

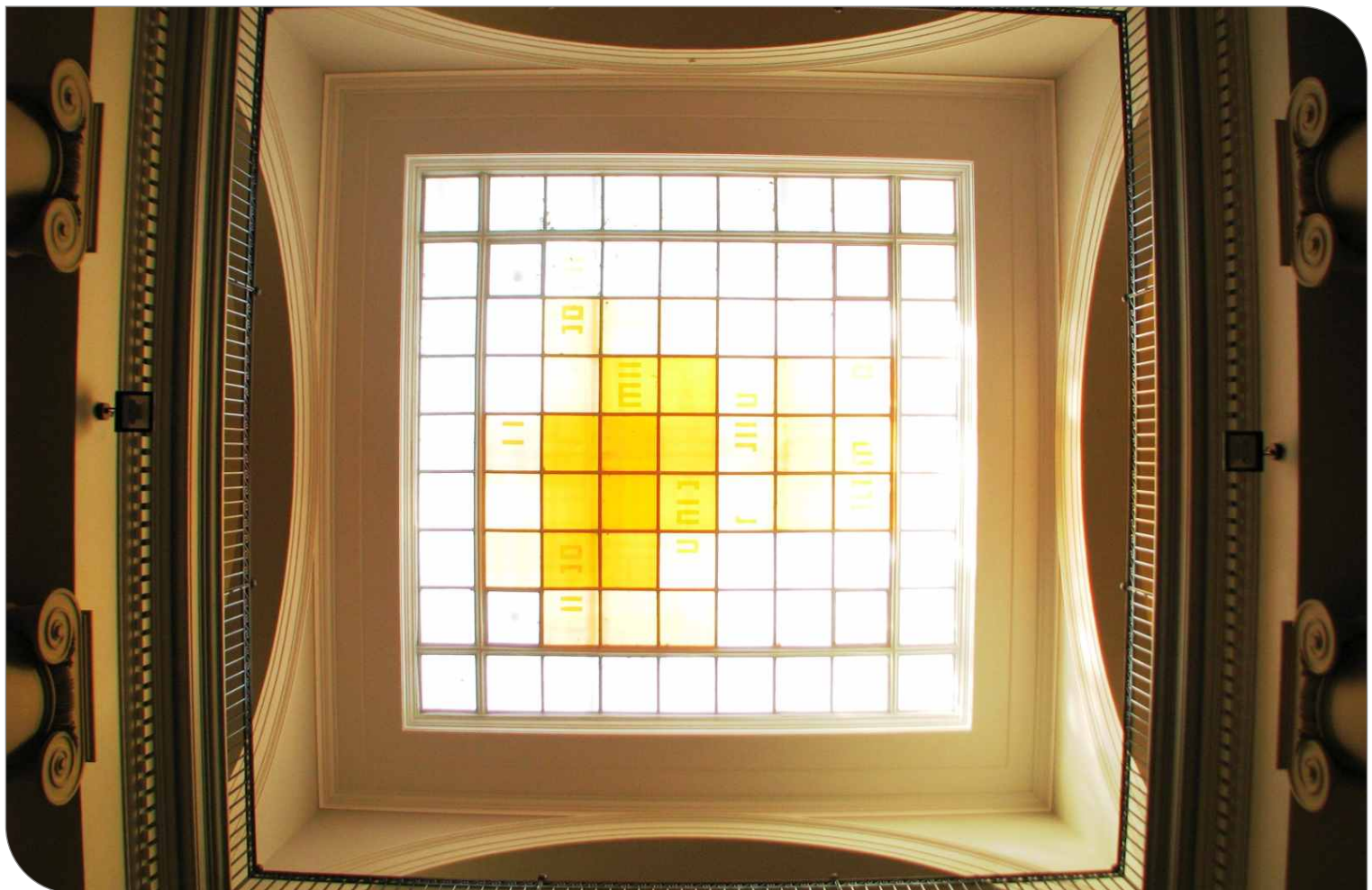
# Module Handbook

## Civil Engineering (Master of Science (M.Sc.), ER/SPO 2017)

Summer term 2022

Date: 09/03/2022

KIT DEPARTMENT OF CIVIL ENGINEERING, GEO- AND ENVIRONMENTAL SCIENCES



## Table Of Contents

<b>1. Preliminary remarks</b>	<b>8</b>
<b>2. Curriculum</b>	<b>9</b>
2.1. Objectives of the master degree program	9
2.2. Structure of the master degree program	10
2.2.1. Study Focus 'Construction Engineering' (SF 1)	11
2.2.2. Study Focus 'Water and Environment' (SF 2)	15
2.2.3. Study Focus 'Mobility and Infrastructure' (SF 3)	18
2.2.4. Study Focus 'Technology and Management in Construction' (SF 4)	21
2.2.5. Study Focus 'Geotechnical Engineering' (SF 5)	25
2.3. Mentoring, module selection, individual curriculum	28
2.4. Interdisciplinary Qualifications	28
2.5. Beginning and completion of a module	28
2.6. Registration, deregistration, repetition of examinations	29
2.7. Students with disability or chronic disease	29
2.8. Crediting and recognition of already obtained accomplishments	29
2.9. Admission, preparation and completion of the master's thesis	30
2.10. Additional accomplishments	30
<b>3. Further information</b>	<b>31</b>
3.1. About the module handbook	31
3.2. About module examinations, examination committee	31
3.3. About changes in module offer	31
3.4. Contact persons	32
3.5. Abbreviations, translations	32
<b>4. Current changes</b>	<b>33</b>
<b>5. Modules</b>	<b>34</b>
5.1. Design and Construction of Components in Reinforced Concrete [bauIM1P1-BEMISTB] - M-BGU-100033	34
5.2. Steel and Composite Structures [bauIM1P2-STAHLEBAU] - M-BGU-100034	36
5.3. Surface Structures and Dynamics of Structures [bauIM1P3-FTW-BD] - M-BGU-100035	38
5.4. Bracing and Stability in Reinforced Concrete [bauIM1S01-STABISTB] - M-BGU-100003	40
5.5. Basics of Prestressed Concrete [bauIM1S02-GDLSPANNB] - M-BGU-100036	41
5.6. Solid Construction Bridges [bauIM1S03-MASSBRUE] - M-BGU-100037	42
5.7. Applied Dynamics of Structures [bauIM1S04-BAUDYN] - M-BGU-100038	43
5.8. Material Science, Welding and Fatigue [bauIM1S06-SCHWEISSEN] - M-BGU-100039	44
5.9. Construction of Steel and Composite Bridges [bauIM1S07-STAHLEBRÜ] - M-BGU-100040	46
5.10. Hollow Section Structures [bauIM1S08-HOHLPROFIL] - M-BGU-100004	48
5.11. Glass, Plastic and Cable Structures [bauIM1S09-GlaKunSe] - M-BGU-100041	49
5.12. Building Preservation of Steel and Timber Structures [bauIM1S11-BAUING-BSH] - M-BGU-100043	51
5.13. Timber Structures [bauIM1S12-BAUING-HB] - M-BGU-100044	53
5.14. Non-linear Analysis of Beam Structures [bauIM1S14-NILI-STAB] - M-BGU-100046	55
5.15. Computational Analysis of Structures [bauIM1S15-CTWM] - M-BGU-100047	56
5.16. FE-Applications in Practical Engineering [bauIM1S16-FE-PRAXIS] - M-BGU-100048	58
5.17. Shell Structures and Stability of Structures [bauIM1S17-STABISHELL] - M-BGU-100049	59
5.18. Numerical Methods in Structural Analysis [bauIM1S18-FEM-BS] - M-BGU-100050	61
5.19. Non-linear Analysis of Surface Structures [bauIM1S19-NILI-FTW] - M-BGU-100051	62
5.20. Basics of Finite Elements [bauIM1S20-GRUNDGE] - M-BGU-100052	63
5.21. Fracture and Damage Mechanics [bauIM1S21-BRUCHMECH] - M-BGU-100053	64
5.22. Material Models in Solid Mechanics [bauIM1S22-MATTHEO] - M-BGU-100054	66
5.23. Concrete Construction Technology [bauIM1S24-BETONTECH] - M-BGU-100056	68
5.24. Durability and Service Life Design [bauIM1S25-DAUERLEB] - M-BGU-100057	69
5.25. Building Preservation of Concrete and Masonry Constructions [bauIM1S26-BBM] - M-BGU-100058	70
5.26. Building Physics I [bauIM1S27-BAUPH-I] - M-BGU-103950	72
5.27. Building Physics II [bauIM1S28-BAUPH-II] - M-BGU-100060	73
5.28. Materials Testing and Measuring Techniques [bauIM1S29-MATPRÜF] - M-BGU-100061	74
5.29. Continuum Mechanics of Heterogeneous Solids [bauIM1S32-KONTIMECH] - M-BGU-100064	75
5.30. Finite Elements in Solid Mechanics [bauIM1S37-FEFKM] - M-BGU-100578	77
5.31. Numerical Structural Dynamics [bauIM1S38-NUMSTRDYN] - M-BGU-100579	78
5.32. Tank Construction [bauIM1S39-BEHBAU] - M-BGU-100580	79
5.33. Modeling in Solid Mechanics [bauIM1S40-MODFEST] - M-BGU-101673	81
5.34. Contact Mechanics [bauIM1S41-KONTMECH] - M-BGU-104916	83

