems, water & sanitation in international development, renewable energies, environmental pollution, climate change, resource recovery – and many more topics will inspire future research.

Module Grade Calculation
The module grade is the grade of the examination of another type.

Workload

- Contact time: lectures and tutorials 60 hrs (4 SWS)
- Group and self study: 50 hrs
- Preparation of assessments and participation at the group presentations (one full day): 30 hrs

M 7.69 Module: Water and Energy Cycles (bauiM2P8-WATENCYC) [M-BGU-103360]

Coordinators: Prof. Dr.-Ing. Erwin Zehe
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Engineering Geology and Hydrogeology (Specialisation in Geosciences: Engineering Geology and Hydrogeology Elective Modules) (Usage from 4/1/2026)
Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
6 CP	graded	Each winter term	1 term	English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-106596	Water and Energy Cycles	**WT+ST**	**6 CP**	**Zehe**

Assessment
- module component T-BGU-106596 with examination of another type according to § 4 Par. 2 No. 3

details about the learning control, see module component

Prerequisites
none

Competence Goal
Students are able to explain the most relevant processes of Hydrology including their feedbacks and limitations. They know the concepts to describe and predict these processes in the context of science and water management. Furthermore are they able to independently apply related computer-based tools for analysis and prediction for standard situations. Students are able to evaluate the required data and to quantify and evaluate the uncertainties related to the simulations and predictions.

Content
This module deepens the fundamentals of the water and energy cycles with particular regard to:

- the soil as the central control element of the water and energy cycle and the interplay of soil water and ground heat balance
- evaporation, energy balance and processes in the atmospheric boundary layer
- runoff and evaporation regimes in different hydro-climates;
- water balance and floods at the catchment scale and statistics for water management
- the interplay between runoff processes and soil water balance, and the soil as filter system
- concepts of hydrological similarity and comparative hydrology
- process-based and conceptual models to simulate water balances and predict flood

Module Grade Calculation
grade of the module is grade of the exam

Additional Information
none

Workload
contact hours (1 HpW = 1 h x 15 weeks):

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 40 h
- preparation of term paper (examination): 80 h

total: 180 h

Recommendations
course Hydrology (6200511) and module and Engineering Hydrology (6200617);
knowledge of programming with Matlab or another similar progamming language, otherwise the attendance of the course 'Introduction to Matlab' (6224907) is strongly recommended

Literature

Aryan, S. P. (2001): Introduction to Micrometeorology, 2nd Ed., Academic Press
Beven, K. (2004): Rainfall runoff modelling – The primer: John Wiley and Sons
Hornberger et al. (1998): Elements of physical hydrology. John Hopkins University Press
Kraus, H. (2000): Die Atmosphäre der Erde. Vieweg S. P.
Plate, E. J., ,Zehe, E. (2008): Hydrologie und Stoffdynamik kleiner Einzugsgebiete. Prozesse und Modelle, Schweizerbart, Stuttgart, 2008.

M 7.70 Module: Water Chemistry and Water Technology [M-CIWVT-103753]

Coordinators: Prof. Dr. Harald Horn
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specific Supplements

Credits	Grading	Recurrence	Duration	Language	Level	Version
10 CP	graded	Each winter term	1 term	German/English	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-CIWVT-107585	Water Chemistry and Water Technology	**WT+ST**	**10 CP**	**Horn**

Prerequisites
None

Competence Goal
Students understand the physical, chemical and biological processes in aquatic systems and can classify these in the context of the hydrological cycle. They are able to describe the occurrence, origin and behavior of geogenic and anthropogenic substances and microorganisms in different compartments of aquatic systems and evaluate their effects on water quality. In addition, they understand the analytical methods for chemical and biological parameters of water quality and can derive their significance for the status of water bodies. Students apply their knowledge of water treatment and water technology processes, compare their possible applications and evaluate their suitability for different requirements for the water quality to be achieved.

Content
Chemische und physikalische Eigenschaften des Wassers, Wasserkreislauf und Inhaltsstoffe, Kalk-Kohlensäure-Gleichgewicht, Sättigungsindex, Grundwasser, Oberflächenwasser, Umsetzungen, Trinkwasser, Grundlagen der Wasserbeurteilung, analytische Verfahren zur Wasseruntersuchung, wassertechnologische und wasserchemische Verfahren (Flockung, Fällung, Enteisenung, Entmanganung, Adsorption und Ionenaustausch, Gasaustausch, Enthärtung und/oder Entkarbonisierung, Oxidation und Entkeimung), Übungen

Recommendations
None

Literature

- Crittenden et al. (2005): Water Treatment, Principles and design. Wiley & Sons
- Skoog, D., A., Holler, F. J., Crouch, S., R. (2013): Instrumentelle Analytik, Springer Spektrum
- Vorlesungsskripte

M 7.71 Module: X-ray Fluorescence Analysis in Geosciences – Fundamentals and Practice [M-BGU-107579]

Coordinators: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: Specialisation in Geoscience: Mineralogy and Geochemistry (Specialisation in Geosciences: Mineralogy and Geochemistry Elective Modules) (Usage from 10/1/2025)
Specific Supplements (Usage from 10/1/2025)

Credits	Grading	Recurrence	Duration	Language	Level	Version
5 CP	graded	Each winter term	1 term	German	4	1

ID	Name	Term offered	Credits	Lecturers
Mandatory				
T-BGU-114845	X-ray Fluorescence Analysis in Geosciences – Fundamentals and Practice		**5 CP**	**Eiche**

Assessment
Examination of another type (Graded report, ca. 10-15 pages).

Prerequisites
None.

Competence Goal
The students understand the physical principles of X-ray fluorescence analysis (XRF) and can apply this understanding to measurements and frequently occur-ring interferences. They are able to understand calibrations for two XRF tech-niques (EDXRF, WDXRF) and check their quality. They are also able to assess the quality of the samples measured with this calibration and deduce where prob-lems arise from in the case of poor quality. In addition to the quantitative meth-ods, they can discuss the advantages and disadvantages of standardless and semi-quantitative approaches and weigh them against each other.
The students gain an insight into the processes and procedures of a world-leading XRF manufacturer and can discuss the requirements of the working envi-ronment with the experts.

Content
- Physical and instrumental principles of energy and wavelength dispersive X-ray fluorescence analysis
- Calibration based on certified standards
- Measurement of samples with different matrices using the calibrations cre-ated
- Standardless and semi-quantitative possibilities of sample analysis using XRF
- Problems and interferences that occur in XRF analysis and possible solutions
- Discussion of the quality of calibrations and sample measurements

Module Grade Calculation
The module grade is the grade for the partial performance *X-ray fluorescence analysis in geosciences – fundamentals and practice.*

Additional Information
The course is carried out face-to-face (at Bruker).

Workload
30 in attendence (coure time at Bruker), 110 h self-study time (online-material, evaluation and interpretation of sample results, report)
Average workload per semester (hours) 150 h

Teaching and Learning Methods
Lectures and lab courses (at Bruker).

8 Module components

T 8.1 Module component: 3D Geological Modelling [T-BGU-111446]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105729 - 3D Geological Modelling

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	5 CP	graded	Each winter term	1 semesters	1

Courses					
WT 26/27	**6339047**	3D Geological Modeling	**3 SWS**	**Lecture / 🗣**	**Blum**

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Workload
150 hours

T 8.2 Module component: Advanced Analysis in GIS [T-BGU-101782]

Coordinators: Dr. Susanne Benz
Prof. Dr. Martin Breunig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-101053 - Advanced Analysis in GIS

Type	Credits	Grading	Term offered	Version
Examination of another type	4 CP	graded	Each summer term	5

Courses					
ST 2026	**6026208**	Advanced Analysis in GIS	**2 SWS**	**Lecture /**	**Benz**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Assessment
A project paper of approximately

Prerequisites
None

Recommendations
Students should be comfortable using QGIS independently

Additional Information
Teaching and Learning Methods: Englisch Video lectures and bi-lingual in-person exercises (inverted classroom)

Workload
90 hours

T 8.3 Module component: Advanced Clay Mineralogy [T-BGU-104840]

Coordinators: apl. Prof. Dr. Katja Emmerich
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102444 - Applied Mineralogy: Clay Science

Type	Credits	Grading	Term offered	Version
Examination of another type	3 CP	graded	Each summer term	2

Courses					
ST 2026	**6310430**	Applications of Clays and Laboratory Introduction	**2 SWS**	**Lecture / Practice /**	**Emmerich**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Prerequisites
none

Additional Information
The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

Obligation of attendance for the practical laboratory exercises from the beginning to the end of the course

Workload
90 hours

T 8.4 Module component: Advanced Geological Mapping [T-BGU-111455]

Coordinators: apl. Prof. Dr. Kirsten Drüppel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105736 - Advanced Geological Mapping

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	5 CP	graded	Each summer term	1 semesters	1

Courses					
WT 26/27	**6310401**	Advanced Geological Mapping (Field Course)	**4 SWS**	**Practice / 🗣**	**Drüppel, Tomašević**

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The assessment consists of an examination of another type, including field work, preparation of a geological mal and a mapping report

Prerequisites
none

Additional Information
none

Workload
150 hours

T 8.5 Module component: Application and Industrial Use [T-BGU-111468]

Coordinators: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105742 - Geothermics II: Application and Industrial Use

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	4 CP	graded	Each summer term	1 semesters	1

Courses					
ST 2026	**6310425**	Geothermics II: Application and Industrial Use	**2 SWS**	**Lecture / Practice /**	**Kohl**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Assessment
The assessment consists of a written exam (45min) according to §4 (2) of the examination regulations.