5.35. Digital Planning and Building Information Modeling [bauim1S42-DIGIPLAN] - M-BGU-105135	84
5.36. Design and Construction in Metal and Lightweight Structures [bauim1S43-ENTW-MLB] - M-BGU-105370	85
5.37. Timber Structures: Materials and Appropriate Design [bauim1S44-BST-HB] - M-BGU-105371	86
5.38. Innovations and Developments in Steel and Timber Structures [bauim1S45-INNO-MHB] - M-BGU-105372	87
5.39. Building Preservation and Innovations in Metal and Lightweight Structures [bauim1S46-BWE-INNO-MLB] - M-BGU-105373	88
5.40. Building Preservation and Innovations in Timber Structures [bauim1S47-BWE-INNO-HB] - M-BGU-105374	89
5.41. Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis [bauim1S48-KNN] - M-BGU-105929	90
5.42. Urban Water Infrastructure and Management [bauim2P10-URBIM] - M-BGU-103358	91
5.43. Numerical Fluid Mechanics [bauim2P5-NUMFLMECH] - M-BGU-103375	92
5.44. Hydraulic Engineering [bauim2P6-ADVHYENG] - M-BGU-103376	93
5.45. Water and Energy Cycles [bauim2P8-WATENCYC] - M-BGU-103360	95
5.46. Advanced Fluid Mechanics [bauim2P9-ADVFM] - M-BGU-103359	97
5.47. Subsurface Flow and Contaminant Transport [bauim2S03-HY3] - M-BGU-103872	98
5.48. Analysis of Spatial Data [bauim2S04-HY4] - M-BGU-103762	100
5.49. Hydrological Measurements in Environmental Systems [bauim2S05-HY5] - M-BGU-103763	102
5.50. Environmental Communication [bauim2S07-HY7] - M-BGU-101108	103
5.51. Groundwater Management [bauim2S08-HY8] - M-BGU-100340	104
5.52. Hydro Power Engineering [bauim2S11-WB3] - M-BGU-100103	106
5.53. Waterway Engineering [bauim2S12-WB4] - M-BGU-103392	107
5.54. Environmental Fluid Mechanics [bauim2S19-SM5] - M-BGU-103383	108
5.55. Advanced Computational Fluid Dynamics [bauim2S21-NS2] - M-BGU-103384	109
5.56. Project Studies in Water Resources Management [bauim2S33-WB6] - M-BGU-103394	111
5.57. Numerical Flow Modeling in Hydraulic Engineering [bauim2S34-WB7] - M-BGU-103390	112
5.58. Hydraulic Structures [bauim2S36-WB9] - M-BGU-103389	113
5.59. Experimental Hydraulics and Measuring Techniques [bauim2S37-WB10] - M-BGU-103388	115
5.60. Water Distribution Systems [bauim2S38-WB11] - M-BGU-104100	116
5.61. Experiments in Fluid Mechanics [bauim2S39-SM6] - M-BGU-103377	118
5.62. Freshwater Ecology [bauim2S41-SW8] - M-BGU-104922	120
5.63. River Basin Modeling [bauim2S42-SW9] - M-BGU-103373	122
5.64. Wastewater Treatment Technologies [bauim2S43-SW10] - M-BGU-104917	123
5.65. Introduction to Environmental Data Analysis and Statistical Learning [bauim2S44-ENVDAT] - M-BGU-104880	125
5.66. Fluid Mechanics of Turbulent Flows [bauim2S45-NS4] - M-BGU-105361	127
5.67. Modeling of Turbulent Flows - RANS and LES [bauim2S46-NS5] - M-BGU-105362	128
5.68. Interaction Flow - Building Structure [bauim2S47-SM2] - M-BGU-105503	129
5.69. Integrated Design Project in Water Resources Management [bauim2S48-HY9] - M-BGU-105637	131
5.70. River Processes [bauim2S49-WB9] - M-BGU-105927	133
5.71. Urban and Regional Planning [bauim3P1-PLSTAREG] - M-BGU-100007	135
5.72. Models and Methods in Traffic Engineering and Transportation Planning [bauim3P2-VERMODELL] - M-BGU-100008	136
5.73. Infrastructure Management [bauim3P3-STRINFRA] - M-BGU-100009	137
5.74. Track Guided Transport Systems - Technical Design and Components [bauim3P4-EBTECHNIK] - M-BGU-100010	138
5.75. Laws and Proceedings Concerning Traffic and Roads [bauim3P5-VERFRECHT] - M-BGU-100011	139
5.76. Urban Renewal [bauim3S01-PLSTUMB] - M-BGU-100013	140
5.77. Space and Infrastructure [bauim3S02-PLRAUMINF] - M-BGU-100014	141
5.78. Traffic Management und Simulation Methods [bauim3S03-VERMANAGE] - M-BGU-100015	142
5.79. Planning of Transportation Systems [bauim3S04-VERPLAN] - M-BGU-100016	143
5.80. Highway Design [bauim3S05-STRENTW] - M-BGU-100017	145
5.81. Road Construction [bauim3S06-STRBAUT] - M-BGU-100006	146
5.82. Project Integrated Planning [bauim3S09-PROJEKTIP] - M-BGU-100018	147
5.83. Intermodality in Freight, Long-Distance and Air Transport [bauim3S11-VERINTER] - M-BGU-100020	148
5.84. Road Safety [bauim3S12-STRVSICH] - M-BGU-100021	150
5.85. Special Topics in Highway Engineering [bauim3S13-STRSPEZ] - M-BGU-100022	151
5.86. City Transport Facilities [bauim3S17-STRIVA] - M-BGU-100026	152
5.87. Track Guided Transport Systems - Operation and Capacity [bauim3S18-EBBETRKAP] - M-BGU-100581	153
5.88. Analysis and Evolution of Mobility [bauim3S20-VERANAMOB] - M-BGU-100583	154
5.89. Special Issues of Public Transport [bauim3S22-VERSPEZOE] - M-BGU-103357	155
5.90. Sustainability in Real Estate Management [bauim4P4-] - M-BGU-100112	157
5.91. Project Management in Construction and Real Estate Industry [bauim4P5-] - M-BGU-100338	159
5.92. Machinery and Process Engineering [bauim4P6-] - M-BGU-100339	161
5.93. Production Planning and Control in Construction [bauim4P7-] - M-BGU-105918	163

5.94. Environmentally-friendly Recycling and Disassembly of Buildings [bauim4S06-] - M-BGU-100110 .....	165
5.95. Upgrading of Existing Buildings and Energetic Refurbishment [bauim4S07-] - M-BGU-100108 .....	167
5.96. Real Estate Management [bauim4S08-] - M-BGU-100346 .....	169
5.97. Lean Construction [bauim4S09-] - M-BGU-100104 .....	171
5.98. Advanced Studies in Construction Engineering [bauim4S10-] - M-BGU-100344 .....	173
5.99. Decommissioning of Nuclear Facilities [bauim4S12-] - M-BGU-100345 .....	175
5.100. Facility Management in Hospitals and Hospital Management [bauim4S13-] - M-BGU-100347 .....	177
5.101. Building Information Modeling (BIM) [bauim4S16-] - M-BGU-103916 .....	178
5.102. Research Seminar Construction Management [bauim4S17-] - M-BGU-103917 .....	180
5.103. Equipment and Special Construction Techniques in Building Practice [bauim4S18-] - M-BGU-103918 .....	181
5.104. Digitalization in Facility and Real Estate Management [bauim4S19-] - M-BGU-104348 .....	182
5.105. Digital Technologies in Field Information Modeling [bauim4S20-] - M-BGU-105638 .....	183
5.106. Digital Engineering and Construction [bauim4S21-] - M-BGU-105830 .....	185
5.107. Leadership and Communication [bauim4S22-] - M-BGU-105917 .....	187
5.108. Real Estate and Facility Management - on Site Lectures [bauim4S23-] - M-BGU-105924 .....	189
5.109. Facility Management [bauim4S24-] - M-BGU-105922 .....	190
5.110. Technology and Production Methods in Turnkey Construction and Civil Engineering Works [bauim4S25-] - M-BGU-105913 .....	191
5.111. Lean Integrated Project Delivery (Lean IPD) [bauim4S26-] - M-BGU-105925 .....	193
5.112. Agile Project Management in Facility and Real Estate Management [bauim4S27-] - M-BGU-105920 .....	195
5.113. Seminar Construction Machinery [bauim4S28-] - M-BGU-105921 .....	196
5.114. Theoretical Soil Mechanics [bauim5P1-THEOBM] - M-BGU-100067 .....	198
5.115. Earthworks and Foundation Engineering [bauim5P2-ERDGB] - M-BGU-100068 .....	200
5.116. Rock Mechanics and Tunneling [bauim5P3-FMTUB] - M-BGU-100069 .....	202
5.117. Basics of Numeric Modeling [bauim5P4-NUMGRUND] - M-BGU-100070 .....	204
5.118. Special Issues of Soil Mechanics [bauim5S01-SPEZBM] - M-BGU-100005 .....	206
5.119. Ground Investigation [bauim5S02-BERKUND] - M-BGU-100071 .....	207
5.120. Applied Geotechnics [bauim5S03-ANGEOTEC] - M-BGU-100072 .....	208
5.121. Ground Water and Earth Dams [bauim5S04-GWDAMM] - M-BGU-100073 .....	209
5.122. Rock Engineering and Underground Construction [bauim5S05-FELSHOHL] - M-BGU-100074 .....	210
5.123. Numerical Modelling in Geotechnics [bauim5S06-NUMMOD] - M-BGU-100075 .....	211
5.124. Geotechnical Testing and Measuring Technology [bauim5S07-VERSMESS] - M-BGU-100076 .....	213
5.125. Special Underground Engineering [bauim5S08-SPEZTIEF] - M-BGU-100078 .....	214
5.126. Environmental Geotechnics [bauim5S09-UMGEOTEC] - M-BGU-100079 .....	216
5.127. Coupled Geomechanic Processes [bauim5S10-GEKOPPRO] - M-BGU-100077 .....	217
5.128. Module Master Thesis [bauimSC-THESIS] - M-BGU-104996 .....	219
5.129. Interdisciplinary Qualifications [bauimW0-UEQUAL] - M-BGU-103927 .....	220
5.130. Further Examinations [bauimZL] - M-BGU-103951 .....	222
<b>6. Courses .....</b>	<b>223</b>
6.1. Advanced Fluid Mechanics - T-BGU-106612 .....	223
6.2. Advanced Studies in Construction Engineering - T-BGU-108003 .....	224
6.3. Agile Project Management in Facility and Real Estate Management - T-BGU-111906 .....	225
6.4. Analysis and Evolution of Mobility - T-BGU-101004 .....	226
6.5. Anchoring, Piling and Slurry Wall Technology - T-BGU-100079 .....	227
6.6. Applied Building Physics - T-BGU-100039 .....	228
6.7. Applied Dynamics of Structures - T-BGU-100021 .....	229
6.8. Applied Ecology and Water Quality - T-BGU-109956 .....	230
6.9. Applied Geotechnics - T-BGU-100073 .....	231
6.10. Applied Geothermics - T-BGU-108017 .....	232
6.11. Basics of Finite Elements - T-BGU-100047 .....	233
6.12. Basics of Prestressed Concrete - T-BGU-100019 .....	234
6.13. Bracing and Stability in Reinforced Concrete - T-BGU-100018 .....	235
6.14. Brownfield Sites - Investigation, Evaluation, Rehabilitation - T-BGU-100089 .....	236
6.15. Building and Environmental Aerodynamics - T-BGU-111060 .....	237
6.16. Building Information Modeling (BIM) - T-BGU-108007 .....	238
6.17. Building Preservation in Steel Structures - T-BGU-110856 .....	239
6.18. Building Preservation in Timber Structures - T-BGU-110857 .....	240
6.19. Building Preservation of Concrete and Masonry Constructions - T-BGU-100038 .....	241
6.20. Building Technology - T-BGU-100040 .....	242
6.21. City Transport Facilities - T-BGU-100083 .....	243
6.22. Computational Analysis of Structures - T-BGU-100031 .....	244
6.23. Computational Structural Dynamics - T-BGU-100999 .....	245

6.24. Concrete Construction Technology - T-BGU-100036 .....	246
6.25. Construction of Steel and Composite Bridges - T-BGU-100024 .....	247
6.26. Contact Mechanics - T-BGU-109947 .....	248
6.27. Continuum Mechanics - T-BGU-106196 .....	249
6.28. Decommissioning of Nuclear Facilities - T-BGU-100627 .....	250
6.29. Design and Construction in Metal and Lightweight Structures - T-BGU-110852 .....	251
6.30. Design and Construction of Components in Reinforced Concrete - T-BGU-100015 .....	252
6.31. Design Exercise Hydraulic Structures - T-BGU-111929 .....	253
6.32. Design Exercise River Engineering - T-BGU-111928 .....	254
6.33. Digital Engineering and Construction - T-BGU-111695 .....	255
6.34. Digital Planning and Building Information Modeling - T-BGU-110382 .....	256
6.35. Digital Technologies in Field Information Modeling - T-BGU-111276 .....	257
6.36. Digitalization in Facility and Real Estate Management - T-BGU-108941 .....	258
6.37. Durability and Service Life Design - T-BGU-100037 .....	259
6.38. Dynamics of Structures - T-BGU-100077 .....	260
6.39. Earthworks and Foundation Engineering - T-BGU-100068 .....	261
6.40. Environmental Communication - T-BGU-101676 .....	262
6.41. Environmental Fluid Mechanics - T-BGU-106767 .....	263
6.42. Environmentally-Friendly Recycling and Disassembly of Buildings - T-BGU-100146 .....	264
6.43. Equipment and Special Construction Techniques in Building Practice - T-BGU-108009 .....	265
6.44. Examination Prerequisite Environmental Communication - T-BGU-106620 .....	266
6.45. Exercises and Student Research Project City Transport Facilities - T-BGU-109912 .....	267
6.46. Exercises Space and Infrastructure - T-BGU-111278 .....	268
6.47. Experimental Hydraulics II - T-BGU-106773 .....	269
6.48. Experiments in Fluid Mechanics - T-BGU-106760 .....	270
6.49. Facility Management - T-BGU-111908 .....	271
6.50. Facility Management in Hospitals and Hospital Management - T-BGU-109291 .....	272
6.51. FE-Applications in Practical Engineering - T-BGU-100032 .....	273
6.52. Field Training Water Quality - T-BGU-109957 .....	274
6.53. Finite Elements in Solid Mechanics - T-BGU-100998 .....	275
6.54. Flow Measurement Techniques - T-BGU-110411 .....	276
6.55. Fluid Mechanics of Turbulent Flows - T-BGU-110841 .....	277
6.56. Fracture and Damage Mechanics - T-BGU-100087 .....	278
6.57. Freight Transport - T-BGU-106611 .....	279
6.58. Geostatistics - T-BGU-106605 .....	280
6.59. Geotechnical Testing and Measuring Technology - T-BGU-100075 .....	281
6.60. Glass, Plastic and Cable Structures - T-BGU-100025 .....	282
6.61. Ground Improvement, Grouting and Soil Freezing - T-BGU-100080 .....	283
6.62. Ground Investigation - T-BGU-100072 .....	284
6.63. Ground Water and Earth Dams - T-BGU-100091 .....	285
6.64. Groundwater Flow around Structures - T-BGU-106774 .....	286
6.65. Groundwater Hydraulics - T-BGU-100624 .....	287
6.66. Group Exercise Project Integrated Planning - T-BGU-109916 .....	288
6.67. Highway Design - T-BGU-100057 .....	289
6.68. History of Urban Planning - T-BGU-108441 .....	290
6.69. Hollow Section Structures - T-BGU-100086 .....	291
6.70. Homework 'Basics of Finite Elements' - T-BGU-109908 .....	292
6.71. Homework 'Introduction to Environmental Data Analysis and Statistical Learning' - T-BGU-109950 .....	293
6.72. Hydraulic Engineering - T-BGU-106759 .....	294
6.73. Hydro Power Engineering - T-BGU-100139 .....	295
6.74. Hydrological Measurements in Environmental Systems - T-BGU-106599 .....	296
6.75. Information Management for Public Mobility Services - T-BGU-106608 .....	297
6.76. Infrastructure Management - T-BGU-106300 .....	298
6.77. Innovations and Developments in Metal and Lightweight Structures - T-BGU-110854 .....	299
6.78. Innovations and Developments in Timber Structures - T-BGU-110855 .....	300
6.79. Integrated Design Project in Water Resources Management - T-BGU-111275 .....	301
6.80. Interaction Flow - Hydraulic Structures - T-BGU-110404 .....	302
6.81. Introduction to Environmental Data Analysis and Statistical Learning - T-BGU-109949 .....	303
6.82. Introduction to Matlab - T-BGU-106765 .....	304
6.83. Landfills - T-BGU-100084 .....	305
6.84. Laws and Proceedings Concerning Traffic and Roads - T-BGU-106297 .....	306
6.85. Leadership and Communication - T-BGU-111900 .....	307