Prerequisites
none

Workload
120 hours

T 8.6 Module component: Applied and Regional Hydrogeology [T-BGU-111593]

Coordinators: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105793 - Applied and Regional Hydrogeology

Type	Credits	Grading	Term offered	Expansion	Version
Oral examination	5 CP	graded	Each winter term	1 semesters	2

Courses					
WT 26/27	**6339081**	Applied Hydrogeology	**2 SWS**	**Lecture / Practice /**	**Goldscheider**
WT 26/27	**6339085**	Regional Hydrogeology	**1.5 SWS**	**Lecture /**	**Goldscheider**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
Oral exam (30 min)

Workload
150 hours

T 8.7 Module component: Applied Mapping [T-BGU-111444]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105713 - Applied Mapping and Processing of Geospatial Data

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	4 CP	graded	Each summer term	1 semesters	1

Courses					
ST 2026	**6310020**	Applied Mapping	**3 SWS**	**Practice / 🗣**	**Blum, Menberg**

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The assessment consists of an examination of another type. It consists of:
- the geological map
- a report of 15 pages
- an oral presentation of results of 15 minutes duration

Prerequisites
Study profile Engineering and Hydrogeology

Workload
120 hours

T 8.8 Module component: Applied Mineralogy: Geomaterials [T-BGU-104811]

Coordinators: Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102430 - Applied Mineralogy: Geomaterials

Type	Credits	Grading	Term offered	Version
Examination of another type	5 CP	graded	Each winter term	3

Courses					
WT 26/27	**6339079**	Mineral Physics	**2 SWS**	**Lecture / Practice /**	**Schilling, Koltschinskaja**
WT 26/27	**6339083**	Crystallography applied to Geomaterials	**2 SWS**	**Lecture / Practice /**	**Schilling, de la Flor Martin, Koltschinskaja**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The assessment consists of an examination of another type (worksheets).

To pass the worksheets, at least 50% of the points must be achieved.

Prerequisites
none

Additional Information
Will be held in Englisch to improve language competence.

The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the course progress of the participants.

Workload
150 hours

T 8.9 Module component: Basic Seminar Supplementary Studies on Science, Technology and Society - Self Registration [T-FORUM-113579]

Coordinators: Dr. Christine Mielke
Christine Myglas

Organisation: General Studies. Forum Science and Society (FORUM)

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	2 CP	pass/fail	Each summer term	1 semesters	1

Assessment
Study achievement in the form of a presentation or a term paper or project work in the selected course.

Prerequisites
None

Self Service Assignment of Supplementary Studies
This module component can be used for self service assignment of grades acquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendations
It is recommended that the basic seminar be completed during the same semester as the lecture series "Science in Society". If it is not possible to attend the lecture series and the basic seminar in the same semester, the basic seminar can also be attended in the semesters before the lecture series.
However, attending courses in the advanced unit before attending the basic seminar should be avoided.

T 8.10 Module component: Basin Analysis and Modeling [T-BGU-111543]

Coordinators: TT-Prof. Dr. Nevena Tomašević
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105773 - Basin Analysis and Modeling

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	5 CP	graded	Each winter term	1 semesters	1

Courses					
WT 26/27	**6339072**	Basin Analysis and Modelling	**4 SWS**	**Lecture / Practice /**	**Tomašević**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Assessment
The assessment consists of an end-term examination of another type (graded written report up to 10 pages, submitted 4 weeks after the end of the lecture period and a final oral presentation (and discussion). Each of the two components weighs 50 %.

Workload
150 hours

T 8.11 Module component: Borehole Technology [T-BGU-111471]

Coordinators: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105745 - Borehole Technology

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	5 CP	graded	Each term	2 semesters	1

Courses					
ST 2026	**6310426**	Borehole Technology: Drilling	**2 SWS**	**Lecture / Practice /**	**Kohl, Gaucher**
WT 26/27	**6339095**	Borehole Technology: Logging	**2 SWS**	**Lecture / Practice /**	**Kohl, Gaucher**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
See module description.

Prerequisites
none

Workload
150 hours

T 8.12 Module component: Brownfield Sites - Investigation, Evaluation, Rehabilitation [T-BGU-100089]

Coordinators: Dr.-Ing. Andreas Bieberstein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100079 - Environmental Geotechnics

Type	Credits	Grading	Term offered	Expansion	Version
Oral examination	3 CP	graded	Each winter term	1 semesters	1

Courses					
WT 26/27	**6251915**	Brownfield Sites - Investigation, Evaluation, Rehabilitation	**2 SWS**	**Lecture / 🗣**	**Bieberstein, Eiche, Würdemann, Mohrlok**

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
oral exam, appr. 20 min.

Prerequisites
none

Recommendations
none

Additional Information
none

Workload
90 hours

T 8.13 Module component: Chemistry of Interfaces [T-BGU-115007]

Coordinators: Dr. rer. nat. Andreas Bogner
Dr. Peter Thissen

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: M-BGU-107660 - Chemistry of Interfaces

Type	Credits	Grading	Term offered	Expansion	Version
Oral examination	6 CP	graded	Each term	1 semesters	1

Courses					
ST 2026	**6211816**	Chemistry of Interfaces	**2 SWS**	**Lecture / 🗣**	**Thissen, Bogner**
ST 2026	**6211817**	Exercises for Chemistry of Interfaces	**2 SWS**	**Practice / 🗣**	**Thissen, Bogner**

Legend: 📱 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
oral exam, appr. 30 min.

Prerequisites
none

Recommendations
none

Additional Information
newly offered as from summer term 2026

Workload
180 hours

T 8.14 Module component: Clay Mineralogy Introduction [T-BGU-104839]

Coordinators: apl. Prof. Dr. Katja Emmerich
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102444 - Applied Mineralogy: Clay Science

Type	Credits	Grading	Term offered	Version
Coursework (written)	2 CP	pass/fail	Each winter term	2

Courses					
WT 26/27	**6339084**	Clay Mineralogy Introduction	**2 SWS**	**Lecture / Practice /**	**Emmerich**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Prerequisites
none

Workload
60 hours

T 8.15 Module component: Coursework ‘Rock Mechanics and Rock Engineering’ [T-BGU-113963]

Coordinators: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-107001 - Rock Mechanics and Rock Engineering

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	1 CP	pass/fail	Each summer term	1 semesters	1

Courses					
ST 2026	**6251804**	Rock Mechanics and Rock Construction Underground	**4 SWS**	**Lecture / Practice /**	**Schneider, Walter**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
preparation of 4 homeworks, former exams

Prerequisites
none

Recommendations
none

Additional Information
none

Workload
20 hours

T 8.16 Module component: Current Research Topics in Hydrogeology and Engineering Geology [T-BGU-111067]

Coordinators: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105506 - Current Research Topics in Hydrogeology and Engineering Geology

Type	Credits	Grading	Term offered	Version
Coursework	5 CP	pass/fail	Each term	1

Courses					
ST 2026	**6339041**	Expert Discussion on Hydrogeology and Engineering Geology	**1 SWS**	**Seminar / 🗣**	**Goldscheider, Steger**
ST 2026	**6339042**	Field Trip Hydrogeology and Engineering Geology	**1.5 SWS**	**Practice / 🗣**	**Goldscheider, Blum**
WT 26/27	**6339051**	Advanced Seminar Hydrogeology/ Engineering Geology	**1.5 SWS**	**Advanced Graduate Seminar / 🗣**	**Blum**
WT 26/27	**6339052**	Expert Discussion on Hydrogeology and Engineering Geology	**1 SWS**	**Lecture / 🗣**	**Eingeladene Gäste, Goldscheider, Steger, Blum**

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
Attendance at current lecture series, field exercise report(s) (1 page/day), presentation (20 min)

Workload
150 hours

T 8.17 Module component: Diagenesis [T-BGU-107559]

Coordinators: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103734 - Diagenesis and Cores

Type	Credits	Grading	Term offered	Version
Examination of another type	3 CP	graded	Each winter term	1

Courses					
WT 26/27	**6339070**	Diagenesis	**2 SWS**	**Seminar / 🗣**	**Busch**

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The assessment is a marked written report

Diagenesis: The assessment is based on a marked written report (10 pages) describing and interpreting a given thin section by independent practical microscopy over 4h on the day after completion of the course. This covers petrographic description of a sedimantary rock in thin section, its interpretation plus thin section images and raw data in the enclosure. Submission of report: 2 weeks after the end of the course.