6.86. Lean Construction - T-BGU-108000 .....	308
6.87. Lean Integrated Project Delivery - T-BGU-111910 .....	309
6.88. Long-Distance and Air Traffic - T-BGU-106301 .....	310
6.89. Machinery and Process Engineering - T-BGU-100623 .....	311
6.90. Mass Fluxes in River Basins - T-BGU-111061 .....	312
6.91. Master Thesis - T-BGU-110135 .....	313
6.92. Material Models in Solid Mechanics - T-BGU-100044 .....	314
6.93. Material Science, Welding and Fatigue - T-BGU-100023 .....	315
6.94. Materials Testing and Measuring Techniques - T-BGU-100043 .....	316
6.95. Micromechanics of Heterogeneous Solids - T-BGU-108879 .....	317
6.96. Modeling of Turbulent Flows - RANS and LES - T-BGU-110842 .....	318
6.97. Modeling Techniques in Solid Mechanics - T-BGU-103223 .....	319
6.98. Models and Methods in Traffic Engineering and Transportation Planning - T-BGU-100012 .....	320
6.99. Non-linear Analysis of Beam Structures - T-BGU-100030 .....	321
6.100. Non-linear Analysis of Surface Structures - T-BGU-100035 .....	322
6.101. Numerical Flow Modeling in Hydraulic Engineering - T-BGU-106776 .....	323
6.102. Numerical Fluid Mechanics - T-BGU-106758 .....	324
6.103. Numerical Fluid Mechanics II - T-BGU-106768 .....	325
6.104. Numerical Groundwater Modeling - T-BGU-100625 .....	326
6.105. Numerical Methods in Structural Analysis - T-BGU-100034 .....	327
6.106. Numerical Modelling in Geotechnics - T-BGU-100107 .....	328
6.107. Numerics in Geotechnics - T-BGU-106197 .....	329
6.108. Parallel Programming Techniques for Engineering - T-BGU-106769 .....	330
6.109. Planning of Transportation Systems - T-BGU-100013 .....	331
6.110. Practical Exercises Dynamics of Structures - T-BGU-111044 .....	332
6.111. Practical Fire Protection - T-BGU-100042 .....	333
6.112. Practical Noise Control - T-BGU-108024 .....	334
6.113. Production Planning and Control in Construction - T-BGU-111901 .....	335
6.114. Project Integrated Planning - T-BGU-100061 .....	336
6.115. Project Lean Integrated Project Delivery - T-BGU-111911 .....	337
6.116. Project Management in Construction and Real Estate Industry - T-BGU-100622 .....	338
6.117. Project Paper Lean Construction - T-BGU-101007 .....	339
6.118. Project Report Water Distribution Systems - T-BGU-108485 .....	340
6.119. Project Studies in Water Resources Management - T-BGU-106783 .....	341
6.120. Real Estate Management - T-BGU-100629 .....	342
6.121. Real Estate und Facility Management - on Site Lectures - T-BGU-111909 .....	343
6.122. Research Seminar Construction Management - T-BGU-108008 .....	344
6.123. River Basin Modeling - T-BGU-106603 .....	345
6.124. River Processes - T-BGU-111930 .....	346
6.125. Road Construction - T-BGU-100058 .....	347
6.126. Road Safety - T-BGU-100062 .....	348
6.127. Rock Engineering and Underground Construction - T-BGU-100074 .....	349
6.128. Rock Mechanics and Tunneling - T-BGU-100069 .....	350
6.129. Self Assignment HoC-ZAK-SpZ 1 not graded - T-BGU-111596 .....	351
6.130. Self Assignment HoC-ZAK-SpZ 2 not graded - T-BGU-111597 .....	352
6.131. Self Assignment HoC-ZAK-SpZ 3 not graded - T-BGU-111598 .....	353
6.132. Self Assignment HoC-ZAK-SpZ 4 graded - T-BGU-111599 .....	354
6.133. Self Assignment HoC-ZAK-SpZ 5 graded - T-BGU-111600 .....	355
6.134. Self Assignment HoC-ZAK-SpZ 6 graded - T-BGU-111601 .....	356
6.135. Seminar Construction Machinery - T-BGU-111907 .....	357
6.136. Seminar in Transportation - T-BGU-100014 .....	358
6.137. Seminar Paper Road Safety - T-BGU-109915 .....	359
6.138. Seminar Paper 'Waterway Engineering' - T-BGU-106779 .....	360
6.139. Shell Structures and Stability of Structures - T-BGU-100033 .....	361
6.140. Solid Construction Bridges - T-BGU-100020 .....	362
6.141. Space and Infrastructure - T-BGU-100056 .....	363
6.142. Special Issues in Rock Mechanics - T-BGU-111058 .....	364
6.143. Special Issues of Soil Mechanics - T-BGU-100071 .....	365
6.144. Special Topics in Highway Engineering - T-BGU-106734 .....	366
6.145. Steel and Composite Structures - T-BGU-100016 .....	367
6.146. Student Research Project 'Building Preservation of Concrete and Masonry Constructions' - T-BGU-100175 .....	368
6.147. Student Research Project 'Computational Analysis of Structures' - T-BGU-100174 .....	369

6.148. Student Research Project 'Cost Estimation in Structural Engineering and Earthworks' - T-BGU-108010 .....	370
6.149. Student Research Project 'Dynamics of Structures' - T-BGU-107819 .....	371
6.150. Student Research Project 'Earthworks and Foundation Engineering' - T-BGU-100178 .....	372
6.151. Student Research Project 'Excavation Pit Development and Shuttering Planning' - T-BGU-108012 .....	373
6.152. Student Research Project 'Reinforced Concrete' - T-BGU-100170 .....	374
6.153. Student Research Project 'Rock Mechanics and Tunneling' - T-BGU-100179 .....	375
6.154. Student Research Project 'Scheduling and Building Site Facilities' - T-BGU-108011 .....	376
6.155. Student Research Project 'Shell Structures and Stability of Structures' - T-BGU-100254 .....	377
6.156. Student Research Project 'Steel Structures' - T-BGU-100171 .....	378
6.157. Student Research Project 'Surface Structures' - T-BGU-107818 .....	379
6.158. Study Project Design of a Rural Road - T-BGU-109917 .....	380
6.159. Surface Structures - T-BGU-100017 .....	381
6.160. Sustainability in Mobility Systems - T-BGU-111057 .....	382
6.161. Sustainability in Real Estate Management - T-BGU-100149 .....	383
6.162. Tank Construction - T-BGU-101000 .....	384
6.163. Technology and Production Methods in Turnkey Construction and Civil Engineering Works - T-BGU-111899 .....	385
6.164. Tendering, Planning and Financing in Public Transport - T-BGU-101005 .....	386
6.165. Term Paper Tank Construction - T-BGU-101001 .....	387
6.166. Term Paper Upgrading of Existing Buildings and Energetic Refurbishment - T-BGU-100621 .....	388
6.167. Term Paper 'Wastewater Treatment Technologies' - T-BGU-111282 .....	389
6.168. Theoretical Soil Mechanics - T-BGU-100067 .....	390
6.169. Timber Structures - T-BGU-100028 .....	391
6.170. Timber Structures: Materials and Appropriate Design - T-BGU-110853 .....	392
6.171. Track Guided Transport Systems - Operation and Capacity - T-BGU-101002 .....	393
6.172. Track Guided Transport Systems - Technical Design and Components - T-BGU-100052 .....	394
6.173. Traffic Management und Simulation Methods - T-BGU-100008 .....	395
6.174. Transport and Transformation of Contaminants in Hydrological Systems - T-BGU-106598 .....	396
6.175. Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis - T-BGU-111932 .....	397
6.176. Upgrading of Existing Buildings and Energetic Refurbishment - T-BGU-108001 .....	398
6.177. Urban and Regional Planning - T-BGU-100050 .....	399
6.178. Urban Management - T-BGU-108442 .....	400
6.179. Urban Water Infrastructure and Management - T-BGU-106600 .....	401
6.180. Wastewater Treatment Technologies - T-BGU-109948 .....	402
6.181. Water and Energy Cycles - T-BGU-106596 .....	403
6.182. Water Distribution Systems - T-BGU-108486 .....	404
6.183. Waterway Engineering - T-BGU-106780 .....	405
6.184. Wildcard Transport of Heat and Fluids - T-BGU-111924 .....	406
<b>7. Appendix: Curriculum by example .....</b>	<b>407</b>

This handbook version is for informational use only. For legally binding information please refer to the German version of the handbook.