Prerequisites
successfully passed Module Reservoir-Geology

Additional Information
Diagenesis: Seminar as block course during winter term due to requirement of microscope lab and involvement of external lecturer

The practical part of this course is carried out in presence. The microscopy exercises are essential for the study progress of the participants.

Workload
90 hours

T 8.18 Module component: Earthworks and Foundation Engineering [T-BGU-100068]

Coordinators: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100068 - Earthworks and Foundation Engineering

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	4 CP	graded	Each term	1 semesters	2

Courses					
WT 26/27	**6251701**	Foundation Types	**2 SWS**	**Lecture / Practice /** 🗣	**Stutz**
WT 26/27	**6251703**	Basics in Earthworks and Embankment Dams	**2 SWS**	**Lecture / Practice /** 🗣	**Bieberstein**

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
written exam, 90 min.

Prerequisites
none

Recommendations
preparation of the student research project for examination preparation

Additional Information
none

Workload
120 hours

T 8.19 Module component: Elective Specialization Supplementary Studies on Science, Technology and Society / About Knowledge and Science - Self-Registration [T-FORUM-113580]

Coordinators: Dr. Christine Mielke
Christine Myglas

Organisation: General Studies. Forum Science and Society (FORUM)

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading	Term offered	Version
Examination of another type	3 CP	graded	Each term	1

Assessment
Another type of examination assessment under § 5, section 3 involves a presentation, term paper, or project work within the chosen course.

Prerequisites
None

Self Service Assignment of Supplementary Studies
This module component can be used for self service assignment of grades acquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendations
The contents of the basic module are helpful. The basic module should be completed or attended in parallel, but not after the advanced module.
The reading recommendations for primary and specialist literature are determined individually by the respective lecturers according to the subject area and course.

Additional Information
This placeholder can be used for any achievement in the Advanced Unit of the Supplementary Studies.

In the Advanced Module, students can choose their own individual focus, e.g. sustainable development, data literacy, etc. The focus should be discussed with the module coordinator at the FORUM.

T 8.20 Module component: Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Public Debates - Self Registration [T-FORUM-113582]

Coordinators: Dr. Christine Mielke
Christine Myglas

Organisation: General Studies. Forum Science and Society (FORUM)

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading	Term offered	Version
Examination of another type	3 CP	graded	Each term	1

Assessment
Another type of examination assessment under § 5, section 3 involves a presentation, term paper, or project work within the chosen course.

Prerequisites
None

Self Service Assignment of Supplementary Studies
This module component can be used for self service assignment of grades acquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendations
The contents of the basic module are helpful. The basic module should be completed or attended in parallel, but not after the advanced module.
The reading recommendations for primary and specialist literature are determined individually by the respective lecturers according to the subject area and course.

Additional Information
This placeholder can be used for any achievement in the Advanced Unit of the Supplementary Studies.

T 8.21 Module component: Elective Specialization Supplementary Studies on Science, Technology and Society / Science in Society - Self-Registration [T-FORUM-113581]

Coordinators: Dr. Christine Mielke
Christine Myglas

Organisation: General Studies. Forum Science and Society (FORUM)

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading	Term offered	Version
Examination of another type	3 CP	graded	Each term	1

Assessment
Another type of examination assessment under § 5, section 3 involves a presentation, term paper, or project work within the chosen course.

Prerequisites
None

Self Service Assignment of Supplementary Studies
This module component can be used for self service assignment of grades acquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendations
The contents of the basic module are helpful. The basic module should be completed or attended in parallel, but not after the advanced module.
The reading recommendations for primary and specialist literature are determined individually by the respective lecturers according to the subject area and course.

Additional Information
This placeholder can be used for any achievement in the Advanced Unit of the Supplementary Studies.

T 8.22 Module component: Electron Microscopy I [T-PHYS-107599]

Coordinators: TT-Prof. Dr. Yolita Eggeler
Organisation: KIT Department of Physics
Part of: M-PHYS-103760 - Electron Microscopy I

Type	Credits	Grading	Term offered	Version
Oral examination	5 CP	graded	Irregular	1

Courses					
WT 26/27	**4027011**	Electron Microscopy I	**2 SWS**	**Lecture / 🗣**	**Eggeler, Hettler**
WT 26/27	**4027012**	Exercises to Electron Microscopy I	**2 SWS**	**Practice / 🗣**	**Eggeler, Hettler**

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
Oral Exam, ca. 45 min

Prerequisites
none

T 8.23 Module component: Electron Microscopy II [T-PHYS-107600]

Coordinators: TT-Prof. Dr. Yolita Eggeler
Organisation: KIT Department of Physics
Part of: M-PHYS-103761 - Electron Microscopy II

Type	Credits	Grading	Term offered	Version
Oral examination	5 CP	graded	Irregular	1

Courses					
ST 2026	**4027021**	Electron Microscopy II	**2 SWS**	**Lecture /**	**Eggeler, Hettler, Müller**
ST 2026	**4027022**	Exercises to Electron Microscopy II	**2 SWS**	**Practice /**	**Eggeler**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
Oral Exam, ca. 45 min

Prerequisites
none

T 8.24 Module component: Energy and Transport Processes [T-BGU-111466]

Coordinators: Prof. Dr. Thomas Kohl
Prof. Dr. Frank Schilling

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: M-BGU-105741 - Geothermics I: Energy and Transport Processes

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	5 CP	graded	Each winter term	1 semesters	1

Courses					
WT 26/27	**6339091**	Geothermics I: Transport of Heat and Fluids	**2 SWS**	**Lecture / Practice /**	**Kohl**
WT 26/27	**6339196**	Geothermics I: Energy Budget of the Earth	**2 SWS**	**Lecture / Practice /**	**Schilling**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The assessment consists of a written exam (45 min) according to §4 (2) of the examination regulations

Prerequisites
none

Workload
140 hours

T 8.25 Module component: Engineering Geologie: Laboratory and Field Methods [T-BGU-111448]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105731 - Engineering Geology: Laboratory and Field Methods

Type	Credits	Grading	Term offered	Version
Oral examination	5 CP	graded	Each term	1

Courses					
ST 2026	**6310404**	Engineering Geological Field Course	**1.5 SWS**	**Practice / 🗣**	**Blum, Menberg, Steger**
WT 26/27	**6339112**	Engineering Geology Laboratory Practical Course	**1.5 SWS**	**Practice / 🗣**	**Blum, Menberg, Steger**

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
none

Additional Information
The practical part of this course is carried out in presence. The field courses and laboratory courses are essential for the progress of the participants.

Workload
150 hours

T 8.26 Module component: Engineering Geology: Mass Movements [T-BGU-110724]

Coordinators: Dr. Kathrin Menberg
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102442 - Engineering Geology: Mass Movements and Modelling

Type	Credits	Grading	Term offered	Version
Coursework	2 CP	pass/fail	Each winter term	1

Courses					
WT 26/27	**6339082**	Mass Movements	**2 SWS**	**Lecture / 🗣**	**Menberg**

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Workload
60 hours

T 8.27 Module component: Engineering Geology: Modelling [T-BGU-110725]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102442 - Engineering Geology: Mass Movements and Modelling

Type	Credits	Grading	Expansion	Version
Examination of another type	3 CP	graded	1 semesters	1

Courses					
ST 2026	**6310413**	Numerical Modeling in Engineering Geology	**2 SWS**	**Lecture / Practice /**	**Blum, Menberg**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Workload
90 hours

T 8.28 Module component: Environmental Geochemistry [T-BGU-111525]

Coordinators: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105766 - Environmental Geochemistry

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	5 CP	graded	Each winter term	2 semesters	2

Courses					
ST 2026	**6310407**	Substance Flow in the Environment	**2 SWS**	**Lecture / 🗣**	**Eiche, Rühr, Zamparas**
WT 26/27	**6330104**	Environmental Geochemistry Seminar	**1 SWS**	**Seminar / 🗣**	**Eiche, Rühr, Gil Diaz**

Legend: 📱 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The assessment consists of an examination of another type (ca. 10 exercise sheets in ILIAS for the lecture, a presentation of 30 min including discussion and a report related to the presentation of 10-20 pages) according to §4 (2) of the examination regulations.

Prerequisites
none

Recommendations
none

Additional Information
none

Workload
150 hours

T 8.29 Module component: Environmental Geology: Radio- & Chemotoxic Elements [T-BGU-107560]

Coordinators: Dr. Frank Heberling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102455 - Environmental Geology: Radio- & Chemotoxic Elements

Type	Credits	Grading	Term offered	Version
Written examination	3 CP	graded	Each winter term	1

Courses					
WT 26/27	**6339088**	Geoscientific Aspects of the Disposal of Radio- and Chemotoxic Waste	**2 SWS**	**Lecture / 🗣**	**Heberling, Metz**

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
none

Workload
90 hours

T 8.30 Module component: Field Course Applied Structural Geology [T-BGU-107508]

Coordinators: apl. Prof. Dr. Agnes Kontny
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102451 - Structural Geology

Type	Credits	Grading	Term offered	Version
Coursework (oral)	2 CP	pass/fail	Each summer term	2

Courses					
ST 2026	**6310406**	Field Exercise on Structural Geology	**3 SWS**	**Practice / 🗣**	**Kontny**

Legend: 📱 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The assessment consists of an examination of another type:

Participation in the field course (5-6 days) and ungraded presentation of a topic relevant to the geological field area (from literature and your own field data) depending on the location of the field course. The presentation is given either during the field course or approx. 4-6 weeks afterwards. The presentation consists either of a poster presentation or a 5-10 minutes talk with an approx. 8-page report. The revised field book records are necessary to pass the course.

Prerequisites
none

Additional Information
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
60 hours

T 8.31 Module component: Field Seminar [T-BGU-111472]

Coordinators: Prof. Dr. Armin Zeh
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105746 - Field Seminar

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	5 CP	graded	Each summer term	1 semesters	1

Courses					
ST 2026	**6310460**	Geoscientific Field Exercise/ Excursion/Master	**5 SWS**	**Practice / 🗣**	**Zeh, Hilgers, Kontny**
WT 26/27	**6310124**	Industrial Minerals	**2 SWS**	**Lecture / Practice / 🗣**	**Kolb**
WT 26/27	**6310460**	Field Seminar	**5 SWS**	**Practice / 🗣**	**Zeh**

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The assessment is the participation of a 10 day (often international) field trip, taking notes in a geological field book, and depending on the respective lecturer a preliminary seminar, daily minutes during the trip, final report or some similar reporting.

Prerequisites
none

Recommendations
Students are requested to take this module in their final year.

Additional Information
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
150 hours

T 8.32 Module component: Field Trip Karst Hydrogeology [T-BGU-110413]

Coordinators: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105790 - Karst Hydrogeology

Type	Credits	Grading	Term offered	Version
Coursework (written)	2 CP	pass/fail	Each summer term	1

Courses					
ST 2026	**6339078**	Field Trip Karst Hydrogeology	**1 SWS**	**Practice / 🗣**	**Goldscheider**

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Additional Information
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
60 hours

T 8.33 Module component: Fundamentals of Foundation Engineering [T-BGU-112815]

Coordinators: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103698 - Geotechnical Engineering
M-BGU-106523 - Fundamentals of Foundation Engineering

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	5 CP	graded	Each term	1 semesters	3

Courses					
WT 26/27	**6200515**	Basics in Foundation Engineering	**2 SWS**	**Lecture /**	**Stutz**
WT 26/27	**6200516**	Exercises to Basics of Foundation Engineering	**2 SWS**	**Practice /**	**Mitarbeiter/innen**
WT 26/27	**6200517**	Tutorial on Basics in Foundation Engineering	**2 SWS**	**Tutorial /**	**Mitarbeiter/innen**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Assessment
written exam, 75 min.

Prerequisites
none

Recommendations
module 'Basics in Soil Mechanics' (M-BGU-106521)

Additional Information
none

Workload
150 hours

T 8.34 Module component: Fundamentals of Project Management [T-BGU-113492]

Coordinators: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106717 - Fundamentals of Project Management

Type	Credits	Grading	Expansion	Version
Coursework	1 CP	pass/fail	1 semesters	1

Courses					
ST 2026	**6339083**	Fundamentals of Project Management	**1 SWS**	**Lecture / Practice /**	**Hilgers, Busch**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
Coursework in accordance with Section 4 Paragraph 3 SPO Master Applied Geosciences: Compulsory participation in the course "Fundamentals of Project Management" and presentation.

T 8.35 Module component: Fundamentals of Soil Mechanics [T-BGU-112814]

Coordinators: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103698 - Geotechnical Engineering
M-BGU-106521 - Fundamentals of Soil Mechanics

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	5 CP	graded	Each term	1 semesters	3

Courses					
ST 2026	**6200415**	Basics in Soil Mechanics	**2 SWS**	**Lecture /**	**Stutz**
ST 2026	**6200416**	Exercises to Basics in Soil Mechanics	**2 SWS**	**Practice /**	**Mitarbeiter/innen**
ST 2026	**6200417**	Tutorials to Basics in Soil Mechanics	**2 SWS**	**Tutorial /**	**Mitarbeiter/innen**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
written exam, 75 min.

Prerequisites
none

Recommendations
none

Additional Information
none

Workload
150 hours

T 8.36 Module component: Geochemical and Petrological Modeling [T-BGU-111473]

Coordinators: apl. Prof. Dr. Kirsten Drüppel
Dr. Elisabeth Eiche
Dr. Frank Heberling
Prof. Dr. Armin Zeh

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: M-BGU-105747 - Geochemical and Petrological Modeling

Type	Credits	Grading	Term offered	Expansion	Version
Oral examination	5 CP	graded	Each winter term	1 semesters	1

Courses					
WT 26/27	**6339043**	Geochemical and Petrological Modeling	**2 SWS**	**Lecture / 🗣**	**Zeh, Drüppel, Heberling, Eiche, Gil Diaz**

Legend: 🖥 Online, 🎭 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The assessment consists of an oral examination (30 minutes duration)

Prerequisites
none

Additional Information
Will be held first in in the winter term 2022/2023

Workload
150 hours

T 8.37 Module component: Geochemical Processes and Analytical Methods [T-BGU-108192]

Coordinators: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103995 - Geochemical Processes and Analytical Methods

Type	Credits	Grading	Term offered	Version
Examination of another type	5 CP	graded	Each summer term	3

Courses					
ST 2026	**6310405**	Geochemical Element Cycling	**2 SWS**	**Lecture /**	**Eiche, Hector, Kimmig, Bilau, Zamparas**
ST 2026	**6310410**	Analytical Geochemistry (Advanced Level)	**2 SWS**	**Practical course /**	**Eiche, Hector, Kimmig, Bilau, Gil Diaz, Chattopadhyay, Zamparas**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Additional Information
The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

Workload
150 hours

T 8.38 Module component: Geodata Analysis II – Big Data and Machine Learning [T-BGU-111268]

Coordinators: Dr. Tanja Liesch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105634 - Geodata Analysis II – Big Data and Machine Learning

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	5 CP	graded	Each summer term	1 semesters	1

Courses					
ST 2026	**6310505**	Geodata Analysis II - Big Data and Machine Learning	**3 SWS**	**Lecture / Practice /**	**Liesch, Menberg**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
Choice of the profile Hydrogeology and Engineering Geology. To register for the exam, the module Geodata Analysis I - Programming and Geostatistics must have been passed.

Workload
150 hours

T 8.39 Module component: Geological Storage of Gas [T-BGU-104841]

Coordinators: Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102445 - Geological Storage of Gas

Type	Credits	Grading	Term offered	Version
Examination of another type	5 CP	graded	Each summer term	3

Courses					
ST 2026	**6339093**	Geological Storage of Gas	**2 SWS**	**Lecture /**	**Schilling**
ST 2026	**6339094**	Fundamentals of Reservoir Geomechanics	**2 SWS**	**Lecture /**	**Schilling, Müller**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The assessment consists of an examination of another type (presentation).

Prerequisites
none

Recommendations
The student shall have a basic knowledge of reservoir geology, mathematics and physics

Additional Information
Depending on the auditorium, this course is held in German or English

Workload
150 hours

T 8.40 Module component: Geology [T-BGU-111470]

Coordinators: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105744 - Geology

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	5 CP	graded	Each winter term	1 semesters	1

Courses					
WT 26/27	**6339080**	Analysis of Geological Structures	**3 SWS**	**Lecture / Practice /**	**Hilgers**
WT 26/27	**6339086**	Depositional Systems of Regions	**1 SWS**	**Lecture / Practice /**	**Hilgers**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The assessment is a marked written exam over 120 minutes

Prerequisites
none

Additional Information
We consider to have one field practical near Karlsruhe.

Workload
150 hours

T 8.41 Module component: Geospatial Data Analysis I – Programming and Geostatistics [T-BGU-111066]

Coordinators: Dr. Kathrin Menberg
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105505 - Geospatial Data Analysis I – Programming and Geostatistics

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	5 CP	graded	Each winter term	1 semesters	2

Courses					
WT 26/27	**6339042**	Geodata Analysis I - Programming and Geostatistics	**3 SWS**	**Lecture / Practice /**	**Menberg**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
Student research project: programming of a code for data analysis, written documentation (ca. 5 pages)

Prerequisites
Choice of the profile Engineering and Hydrogeology

Recommendations
This module should be attended and completed before the module Geodata Analysis II that builds on it.