### 1 Preliminary remarks

The module handbook is the document in which important additional information about the studies is described. The general rules from the examination regulation (s. <https://www.sle.kit.edu/english/vorstudium/master-civil-engineering.php>; *in German*) and the structure of the program are specified by the curriculum (Chapt. 2). The main function of the Module Handbook is the compilation of the module descriptions (Chapt. 5) and the learning controls (Chapt. 6).

In addition to the module handbook information about the single courses (execution, content, etc.) is collected within the course catalog. Links to the courses (online) are given with the learning controls (Chapt. 6). The course language is indicated in the module tables (Chapt. 2) and partly in the course catalog (online). Information about the examinations is provided by the self-service function for students. This information is also announced by postings and web pages of the institutes

#### Hints concerning Corona pandemic:

The descriptions in this module handbook are not adapted to the rules concerning the Corona pandemic. Important information about the current rules are found on the webpage of the Corona Crisis Unit, <http://www.kit.edu/kit/english/25911.php>, in the section 'Studying and Teaching'. This will be updated regularly during the period of the pandemic.

Information about the offered mode of the single courses, in presence or online, are found in the [online course catalog](#). Please note: Not all this information was up to date when the module handbook was published. In the linked ILIAS course further information about the procedure and content of the course is provided.

#### Publisher:

KIT Department of Civil Engineering, Geo and Environmental Sciences  
Karlsruhe Institute of Technology (KIT)  
76128 Karlsruhe

#### Photographs:

Martin Fenchel

#### Contact:

[ulf.mohrlok@kit.edu](mailto:ulf.mohrlok@kit.edu)



## 2 Curriculum

In this section 'Curriculum' rules in addition to the examination regulation (ER/SPO) and their amendment statutes are described. These can be found on

[https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2017\\_AB\\_011.pdf](https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2017_AB_011.pdf)

(2017 KIT 011 Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Masterstudiengang Bauingenieurwesen; *in German*)

[https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2020\\_AB\\_049.pdf](https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2020_AB_049.pdf)

(2020 KIT 049 Satzung des Karlsruher Instituts für Technologie (KIT) über die Änderung der Studien- und Prüfungsordnungen zur Anwendbarkeit der Satzung des Karlsruher Instituts für Technologie (KIT) zur Durchführung von Erfolgskontrollen im Antwort-Wahl-V., Artikel 38; *in German*)

[https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2021\\_AB\\_012.pdf](https://www.sle.kit.edu/downloads/AmtlicheBekanntmachungen/2021_AB_012.pdf)

(2021 KIT 012 Satzung zur Änderung der Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Masterstudiengang Bauingenieurwesen; *in German*)

### 2.1 Objectives of the master degree program

The master degree program **Civil Engineering** provides a deepened and research-oriented qualification in all typical professional fields of civil engineering. The main component of the qualification is the engineering applications of the qualifications acquired during the bachelor studies added by advanced and extended knowledge in at least two of the five study focuses '*Structural Engineering*', '*Water and Environment*', '*Mobility and Infrastructure*', '*Technology and Management in Construction*' and '*Geotechnical Engineering*'.

The graduates are able to apply self-reliantly their scientific profound and interdisciplinary knowledge and methods in the fields of system analysis, measurement techniques, modeling and management also across disciplines. They evaluate their significance and scope for the solution of complex scientific and societal problems. They develop innovative problem solutions beyond the application of established structurally engineered and scientific rules, and enter new fields of engineering. Because of the increasing complexity of these problems they develop overall economic, socially and ecologically acceptable solutions within an interdisciplinary team.

They have the capability to present technically complex issues understandably and to perform convincingly which let them also be prepared very well for executive functions - also in an interdisciplinary team. They are qualified for responsible activities in planning offices and consultants, industry, administration and science. They obtain the qualification for Ph.D. studies as well.

## 2.2 Structure of the master degree program

The master degree program Civil Engineering comprises 120 credit points (CP). It is structured in a compulsory elective section, the **Focus Studies** (60 CP), a compulsory section, the **Supplementary Studies** (30 CP), and the **Master's Thesis** (30 CP; comp. ER/SPO § 19). Within the Focus Studies two of the five subject-related **Study Focuses**

- I. Construction Engineering
- II. Water and Environment
- III. Mobility and Infrastructure
- IV. Technology and Management in Construction
- V. Geotechnical Engineering

have to be selected as compulsory elective subjects. These represent the different characteristics of the occupational profile. They comprises 30 CP each and are structured differently regarding the assigned compulsory modules (PM) and compulsory elective modules (SM). All modules in the master degree program comprise 6 CP each and are integrated into these subject-related study focuses (s. Tab. 1 - 5 ) as described in the following sections.

The Supplementary Studies comprises the two compulsory subjects **Subject-Specific Supplements** (24 CP) and **Interdisciplinary Qualifications** (6 CP). Within the subject Subject-Specific Supplements all modules not already elected from all study focuses can be selected freely. In order to obtain the interdisciplinary qualifications basically courses from the respective course catalog on key competences offered by the House of Competence (HoC) or of the Centre for Cultural and General Studies (ZAK) or language courses of the 'Sprachenzentrum' (SpZ, center of language studies) can be selected freely.

1. Sem.	2. Sem.	3. Sem.	4. Sem.
<b>Focus Studies (compulsory elective)</b>			<b>Master's Thesis</b>  <b>30 CP</b>  in one of the selected focuses:  <b>duration of preparation:</b> 6 months  <b>completion by presentation</b>
selection of one Study Focus, 5 modules of 6 CP each (variable number fixed and selectable respectively): <b>30 CP</b> <b>Construction Engineering (SF 1)</b> <b>Water and Environment (SF 2)</b> <b>Mobility and Infrastructure (SF 3)</b> <b>Technology and Management in Construction (SF 4)</b> <b>Geotechnical Engineering (SF 5)</b>			
selection of one Study Focus, 5 modules of 6 CP each (variable number fixed and selectable respectively): <b>30 CP</b> <b>Construction Engineering (SF 1)</b> <b>Water and Environment (SF 2)</b> <b>Mobility and Infrastructure (SF 3)</b> <b>Technology and Management in Construction (SF 4)</b> <b>Geotechnical Engineering (SF 5)</b>			
<b>Supplementary Studies (compulsory)</b>			
Subject-Specific Supplements: <b>24 CP</b>  subject-specific modules freely selectable			
Interdisciplinary Qualifications (selectable out of the offer of HoC, ZAK and SpZ) <b>6 CP</b>			
<b>Additional Studies</b>			
Additional Accomplishments: freely selectable out of the entire course offer of KIT			<b>max. 30 CP</b>

### 2.2.1 Study Focus 'Construction Engineering' (SF 1)

Civil engineers working in construction engineering are dealing with planning, design and calculation of structures and structural designs of all kinds. The graduates of the study focus '*Construction Engineering*' are able to design, plan and calculate structures and structural designs independently considering technological, ecological and economic aspects by means of their broad knowledge about building material properties and designing approaches.

All modules offered in the study focus 'Construction Engineering' are summarized in Table 1. This table provides also information in which semester the associated courses and how the course assessment take place.