Workload
150 hours

T 8.42 Module component: Geothermal Exploitation – Field Exercise [T-BGU-111469]

Coordinators: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105742 - Geothermics II: Application and Industrial Use

Type	Credits	Grading	Term offered	Expansion	Version
Coursework (written)	1 CP	pass/fail	Each summer term	1 semesters	1

Courses					
ST 2026	**6310427**	Geothermics II: Geothermal Exploitation - Field Exercises (2 Days)	**1 SWS**	**Practice / 🗣**	**Kohl**

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
Non-assessed coursework (participation in field trip and report), see §4 (3) of the examination regulations.

Prerequisites
none

Additional Information
The date for the field exercise and the closing date for the field exercise report will be announced in the sumer term.

The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
30 hours

T 8.43 Module component: Geothermics in the Rhine Graben – Field Exercise [T-BGU-111467]

Coordinators: Prof. Dr. Thomas Kohl
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105741 - Geothermics I: Energy and Transport Processes

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	0 CP	pass/fail	Each winter term	1 semesters	1

Courses					
WT 26/27	**6339092**	Geothermics I: Geothermics in the Rhine Graben - Field Exercise	**1 SWS**	**Excursion / 🗣**	**Kohl, Nitschke**

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
non-assessed coursework (participation in field exercise and report) according to §4 (3) of the examination regulations

Prerequisites
none

Additional Information
The practical part of this course is carried out in presence. The field course is essential for the progress of the participants.

Workload
10 hours

T 8.44 Module component: GIS Cartography [T-BGU-111445]

Coordinators: Dr. Kathrin Menberg
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105713 - Applied Mapping and Processing of Geospatial Data

Type	Credits	Grading	Term offered	Expansion	Version
Coursework (written)	1 CP	pass/fail	Each summer term	1 semesters	1

Courses					
ST 2026	**6310399**	Processing of Geospatial Data	**2 SWS**	**Practice / 🗣**	**Menberg**

Legend: 🖥 Online, 🎭 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
Four unmarked exercise sheets

Prerequisites
none

Workload
30 hours

T 8.45 Module component: Ground Water and Earth Dams [T-BGU-100091]

Coordinators: Dr.-Ing. Andreas Bieberstein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100073 - Ground Water and Earth Dams

Type	Credits	Grading	Term offered	Expansion	Version
Oral examination	6 CP	graded	Each term	1 semesters	1

Courses					
ST 2026	**6251814**	Geotechnical Ground Water Problems	**2 SWS**	**Lecture / Practice /**	**Bieberstein**
ST 2026	**6251816**	Embankment Dams (Advanced)	**2 SWS**	**Lecture / Practice /**	**Bieberstein**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
oral exam, appr. 40 min.

Prerequisites
none

Recommendations
none

Additional Information
none

Workload
180 hours

T 8.46 Module component: Hydrogeology: Groundwater Modelling [T-BGU-104757]

Coordinators: Dr. Tanja Liesch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102439 - Hydrogeology: Groundwater Modelling

Type	Credits	Grading	Term offered	Version
Examination of another type	5 CP	graded	Each winter term	2

Courses					
WT 26/27	**6339113**	Groundwater Modeling	**4 SWS**	**Lecture / Practice /**	**Liesch, Schäfer**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Prerequisites
none

Workload
150 hours

T 8.47 Module component: Hydrogeology: Hydraulics and Isotopes [T-BGU-111402]

Coordinators: Dr. Tanja Liesch
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105726 - Hydrogeology: Hydraulics and Isotopes

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	5 CP	graded	Each summer term	1 semesters	2

Courses					
ST 2026	**6310411**	Isotope Methods in Hydrologeology	**1 SWS**	**Lecture / Practice /**	**Himmelsbach**
ST 2026	**6339081**	Hydraulic Methods	**1.5 SWS**	**Lecture / Practice /**	**Liesch**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
Written exam (90 min)

Prerequisites
none

Additional Information
The choice of the module "Hydrogeology: Hydraulics and Isotopes" as well as the active participation in it is a prerequisite for the choice/occupation of the modules Hydrogeology: Groundwater Modelling [M-BGU-102439] and Hydrogeology: Field and Laboratory Methods [M-BGU-102441], as it forms the theoretical and practical basis for them.

Workload
150 hours

T 8.48 Module component: Industrial Minerals and Environment [T-BGU-108191]

Coordinators: Prof. Dr. Jochen Kolb
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103993 - Industrial Minerals and Environment

Type	Credits	Grading	Term offered	Version
Examination of another type	5 CP	graded	Each winter term	2

Courses					
WT 26/27	**6310124**	Industrial Minerals	**2 SWS**	**Lecture / Practice /** 🗣	**Kolb**
WT 26/27	**6310125**	Field Seminar Industrial Minerals	**2 SWS**	**Seminar /** 🗣	**Kolb**

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The assessment consists of an examination of another type (graded module report incl. field seminar report). The assessment consists of a report accounting for 60% of the grade, a field seminar report accounting for 20% of the grade and weekly tests that account for 20% of the grade.

Prerequisites
keine

Additional Information
The course "Field Seminar Industrial Minerlas" is part of this module, duration: 2,5 days. The date will be announced during the winter term.

The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
150 hours

T 8.49 Module component: Internship [T-BGU-108210]

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103996 - Internship

Type	Credits	Grading	Term offered	Version
Examination of another type	5 CP	graded	Irregular	2

Assessment
see module description

T 8.50 Module component: Introduction into Paleontology [T-BGU-113458]

Coordinators: Dr. Julien Kimmig
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106693 - Introduction to Paleontology

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	5 CP	graded	Each summer term	1 semesters	2

Courses					
ST 2026	**6339097**	Introduction to Paleontology	**4 SWS**	**Lecture / 🗣**	**Kimmig**

Legend: 📱 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The competence is tested in form of:

- A written exam of approx 90 minutes
- Presentation of approx 20 minutes
- Lab book
- Worksheets

50% of the points need to be reached to pass the worksheet portion.

Prerequisites
Interest in paleontology

Workload
126 hours

T 8.51 Module component: Introduction to Ceramics [T-MACH-100287]

Coordinators: Prof. Dr. Kaline Pagnan Furlan
Organisation: KIT Department of Mechanical Engineering

Part of: M-BGU-105222 - Introduction to Ceramics

Type	Credits	Grading	Term offered	Version
Written examination	6 CP	graded	Each winter term	2

Courses					
WT 26/27	**2125757**	Introduction to Ceramics	**3 SWS**	**Lecture /**	**Pagnan Furlan, Wagner, Ribas Gomes**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The assessment consists of an written exam (60 min) taking place at a specific date.
The re-examination is offered at a specific date.

Prerequisites
None

Workload
180 hours

T 8.52 Module component: Introduction to Computational Geodynamics – Part 1 [T-BGU-113836]

Coordinators: Dr. Ali Ismail-Zade
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106898 - Introduction to Computational Geodynamics: Part 1

Type	Credits	Grading	Expansion	Version
Oral examination	3 CP	graded	1 semesters	1

Courses					
WT 26/27	**6339135**	Introduction to Computational Geodynamics	**2 SWS**	**Lecture /**	**Ismail-Zade**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The assessment consists of an oral exam (each student will have 30 min to pre-pare answers to questions and 30 min to present their answers). To pass the exam, students should show their understanding of the lecture course topics and quantitative ways for solving geodynamical problems, comprehension of gained knowledge, and independent thinking.

Prerequisites
Basic knowledge about Earth dynamics, its surface processes, linear algebra, differential equations, tensor analysis.

Recommendations
This module will introduce general concepts of numerical modelling in geodynamics. Module M-BGU-105739 presents more specific knowledge and coding related to the numerical modelling in geothermal studies.

Additional Information
The principal goal of the course is to introduce quantitative and interdisciplinary understanding of and thinking about geodynamical problems rather than just to provide knowledge. Enthusiasm is expected in cooperation, discussions, and debates. So, your physical presence at the lectures is advisable, but online op-tion can be used as well (if required).

Workload
100 hours

T 8.53 Module component: Introduction to Geohazard Analysis [T-BGU-115036]

Coordinators: Dr. Ali Ismail-Zade
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-107656 - Introduction to Geohazard Analysis

Type	Credits	Grading	Term offered	Version
Oral examination	3 CP	graded	Each summer term	1

Courses					
ST 2026	**6310013**	Introduction to Geohazard Analysis	**2 SWS**	**Lecture**	**Ismail-Zade**

Prerequisites
Basic knowledge about Earth dynamics, its surface processes, linear algebra, differential equations.

Additional Information
The principal goal of the course is to introduce interdisciplinary understanding of and thinking about geohazard risk problems. Enthusiasm is expected in cooperation, discussions, and de-bates. So, your physical presence at the lectures is required.

Workload
90 hours

T 8.54 Module component: Introduction to Reflection Seismics, Prerequisite [T-PHYS-113453]

Coordinators: Prof. Dr. Thomas Bohlen
Organisation: KIT Department of Physics
Part of: M-BGU-105777 - Seismic Interpretation
Prerequisite for: T-BGU-113474 - Seismic Interpretation, Examination

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	1 CP	pass/fail	Each summer term	1 semesters	1

Courses					
ST 2026	**4060431**	Introduction to Reflection Seismics	**1 SWS**	**Lecture / 🗣**	**Hertweck, Bohlen**
ST 2026	**4060432**	Exercises to Introduction to Reflection Seismics	**1 SWS**	**Practice / 🗣**	**Hertweck, Bohlen**

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
Regular attendance of lectures and exercises; submission of exercises and/or homework assignments in which at least 60% of the total number of points available must be achieved.

Prerequisites
See module description.

Workload
30 hours

T 8.55 Module component: Isotope Geochemistry and Geochronology [T-BGU-112211]

Coordinators: Dr. Aratz Beranoaguirre
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-106025 - Isotope Geochemistry and Geochronology

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	5 CP	graded	Each summer term	1 semesters	1

Assessment
The assessment consists of a written exam (multiple choice, 45min, ~30 questions).

Prerequisites
none

Additional Information
This module will start in the summer term of 2023, the courses will be added to the course catalog by then.

Workload
150 hours

T 8.56 Module component: Karst Hydrogeology [T-BGU-111592]

Coordinators: Prof. Dr. Nico Goldscheider
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105790 - Karst Hydrogeology

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	3 CP	graded	Each winter term	1 semesters	3

Courses					
WT 26/27	**6339076**	Karst Hydrogeology	**2 SWS**	**Lecture / Practice /**	**Goldscheider**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Assessment
Written Exam, 60 min

Workload
90 hours

T 8.57 Module component: Laboratory Work in Physical Chemistry [T-CHEMBIO-109395]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-104581 - Physical Chemistry for Applied Geosciences

Type	Credits	Grading	Term offered	Expansion	Version
Oral examination	6 CP	graded	Each winter term	1 semesters	2

Courses					
ST 2026	**5229**	Physikalisch-chemisches Praktikum für Angewandte Geowissenschaften	**8 SWS**	**Practical course / 🗣**	**Höfener, Bickel, Unterreiner, Die Dozierenden des Instituts**
WT 26/27	**5229**	Physikalisch-chemisches Praktikum für Angewandte Geowissenschaften	**8 SWS**	**Practical course**	**Höfener, Unterreiner, Die Dozierenden des Instituts**

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
acc. to lecturer

Workload
180 hours

T 8.58 Module component: Landfills [T-BGU-100084]

Coordinators: Dr.-Ing. Andreas Bieberstein
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100079 - Environmental Geotechnics

Type	Credits	Grading	Term offered	Expansion	Version
Oral examination	3 CP	graded	Each winter term	1 semesters	1

Courses					
WT 26/27	**6251913**	Landfills	**2 SWS**	**Lecture / Practice /**	**Bieberstein**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Assessment
oral exam, appr. 20 min.

Prerequisites
none

Recommendations
none

Additional Information
none

Workload
90 hours

T 8.59 Module component: Lecture Series Supplementary Studies on Science, Technology and Society - Self Registration [T-FORUM-113578]

Coordinators: Dr. Christine Mielke
Christine Myglas

Organisation: General Studies. Forum Science and Society (FORUM)

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	2 CP	pass/fail	Each summer term	1 semesters	1

Courses					
ST 2026	**1130716**	Lecture Series Science in Society	**2 SWS**	**Lecture / 🗣**	**Post, Mielke**

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
Active participation, learning protocols, if applicable.

Prerequisites
None

Self Service Assignment of Supplementary Studies
This module component can be used for self service assignment of grades acquired from the following study providers:

- Studium Generale. Forum Wissenschaft und Gesellschaft (FORUM) (ehem. ZAK)
- FORUM (ehem. ZAK) Begleitstudium

Recommendations
It is recommended that you complete the lecture series "Science in Society" before attending events in the advanced module and in parallel with attending the basic seminar.
If it is not possible to attend the lecture series and the basic seminar in the same semester, the lecture series can also be attended after attending the basic seminar.
However, attending events in the advanced module before attending the lecture series should be avoided.

Additional Information
The basic module consists of the lecture series "Science in Society" and the basic seminar. The lecture series is only offered during the summer semester.
The basic seminar can be attended in the summer or winter semester.

T 8.60 Module component: Master's Thesis [T-BGU-111758]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105845 - Master's Thesis

Type	Credits	Grading	Term offered	Version
Final Thesis	30 CP	graded	Each term	1

Final Thesis
This module component represents a final thesis. The following periods have been supplied:

Submission deadline	6 months
Maximum extension period	3 months
Correction period	8 weeks

Workload
900 hours

T 8.61 Module component: Microstructures [T-BGU-107507]

Coordinators: apl. Prof. Dr. Agnes Kontny
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102451 - Structural Geology

Type	Credits	Grading	Term offered	Version
Examination of another type	3 CP	graded	Each summer term	1

Courses					
ST 2026	**6339085**	Microstructures	**2 SWS**	**Lecture / Practice /**	**Kontny**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Assessment
The success control is carried in form of an approx. 20 min graded presentation in the course microstructure at the end of the course.
Content: Geological framework, description of the microstructures and derivation of the deformation history based on exercise thin sections.

Prerequisites
none

Additional Information
The practical part of this course is carried out in presence. The microscopy courses are essential for the progress of the participants.

Workload
90 hours

T 8.62 Module component: Mineral and Rock Physics [T-BGU-104838]

Coordinators: Prof. Dr. Frank Schilling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105784 - Petrophysics

Type	Credits	Grading	Term offered	Version
Examination of another type	5 CP	graded	Each summer term	4

Courses					
ST 2026	**6310428**	Mineral and Rock Physics	**4 SWS**	**Lecture / Practice /**	**Schilling, Kontny**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Assessment
The assessment consists of an examination of another type

Prerequisites
none

Additional Information
From the summer term 2022 on the lecture in this course will be named "Mineral and Rock Physics" (till now Petrophysics II)

The practical part of this course is carried out in presence. It requires special rooms (laboratory) and is essential for the study progress of the participants.

Workload
150 hours

T 8.63 Module component: Mineral Exploration [T-BGU-110833]

Coordinators: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105357 - Mineral Exploration

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	5 CP	graded	Each summer term	1 semesters	1

Courses					
ST 2026	**6321410**	Mineral Exploration	**4 SWS**	**Lecture / Practice /**	**Kolb, Hector**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
Report (after preliminary review), see module description

Prerequisites
see module description

Recommendations
see module description

Additional Information
Starting from the summer term 2022, in this brick 3 courses are given:

Course 1: Geochemical and Environmental Analysis (5 days), Lecture and Practical
Course 2: Geochemical Field Analysis and Sampling Techniques, Field Seminar
Course 3: Geochemical Core Analysis and Lab Techniques (3 days), Practical

Workload
150 hours

T 8.64 Module component: Mineral Materials [T-BGU-104856]

Coordinators: Dr. Matthias Schwotzer
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102453 - Mineral Materials

Type	Credits	Grading	Term offered	Version
Oral examination	5 CP	graded	Each term	1

Courses					
ST 2026	**6310419**	Material-damaging Reactions	**2 SWS**	**Lecture /**	**Schwotzer**
WT 26/27	**6339089**	Mineral Binders in the Construction Industry	**2 SWS**	**Lecture /**	**Schwotzer**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
none

Additional Information
The practical part of this course is carried out in presence. The laboratory courses are essential for the progress of the participants.

Workload
150 hours

T 8.65 Module component: Mineralogical Analytics [T-BGU-111524]

Coordinators: apl. Prof. Dr. Kirsten Drüppel
Prof. Dr. Frank Schilling

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: M-BGU-105765 - Mineralogical Analytics

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	5 CP	graded	Each summer term	1 semesters	1

Courses					
ST 2026	**6339090**	Mineralogical Analytics	**4 SWS**	**Lecture / Practice / ✿**	**Zeh, Schwotzer, Göttlicher, Heberling, Drüppel**

Legend: Online, ✿ Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The assessment consists of an examination of another type, including colloquia (approx. 15 Min) and short reports (1-2 pages each) for the laboratory exercises and a written examination (60 min).