Study Focus Construction Engineering (SF 1)		
3 PM are fixed:		
PM1	<b>M1P1 - Design and Construction of Components in Reinforced Concrete</b> WS	6 CP
PM2	<b>M1P2 - Steel and Composite Structures</b> SS	6 CP
PM3	<b>M1P3 - Surface Structures and Dynamics of Structures</b> WS	6 CP
2 SM have to be selected from M1S01 - M1S47 (s. Tab. 1):		
SM1	<b>compulsory elective module 1</b>	6 CP
SM2	<b>compulsory elective module 2</b>	6 CP

In this study focus three compulsory modules are predetermined:

- Design and Construction of Components in Reinforced Concrete
- Steel and Composite Structures
- Surface Structures and Dynamics of Structures

In addition, two compulsory elective modules, study focus modules, have to be selected (s. Tab. 1).

For several modules recommendations are given which modules should be taken in advance or in parallel.

As part of several courses numerous field trips are offered. It is recommended to attend at least one field trip.

**Table 1: Modules in Study Focus Construction Engineering**

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
compulsory modules:								
M1P1:	Design and Construction of Components in Reinforced Concrete	6	Design and Construction of Components in Reinforced Concrete (G)	L/E	2/2		ngA wE	2 4
M1P2:	Steel and Composite Structures	6	Steel and Composite Structures (G)	L/E		2/2	ngA wE	2 4
M1P3:	Surface Structures and Dynamics of Structures	6	Surface Structures (G)	L	2		ngA wE	1 2
			Dynamics of Structures *) (G)	L	2		ngA wE	1 2
Sum compulsory modules		18			8	4		
compulsory elective modules:								
M1S01:	Bracing and Stability in Reinforced Concrete	6	Bracing and Stability in Reinforced Concrete (G)	L/E		2/2	wE	6
M1S02:	Basics of Prestressed Concrete	6	Basics of Prestressed Concrete (G)	L/E		2/2	wE	6
M1S03:	Solid Construction Bridges	6	Solid Construction Bridges (G)	L/E	2/2		wE	6
M1S04:	Applied Dynamics of Structures <sup>1)</sup>	6	Applied Dynamics of Structures (G)	L/E		1/1	wE	6
			Earthquake Engineering**) (G)	L/E	1/1			
M1S06:	Material Science, Welding and Fatigue	6	Material Science, Welding and Fatigue (G)	L/E		4	wE	6
M1S07:	Construction of Steel and Composite Bridges	6	Construction of Steel and Composite Bridges (G)	L/E		2/2	wE	6
M1S08:	Hollow Section Structures	6	Hollow Section Structures (G)	L/E	2/2		oE	6
M1S09:	Glass, Plastic and Cable Structures	6	Glass, Plastic and Cable Structures (G)	L/E	3/1		oE	6
M1S11:	Building Preservation of Steel and Timber Structures <sup>5a)</sup>	6	Building Preservation in Steel Structures (G)	L	2		wE	3
			Building Preservation in Timber Structures (G)	L/E	2		wE	3
M1S12:	Timber Structures	6	Timber Structures (G)	L/E		2/2	wE	6
M1S14:	Non-linear Analysis of Beam Structures	6	Non-linear Analysis of Beam Structures (G)	L/E	2/2		wE	6
M1S15:	Computational Analysis of Structures	6	Computational Analysis of Structures (G)	L/E		2/2	ngA <sup>6)</sup> oE	2 4
M1S16:	FE-Applications in Practical Engineering	6	FE-Applications in Practical Engineering (G)	L/E		2/2	oE	6
M1S17:	Shell Structures and Stability of Structures	6	Shell Structures (G)	L/E		1/1	ngA <sup>6)</sup> oE	2 4
			Stability of Structures (G)	L/E		1/1		
M1S18:	Numerical Methods in Structural Analysis	6	Numerical Methods in Structural Analysis (G)	L/E	2/2		oE	6
M1S19:	Non-linear Analysis of Surface Structures	6	Non-linear Analysis of Surface Structures (G)	L/E	2/2		oE	6
M1S20:	Basics of Finite Elements	6	Basics of Finite Elements (G)	L/E	2/2		ngA oE	1 5
M1S21:	Fracture and Damage Mechanics	6	Fracture and Damage Mechanics (G)	L/E		2/2	oE	6
M1S22:	Material Models in Solid Mechanics	6	Material Models in Solid Mechanics (G)	L/E	2/2		oE	6

(continuing next page)

\*) Practical course Dynamics of Structure recommended as supplementary additional accomplishment

\*\*) Course was not offered in winter term 2021/22.

Table 1: Modules in Study Focus Construction Engineering (continued)

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
M1S24:	Concrete Construction Technology	6	Concrete Technology (G)	L/E	3		oE	6
			Deformation and Fracture Processes (G)	L	1			
M1S25:	Durability and Service Life Design	6	Corrosion Processes and Life Time (G)	L/E	3		oE	6
			Analytic Methods (D)	L	1			
M1S26:	Building Preservation of Concrete and Masonry Constructions	6	Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions (G)	L/E		2/1	ngA oE	1 5
			Building Analysis (G)	L		1		
M1S27:	Building Physics I	6	Applied Building Physics (G)	L	2		oE	3
			Building Technology (G)	L	2			
M1S28:	Building Physics II	6	Practical Noise Control (G)	L		2	EoT oE	1 2
			Practical Fire Protection (G)	L		2		
M1S29:	Materials Testing and Measuring Techniques	6	Measuring Techniques in Construction Engineering (G)	L/E	1/1		oE	6
			Materials Testing in the Field of Concrete (G)	L	2			
M1S32:	Continuum Mechanics of Heterogeneous Solids <sup>2,4)</sup>	6	Continuum Mechanics (G)	L	2		oE	3
			Micromechanics of Heterogeneous Solids (G)	L		2		
M1S37:	Finite Elements in Solid Mechanics	6	Finite Elements in Solid Mechanics (G)	L/E		2/2	oE	6
M1S38:	Numerical Structural Dynamics	6	Numerical Structural Dynamics (G)	L/E		4	oE	6
M1S39:	Tank Construction	6	Tank Construction (G)	L/E	3/1		EoT oE	3 3
M1S40:	Modeling in Solid Mechanics	6	Modeling in Solid Mechanics (G)	L/E		4	oE	6
M1S41:	Contact Mechanics	6	Contact Mechanics (G)	L/E	2/2		oE	6
M1S42:	Digital Planning and Building Information Modeling	6	Digital Planning and Building Information Modeling (G)	L/E	4		EoT	6
M1S43:	Design and Construction in Metal and Lightweight Structures <sup>5a)</sup>	6	Design and Construction in Metal and Lightweight Structures (G)	L/E	4		EoT	6
M1S44:	Timber Structures: Materials and Appropriate Design <sup>5b)</sup>	6	Timber Structures: Materials and Appropriate Design (G)	L/E	4		oE	6
M1S45:	Innovations and Developments in Steel and Timber Structures <sup>5c)</sup>	6	Innovations and Developments in Metal and Lightweight Structures (G)	L/E		2	oE	3
			Innovations and Developments Timber Structures (G)	L/E	2			
M1S46:	Building Preservation and Innovations in Metal and Lightweight Structures <sup>5d)</sup>	6	Building Preservation in Steel Structures (G)	L/E	2		wE	3
			Innovations and Developments in Metal and Lightweight Structures (G)	L/E		2		
M1S47:	Building Preservation and Innovations in Timber Structures <sup>5d)</sup>	6	Building Preservation in Timber Structures (G)	L/E	2		wE	3
			Innovations and Developments Timber Structures (G)	L/E	2			
M1S48:	Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis <sup>3)</sup>	6	Structural Analysis with Uncertain Data (G)	L		2	oE	6
			Artificial Neural Networks in Structural Analysis (G)	L		1		
			Structural Optimization (G)	L		1		
Sum compulsory elective modules		216			78	66		

**explanations to Table 1:**

## general:

M1PX Study Focus I, compulsory modules

M1SXX Study Focus I, compulsory elective modules

LC learning control

CP credit point

HpW /

SWS hours per week

W / S winter term / summer term

G / E language German / English

1) Starting the module in summer term (S) is recommended.

2) Starting the module in winter term (W) is recommended.

3) Module will be offered newly as from summer term 2022.

4) Module must not be selected together with module M5P4 (SF 5).

5a) Module must not be selected together with the module M1S10 not offered anymore.

5b) Module must not be selected together with the modules M1S10 and M1S13 not offered anymore.

5c) Module must not be selected together with the modules M1S46 and M1S47.

5d) Module must not be selected together with the modules M1S11 and M1S45.

## type of course:

L lecture

L/E lecture and exercise, separate or integrated

## type of learning control:

wE written examination

oE oral examination

EoT examination of other type

ngA not graded

accomplishment

ngA <sup>6)</sup> not graded accomplishment as examination prerequisite

### 2.2.2 Study Focus 'Water and Environment' (SF 2)

Civil engineers working in water management and environmental engineering are dealing with the management of water resources, their interaction with soil and air as well as the handling of waste and waste water. The graduates of the study focus '*Water and Environment*' can develop efficient and adapted solutions for problems of any kind in water management based on a deepened understanding of fluid mechanical processes on water and mass transport as well as methods for their quantification.

All modules offered in the study focus 'Water and Environment' are summarized in Table 2. This table provides also information in which semester the associated courses and how the course assessment take place.

Study Focus Water and Environment (SF 2)		
3 PM out of 5 PM have to be selected:		
PM1	<b>M2P9 - Advanced Fluid Mechanics</b> SS	6 CP
PM2	<b>M2P5 - Numerical Fluid Mechanics</b> WS	6 CP
PM3	<b>M2P6 - Hydraulic Engineering</b> SS	6 CP
PM4	<b>M2P10 - Urban Water Infrastructure and Management</b> WS	6 CP
PM5	<b>M2P8 - Water and Energy Cycles</b> WS	6 CP
2 SM have to be selected from M2S01 - M2S48 or M2P5 - M2P10, if not already selected as PM (s. Tab. 2):		
SM1	<b>compulsory elective module 1</b>	6 CP
SM2	<b>compulsory elective module 2</b>	6 CP

In this study focus five compulsory modules are predetermined:

- Advanced Fluid Mechanics
- Numerical Fluid Mechanics
- Hydraulic Engineering
- Urban Water Infrastructure and Management
- Water and Energy Cycles

At least three out of these five compulsory modules have to be selected. In case of selecting less than five compulsory modules the respective number of compulsory elective modules, study focus modules, have to be selected (s. Tab 2).

**Table 2: Modules in Study Focus Water and Environment**

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(bauI)					W	S		
<i>compulsory modules *)</i> : 3 compulsory modules have to be selected, in total 18 CP.								
M2P5:	Numerical Fluid Mechanics *)	6	Numerical Fluid Mechanics (E)	L/E	4		wE	6
M2P6:	Hydraulic Engineering *)	6	River Engineering (E)	L/E		2	ngA <sup>7)</sup>	6
			Design of Hydraulic Structures (E)	L/E		2	ngA <sup>7)</sup> wE	
M2P8:	Water and Energy Cycles *)	6	Water and Energy Cycles in Hydrological Systems: Processes, Predictions and Management (E)	L/E	4		EoT	6
M2P9:	Advanced Fluid Mechanics *)	6	Advanced Fluid Mechanics (E)	L/E		4	wE	6
M2P10:	Urban Water Infrastructure and Management *)	6	Urban Water Infrastructure and Management (E)	L/E	4		wE	6
<b>Sum compulsory modules</b>		<b>30</b>			<b>12</b>	<b>8</b>		
<i>compulsory elective modules *)</i> : At least 2 modules out of the compulsory elective modules and the not already selected compulsory modules have to be selected, in total 12 CP.								
M2S03:	Subsurface Flow and Contaminant Transport	6	Transport and Transformation of Contaminants in Hydrological Systems (E)	L/E		4	oE	6
M2S04:	Analysis of Spatial Data	6	Geostatistics (E)	L/E		4	oE	6
M2S05:	Hydrological Measurements in Environmental Systems	6	Hydrological Measurements in Environmental Systems (E)	PE		4	EoT	6
M2S07:	Environmental Communication	6	Environmental Communication <sup>2)</sup> (G)	S	2	2	ngA <sup>7)</sup> EoT	0 6
M2S08:	Groundwater Management <sup>1)</sup>	6	Groundwater Hydraulics (E)	L/E		2	oE	3
			Numerical Groundwater Modeling (E)	Pj	2		EoT	3
M2S11:	Hydro Power Engineering	6	Hydro Power Engineering (G)	L/E		4	oE	6
M2S12:	Waterway Engineering	6	Waterway Engineering (G)	L/E		4	ngA <sup>7)</sup> oE	1 5
M2S17:	Technical Hydraulics <sup>3)</sup>	6	Steady and Unsteady-state Operation of Hydraulic Systems (G)	L/E		4	wE	6
M2S19:	Environmental Fluid Mechanics	6	Environmental Fluid Mechanics (E)	L/E	4		wE	6
M2S21:	Advanced Computational Fluid Dynamics	6	Numerical Fluid Mechanics II (E)	L/E		2	oE	3
			Parallel Programming Techniques for Engineering Problems (E)	L/E		2	oE	3
M2S33:	Project Studies in Water Resources Management	6	Project Studies in Water Resources Management (G)	L/E	4		EoT	6
M2S34:	Numerical Flow Modeling in Hydraulic Engineering	6	Numerical Flow Modeling in Hydraulic Engineering (G)	L/E	4		oE	6
M2S35:	Flow and Sediment Dynamics in Rivers <sup>3)</sup>	6	Morphodynamics (E)	L/E		2	ngA <sup>7)</sup> oE	2 4
			Flow Behavior of Rivers (E)	L/E		2		
M2S36:	Hydraulic Structures <sup>5a)</sup>	6	Groundwater Flow around Structures**) (E)	L/E		2	oE	3
			Interaction Flow - Hydraulic Structures (E)	L/E	2		wE	3
M2S37:	Experimental Hydraulics and Measuring Techniques	6	Flow Measurement Techniques (E)	L/E	2		oE	3
			Experimental Hydraulics II (G)	L/E	2		EoT	3
M2S38:	Water Distribution Systems	6	Water Distribution Systems (E)	L/E	4		ngA <sup>7)</sup> oE	2 4

(continuing next page)

\*\*) Course will not be offered in summer term 2022.



**Table 2: Modules in Study Focus Water and Environment (continued)**

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
M2S39:	Experiments in Fluid Mechanics	6	Experiments in Fluid Mechanics (E)	L/E		4	EoT	6
M2S41:	Freshwater Ecology	6	Applied Ecology and Water Quality (E)	L/S		3	EoT	3
			Field Training Water Quality (E)	E		1	EoT	3
M2S42:	River Basin Modeling <sup>1)</sup>	6	Mass Fluxes in River Basins (E)	L		2	ngA <sup>7)</sup>	3
			Modeling Mass Fluxes in River Basins (E)	E	2		EoT	3
M2S43:	Wastewater Treatment Technologies	6	Wastewater Treatment Technologies (E)	L/E		4	ngA <sup>7)</sup> wE	3 3
M2S44:	Introduction to Environmental Data Analysis and Statistical Learning	6	Introduction to Environmental Data Analysis and Statistical Learning (E)	L/E	4		ngA <sup>7)</sup> wE	2 4
M2S45:	Fluid Mechanics of Turbulent Flows	6	Fluid Mechanics of Turbulent Flows (E)	L/E		4	oE	6
M2S46:	Modeling of Turbulent Flows – RANS and LES	6	Modeling of Turbulent Flows – RANS and LES (E)	L/E	4		oE	6
M2S47:	Interaction Flow - Building Structure <sup>5b)</sup>	6	Interaction Flow - Hydraulic Structures (E)	L/E	2		wE	3
			Building and Environmental Aerodynamics (G)	L/E	1/1		oE	3
M2S48:	Integrated Design Project in Water Resources Management	6	Integrated Design Project in Water Resources Management (E)	L/E		4	EoT	6
M2S49:	River Processes <sup>4,6)</sup>	6	Landscape and River Morphology (E)	L/E		2	EoT	6
			Transport Processes in Rivers (E)	L/E		2		
Sum compulsory elective modules		138			38	56		

**explanations to Table 2:**

## general:

M2PX Study Focus II, compulsory modules

M2SXX Study Focus II, compulsory elective modules

LC learning control

CP credit point

HpW /

SWS hours per week

W / S winter term / summer term

G / E language German / English

<sup>1)</sup> Starting the module in summer term (S) is recommended.<sup>2)</sup> Course is offered every semester.<sup>3)</sup> Module will not be offered anymore as from summer term 2022.<sup>4)</sup> Module will be offered newly as from summer term 2022.<sup>5a)</sup> Module must not be selected together with the modules M2S16 not offered anymore and M2S47.<sup>5b)</sup> Module must not be selected together with the modules M2S16 not offered anymore and M2S36.<sup>6)</sup> Module must not be selected together with the module M2S35 not offered anymore.