Prerequisites
none

Recommendations
none

Additional Information
none

Workload
150 hours

T 8.66 Module component: Numerical Methods in Geosciences [T-BGU-111456]

Coordinators: Dr. Emmanuel Gaucher
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105739 - Numerical Methods in Geosciences

Type	Credits	Grading	Term offered	Version
Written examination	5 CP	graded	Each winter term	1

Courses					
WT 26/27	**6339078**	Numerical Methods in Geosciences	**4 SWS**	**Lecture / Practice /**	**Gaucher**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The assessment consists of a written exam (90 min).

Prerequisites
none

Additional Information
The practical part of this course is carried out in presence. The exercises are partly conducted in the computing lab and are essential for the progress of the participants.

Workload
150 hours

T 8.67 Module component: Ore Geology of Metals [T-BGU-109345]

Coordinators: Prof. Dr. Jochen Kolb
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103994 - Ore Geology of Metals

Type	Credits	Grading	Term offered	Expansion	Version
Oral examination	5 CP	graded	Each winter term	1 semesters	2

Courses					
WT 26/27	**6339096**	Field Seminar Ore Geology	**2 SWS**	**Seminar / 🗣**	**Kolb**
WT 26/27	**6339097**	Ore Microscopy and Ore Analysis	**2 SWS**	**Practice / 🗣**	**Kolb**
WT 26/27	**6339099**	Ore-forming processes	**1 SWS**	**Lecture / 🗣**	**Kolb**

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The assessment consists of an oral exam (30 min). A report on the field seminar has to be handed in before the oral exam. The assessment consists of an oral exam including sample description (45 min) accounting for 60% of the grade, a field seminar report accounting for 20% of the grade and weekly tests that account for 20% of the grade.

Additional Information
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
150 hours

T 8.68 Module component: Petrology [T-BGU-104854]

Coordinators: apl. Prof. Dr. Kirsten Drüppel
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102452 - Petrology

Type	Credits	Grading	Term offered	Version
Examination of another type	5 CP	graded	Each summer term	1

Courses					
ST 2026	**6339104**	Rock Forming Processes	**3 SWS**	**Lecture /**	**Drüppel**
ST 2026	**6339108**	Field Course	**1 SWS**	**Practice /**	**Drüppel**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
see module description

Prerequisites
none

Additional Information
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
150 hours

T 8.69 Module component: Physical Chemistry [T-CHEMBIO-103385]

Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-104581 - Physical Chemistry for Applied Geosciences

Type	Credits	Grading	Version
Written examination	9 CP	graded	2

Courses					
WT 26/27	**5206**	Physikalische Chemie I	**4 SWS**	**Lecture**	**Kappes, Schuster**
WT 26/27	**5207**	Übungen zur Vorlesung Physikalische Chemie I	**2 SWS**	**Practice**	**Kappes, Schuster, Assistenten**

Prerequisites
none

Workload
270 hours

T 8.70 Module component: Project Study [T-BGU-104826]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102438 - Project Study

Type	Credits	Grading	Term offered	Version
Examination of another type	5 CP	graded	Each term	1

Courses					
ST 2026	**6339082**	Project Study	**6 SWS**	**Practice /**	**Dozenten der Geowissenschaften, Zeh**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Assessment
see module description

Prerequisites
none

Workload
150 hours

T 8.71 Module component: Radiogeochemical Field Excercise and Seminar [T-BGU-107623]

Coordinators: Dr. Frank Heberling
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-102455 - Environmental Geology: Radio- & Chemotoxic Elements

Type	Credits	Grading	Term offered	Version
Coursework (written)	2 CP	pass/fail	Each summer term	2

Courses					
ST 2026	**6339089**	Radiogeochemical Field Exercise and Radiogeochemical Seminar	**2 SWS**	**Practice / 🗣**	**Heberling, Metz**

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The assessment consists of an ungraded coursework: seminar as preparation for the field excercise (15 min presentation) and report (15-20 pages, submission till 2 months after the excercise).

Additional Information
The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
60 hours

T 8.72 Module component: Raw Materials and Environment [T-BGU-112118]

Coordinators: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105963 - Raw Materials and Environment

Type	Credits	Grading	Term offered	Expansion	Version
Oral examination	5 CP	graded	Each winter term	2 semesters	2

Courses					
WT 26/27	**6339090**	Assessment of Mine Waste	**2 SWS**	**Practice / 🗣**	**Eiche, Bilau**
WT 26/27	**6339197**	Raw Materials and Environment	**2 SWS**	**Lecture / 🗣**	**Stutz, Eiche**

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
Oral exam (20-30 min) + report on characterization of mine waste deposit

Prerequisites
none

Additional Information
none

Workload
150 hours

T 8.73 Module component: Registration for Certificate Issuance - Supplementary Studies on Science, Technology and Society [T-FORUM-113587]

Coordinators: Dr. Christine Mielke
Christine Myglas

Organisation: General Studies. Forum Science and Society (FORUM)

Part of: M-FORUM-106753 - Supplementary Studies on Science, Technology and Society

Type	Credits	Grading	Term offered	Version
Coursework	0 CP	pass/fail	Each term	1

Prerequisites
In order to register, it is mandatory that the basic module and the advanced module have been completed and that the grades for the partial performances in the advanced module are available.

Registration as a partial achievement means the issue of a certificate.

T 8.74 Module component: Reserve Modeling [T-BGU-111499]

Coordinators: Dr. Simon Hector
Dr. Klaus Steinmüller

Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences

Part of: M-BGU-105759 - Reserve Modeling

Type	Credits	Grading	Term offered	Expansion	Version
Oral examination	5 CP	graded	Each winter term	1 semesters	3

Courses					
WT 26/27	**6320101**	Reserve Modeling - Feasibility Study of Mining Projects (2 days)	**2 SWS**	**Seminar / 🗣**	**Mitarbeiter/innen**
WT 26/27	**6320104**	Economic- and Risk Evaluation (3 Days)	**2 SWS**	**Seminar / 🗣**	**Masurenko**

Legend: 📱 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The assessment consists of an oral examination and a summary report.

Workload
150 hours

T 8.75 Module component: Reservoir Engineering and Modeling Exercises [T-BGU-111523]

Coordinators: Dr. Emmanuel Gaucher
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105743 - Geothermics III: Reservoir Engineering and Modeling

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	5 CP	graded	Each winter term	1 semesters	1

Courses					
WT 26/27	**6339117**	Geothermics III: Reservoir Engineering and Modeling	**4 SWS**	**Lecture / Practice /**	**Gaucher, Kohl, Grimmer, Nitschke**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
See module description.

Prerequisites
none.

Workload
150 hours

T 8.76 Module component: Reservoir Geology [T-BGU-107563]

Coordinators: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103742 - Reservoir Geology

Type	Credits	Grading	Term offered	Version
Written examination	5 CP	graded	Each summer term	1

Courses					
ST 2026	**6310600**	Reservoir-Geology	**2 SWS**	**Lecture / Practice /**	**Hilgers, Busch**
ST 2026	**6310601**	Field Seminar Reservoir-Geology	**4 SWS**	**Seminar /**	**Hilgers**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The assessment is a marked written exam over 120 minutes, the participitation in the Field Seminar Reservoir-Geology and the submission of field book.

Prerequisites
Entrance to the module examination requires the submission of homework (100%) within the given deadline, of which 80% are passed

Recommendations
The student shall have a basic knowledge of sedimentology and structural geology, such as presented in the module Geology, MSc 1st semester

Additional Information
Field Seminar Reservoir-Geology: For participants of field seminar Reservoir-Geology: Please mind the visa regulations.

The practical part of this course is carried out in presence. The field courses are essential for the progress of the participants.

Workload
150 hours

T 8.77 Module component: Reservoir-Analogs and Core Description [T-BGU-107624]

Coordinators: Prof. Dr. Christoph Hilgers
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103734 - Diagenesis and Cores

Type	Credits	Grading	Term offered	Version
Coursework (written)	2 CP	pass/fail	Each summer term	2

Courses					
WT 26/27	**6339071**	Reservoir Analogs & Core Description	**2 SWS**	**Seminar / 🗣**	**Hilgers, Busch**

Legend: 📱 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The assessment is based on a passed report of 2 pages plus digital and hand-written enclosures of a core description (passed/not passed). Submission of report: 2 weeks after the end of the course.

Prerequisites
Module Reservoir-Geology successfully passed

Additional Information
Seminar as block course during winter term due to visit of industry core shed.

The practical part of this course is carried out in presence. The field course is essential for the study progress of the participants.

Workload
60 hours

T 8.78 Module component: Rock Mechanics and Rock Engineering [T-BGU-113962]

Coordinators: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-107001 - Rock Mechanics and Rock Engineering

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	5 CP	graded	Each term	1 semesters	1

Courses					
ST 2026	**6251804**	Rock Mechanics and Rock Construction Underground	**4 SWS**	**Lecture / Practice /**	**Schneider, Walter**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Assessment
written exam, 90 min.

Prerequisites
none

Recommendations
preparation of the coursework for examination preparation

Additional Information
none

Workload
160 hours

T 8.79 Module component: Sedimentary Petrology [T-BGU-107558]

Coordinators: Prof. Dr. Armin Zeh
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103733 - Sedimentary Petrology

Type	Credits	Grading	Term offered	Version
Written examination	5 CP	graded	Each winter term	1

Courses					
WT 26/27	**6339040**	Sedimentary Petrology	**4 SWS**	**Lecture / Practice /**	**Zeh**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
see module description

Prerequisites
none

Workload
150 hours

T 8.80 Module component: Seismic & Sequence Stratigraphy [T-BGU-111720]

Coordinators: TT-Prof. Dr. Nevena Tomašević
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105777 - Seismic Interpretation
Prerequisite for: T-BGU-113474 - Seismic Interpretation, Examination

Type	Credits	Grading	Term offered	Expansion	Version
Coursework (written)	1 CP	pass/fail	Each summer term	1 semesters	2

Courses					
ST 2026	**6339014**	Seismic and Sequence Stratigraphy	**2 SWS**	**Lecture / Practice /**	**Tomašević**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
The assessment consists of an ungraded completed coursework.

Prerequisites
See module description.

Workload
30 hours

T 8.81 Module component: Seismic Interpretation, Examination [T-BGU-113474]

Coordinators: TT-Prof. Dr. Nevena Tomašević
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105777 - Seismic Interpretation

Type	Credits	Grading	Expansion	Version
Written examination	3 CP	graded	1 semesters	3

Assessment
The assessment consists of graded written end-term exam.

Prerequisites
Successfully passed T-BGU-111720 and T-PHYS-113453.

Modeled Prerequisites
The following conditions have to be fulfilled:

1. The module component T-BGU-111720 - Seismic & Sequence Stratigraphy must have been passed.
2. The module component T-PHYS-113453 - Introduction to Reflection Seismics, Prerequisite must have been passed.
3. The module component T-BGU-113474 - Seismic Interpretation, Examination must not have been started.

Workload
90 hours

T 8.82 Module component: Shallow Geothermal Energy [T-BGU-111447]

Coordinators: Prof. Dr. Philipp Blum
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-105730 - Shallow Geothermal Energy

Type	Credits	Grading	Term offered	Expansion	Version
Oral examination	5 CP	graded	Each winter term	1 semesters	1

Courses					
WT 26/27	**6339115**	Thermal Use of Groundwater	**2 SWS**	**Lecture / Practice /** 🗣	**Blum, Menberg**
WT 26/27	**6339116**	Exercises to Shallow Geothermal Energy	**1 SWS**	**Practice /** 🗣	**Blum**

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
Oral exam (approx. 15 min.)

Prerequisites
none

Recommendations
Basic programming skills in Matlab are recommended, e.g. by completing the course “Introduction to Matlab (CC772)”.

Additional Information
The basic course with 2 SWS will be complemented by laboratory and field exercises, heat transport modelling and energy planning will be performed. (1 SWS in winter term).

Workload
150 hours

T 8.83 Module component: Structural and Phase Analysis [T-MACH-102170]

Coordinators: Dr.-Ing. Susanne Wagner
Organisation: KIT Department of Mechanical Engineering

Part of: M-BGU-105236 - Structural and Phase Analysis

Type	Credits	Grading	Term offered	Version
Oral examination	4 CP	graded	Each summer term	1

Courses					
ST 2026	**2125763**	Structural and phase analysis	**2 SWS**	**Lecture / ✕**	**Bucharsky**

Legend: Online, Blended (On-Site/Online), On-Site, ✕ Cancelled

Assessment
Oral examination

Prerequisites
none

T 8.84 Module component: Student Research Project 'Earthworks and Foundation Engineering' [T-BGU-100178]

Coordinators: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-100068 - Earthworks and Foundation Engineering

Type	Credits	Grading	Term offered	Expansion	Version
Coursework	2 CP	pass/fail	Each winter term	1 semesters	2

Courses					
WT 26/27	**6251701**	Foundation Types	**2 SWS**	**Lecture / Practice /**	**Stutz**
WT 26/27	**6251703**	Basics in Earthworks and Embankment Dams	**2 SWS**	**Lecture / Practice /**	**Bieberstein**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Assessment
report appr. 45 pages

Prerequisites
none

Recommendations
none

Additional Information
none

Workload
60 hours

T 8.85 Module component: Surface and Subsurface Contaminant Transport [T-BGU-113965]

Coordinators: Prof. Dr.-Ing. Erwin Zehe
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-107003 - Surface and Subsurface Contaminant Transport

Type	Credits	Grading	Term offered	Expansion	Version
Oral examination	6 CP	graded	Each term	1 semesters	1

Courses					
ST 2026	**6224803**	Surface and Subsurface Contaminant Transport: From Processes to Numerical Models	**4 SWS**	**Lecture / Practice /**	**Zehe, Wienhöfer**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
oral exam, appr. 30 min.

Prerequisites
The module component 'Transport and Transformation of Contaminants in Hydrological Systems' (T-BGU-106598) must not be selected.

Recommendations
none

Additional Information
none

Workload
180 hours

T 8.86 Module component: Tunneling and Underground Construction [T-BGU-113964]

Coordinators: Prof. Dr.-Ing. Hans Henning Stutz
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-107002 - Tunneling and Underground Construction

Type	Credits	Grading	Term offered	Expansion	Version
Written examination	6 CP	graded	Each term	1 semesters	1

Courses					
WT 26/27	**6251905**	Tunneling and Underground Construction	**4 SWS**	**Lecture / Practice /**	**Stutz, Wagner**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
written exam, 90 min.

Prerequisites
none

Recommendations
none

Additional Information
will be offered newly as from summer term 2025

Workload
180 hours

T 8.87 Module component: Water – Energy – Environment Nexus in a Circular Economy: Research Proposal Preparation [T-CIWVT-113433]

Organisation: KIT Department of Chemical and Process Engineering

Part of: M-CIWVT-106680 - Water – Energy – Environment Nexus in a Circular Economy: Research Proposal Preparation

Type	Credits	Grading	Term offered	Version
Examination of another type	5 CP	graded	Each summer term	1

Courses					
ST 2026	**2233130**	Circular Economy Water Energy Environment: Research Proposal Preparation	**4 SWS**	**Lecture / 🗣**	**Schäfer**

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Assessment
The Learning control is an examination of another type:
Research proposal of 10 pages and an oral presentation of 10 minutes (individual work). The grade will be a composite of the proposal (submission in week 13 before class) and oral & poster presentation (all day workshop with researcher participation).

Prerequisites
None

T 8.88 Module component: Water and Energy Cycles [T-BGU-106596]

Coordinators: Prof. Dr.-Ing. Erwin Zehe
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-103360 - Water and Energy Cycles

Type	Credits	Grading	Term offered	Expansion	Version
Examination of another type	6 CP	graded	Each term	1 semesters	3

Courses					
WT 26/27	**6224702**	Water and Energy Cycles in Hydrological Systems: Processes, Predictions and Management	**4 SWS**	**Lecture / Practice /**	**Zehe**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Assessment
submission of at least 50% of the weekly exercises plus a written term paper on a given topic, approx. 10 to 15 pages

Prerequisites
none

Recommendations
none

Additional Information
none

Workload
180 hours

T 8.89 Module component: Water Chemistry and Water Technology [T-CIWVT-107585]

Coordinators: Prof. Dr. Harald Horn
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-103753 - Water Chemistry and Water Technology

Type	Credits	Grading	Term offered	Version
Oral examination	10 CP	graded	Each term	1

Courses					
WT 26/27	**2233030**	Water Technology	**2 SWS**	**Lecture /**	**Horn, Markiewicz**
WT 26/27	**2233031**	Exercises to Water Technology	**1 SWS**	**Practice /**	**Markiewicz, und Mitarbeitende**
WT 26/27	**2233230**	Fundamentals of Water Quality	**2 SWS**	**Lecture /**	**Wagner, Markiewicz**
WT 26/27	**2233231**	Fundamentals of Water Quality - Exercises	**1 SWS**	**Practice /**	**Wagner, Markiewicz, und Mitarbeitende**

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Prerequisites
None

T 8.90 Module component: X-ray Fluorescence Analysis in Geosciences – Fundamentals and Practice [T-BGU-114845]

Coordinators: Dr. Elisabeth Eiche
Organisation: KIT Department of Civil Engineering, Geo and Environmental Sciences
Part of: M-BGU-107579 - X-ray Fluorescence Analysis in Geosciences – Fundamentals and Practice

Type	Credits	Grading	Expansion	Version
Examination of another type	5 CP	graded	1 semesters	1

Courses					
WT 26/27	**6320111**	X-ray Fluorescence Analysis in Geosciences – Fundamentals and Practice	**4 SWS**	**Lecture / Practice /**	**Eiche**

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

Workload
150 hours