## type of course:

L lecture

L/E lecture and exercise, separate or integrated

L/S lecture and seminar integrated

E exercise

S seminar

PE practical exercise

Pj project

## type of learning control:

wE written examination

oE oral examination

EoT examination of other type

ngA <sup>7)</sup> not graded accomplishment as examination prerequisite

### 2.2.3 Study Focus 'Mobility and Infrastructure' (SF 3)

Civil Engineers working in urban, regional and federal state planning or transportation, highway engineering and railroad are dealing with the provision and maintenance of transportation infrastructure. The graduates of the study focus '*Mobility and Infrastructure*' are able to design, construct and operate transportation systems under logistical, ecological and socio-economic aspects by means of deepened knowledge of the interrelationships between urban planning, regional planning, mobility behavior and required infrastructure.

All modules offered in the study focus 'Mobility and Infrastructure' are summarized in Table 3. This table provides also information in which semester the associated courses and how the course assessment take place.

Study Focus Mobility and Infrastructure (SF 3)		
3 PM out of 5 PM have to be selected:		
PM1	<b>M3P1 - Urban and Regional Planning</b> WS	6 CP
PM2	<b>M3P2 - Models and Methods in Traffic Engineering and Transportation Planning</b> WS	6 CP
PM3	<b>M3P3 - Infrastructure Management</b> SS	6 CP
PM4	<b>M3P5 - Laws and Proceedings concerning Traffic and Roads</b> SS	6 CP
PM5	<b>M3P6 - City Transport Facilities</b> WS	6 CP
2 SM have to be selected from M3S01 - M3S23 or M3P1 - M3P6, if not already selected as PM (s. Tab. 3):		
SM1	<b>compulsory elective module 1</b>	6 CP
SM2	<b>compulsory elective module 2</b>	6 CP

In this study focus five compulsory modules are predetermined:

- Urban and Regional Planning
- Models and Methods in Traffic Engineering and Transportation Planning
- Infrastructure Management
- Laws and Proceedings concerning Traffic and Roads
- City Transport Facilities

At least three out of these five compulsory modules have to be selected. In case of selecting less than five compulsory modules the respective number of missing modules have to be selected from the offer of this study focus (Tab. 3).

Students selecting the study focus 'Mobility and Infrastructure' are recommended to attend one field trip of several days' duration. Normally, this takes place annually in the week following the Whitsun holidays.

**Table 3: Modules in Study Focus Mobility and Infrastructure**

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
<i>compulsory modules *)</i> : 3 compulsory modules have to be selected, in total 18 CP.								
M3P1:	Urban and Regional Planning *)	6	Urban Planning (G)	L/E	2		oE	6
			Regional Planning (G)	L	2			
M3P2:	Models and Methods in Traffic Engineering and Transportation Planning *)	6	Methods and Models in Transportation Planning (G)	L/E	2		oE	6
			Traffic Engineering (G)	L/E	2			
M3P3:	Infrastructure Management *)	6	Design and Construction of Highways (G)	L		2	wE	6
			Operation and Maintenance of Highways (G)	L		2		
M3P5:	Laws and Proceedings concerning Traffic and Roads *)	6	Laws concerning Traffic and Roads (G)	L		2	wE	6
			Environmental Impact Assessment (G)	L		1		
			Assessment and Evaluation Techniques (G)	L		1		
M3P6: (M3S17)	City Transport Facilities *)	6	City Transport Facilities (G)	L/E	4		ngA <sup>4)</sup> oE	2 4
<b>Sum compulsory modules</b>		<b>30</b>			<b>12</b>	<b>8</b>		
<i>compulsory elective modules *)</i> : At least 2 modules out of the compulsory elective modules and the not already selected compulsory modules have to be selected, in total 12 CP.								
M3S01:	Urban Renewal	6	Urban Management (G)	L/E		2	oE	3
			History of Urban Planning (G)	L		2		3
M3S02:	Space and Infrastructure	6	Logistics, Supply and Disposal (G)	L/E		2	ngA <sup>4)</sup> wE	1 5
			Fundamentals of Geographic Information Systems for Modelling and Planning (G)	L/E		2/2		
M3S03:	Traffic Management and Simulation Methods	6	Traffic Management and Transport Telematics (G)	L/E		2	oE	6
			Traffic Flow Simulation (G)	L/E		2		
M3S04:	Planning of Transportation Systems	6	Characteristics of Transportation Systems (G)	L		2	wE	6
			Strategic Transport Planning (G)	L		2		
M3S05:	Highway Design	6	IT-based Road Design (G)	L/E	2		ngA <sup>4)</sup> oE	2 4
			Highway Design Project Study (G)	L/E	2			
M3S06:	Road Construction	6	Practical Laboratory Training in Road Construction (G)	L/E	2		oE	6
			Pavement Structural Design and Failure Analysis (G)	L	2			
M3S09:	Project Integrated Planning <sup>1)</sup>	6	Project Integrated Planning (G)	Pj	4		ngA <sup>4)</sup> oE	5 1
M3S11:	Intermodality in Freight, Long-distance and Air Transport	6	Freight Transport (G)	L/E		2	wE	3
			Long-distance and Air Traffic (G)	L	2			3
M3S12:	Road Safety	6	Safety Management in Highway Engineering (G)	L/E	2		ngA <sup>4)</sup> wE	3 3
			Seminar in Highway Engineering (G)	S	2			

(continuing next page)

\*\*) Course is offered exceptionally in winter term 2021/22.

**Table 3: Modules in Study Focus Mobility and Infrastructure (continued)**

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
M3S13:	Special Topics in Highway Engineering	6	Technical and Economic Management Tools in Highway Engineering (G)	L		2	oE	6
			Simulations and Analysis Methods in Highway Engineering (G)	L		1		
			Special Topics in Highway Engineering (D)	L		1		
M3S18:	Track Guided Transport Systems - Operation and Capacity	6	Operation Track Guided Systems (G)	L		2	wE	6
			Operation Systems and Track Guided Infrastructure Capacity (G)	L		2		
M3S20:	Analysis and Evolution of Mobility	6	Transportation Data Analysis (G)	L/E	2		oE	6
			Mobility Services and new Forms of Mobility (G)	L		2		
M3S22:	Special Issues of Public Transport <sup>2)</sup>	6	Tendering, Planning and Financing in Public Transport (G)	L		2	oE	3
			Seminar in Transportation <sup>3)</sup> (G)	S	2	2	EoT	3
			Information Management for Public Mobility Services (G)	L/E	2		EoT	3
			Sustainability in Mobility Systems (G)	L	2		wE	3
M3S23: (M3P4)	Track Guided Transport Systems - Technical Design and Components	6	Track Guided Transport Systems - Technical Design and Components (G)	L/E	3/1		wE	6
<b>Sum compulsory elective modules</b>		<b>84</b>			<b>30</b>	<b>34</b>		

**explanations to Table 3:**

## general:

M3PX Study Focus III, compulsory modules

M3SXX Study Focus III, compulsory elective modules

LC learning control

CP credit point

HpW /

SWS hours per week

W / S winter term / summer term

G / E language German / English

<sup>1)</sup> Taking this module in the first semester is not recommended.<sup>2)</sup> Two of these courses with the related learning controls have to be selected.<sup>3)</sup> Course is offered every semester.

## type of course:

L lecture

L/E lecture and exercise, separate or integrated

S seminar

Pj project

## type of learning control:

wE written examination

oE oral examination

EoT examination of other type

ngA <sup>4)</sup> not graded

accomplishment as examination prerequisite

### 2.2.4 Study Focus 'Technology and Management in Construction' (SF 4)

Civil engineers working in construction management are dealing comprehensively with the life cycle of a building from planning to construction to demolition at the end of utilization. The graduates of the study focus '*Technology and Management in Construction*' can apply specifically their deepened knowledge in project management, process engineering and economics in construction operation as well as their knowledge in methods of project development and facility management for the solution of all problems, in order to realize optimally buildings in all fields of civil engineering by means of their broad understanding of the legal, economic and technical interrelationships.

All modules offered in the study focus 'Technology and Management in Construction' are summarized in Table 4. This table provides also information in which semester the associated courses and how the course assessment take place.

Study Focus Technology and Management in Construction (SF 4)		
4 PM are fixed:		
PM1	<b>M4P5 - Project Management in Construction and Real Estate Industry</b>	6 CP
PM2	<b>M4P6 - Machinery and Process Engineering</b>	6 CP
PM3	<b>M4P7 - Production Planning and Control in Construction</b>	6 CP
PM4	<b>M4P4 - Sustainability in Real Estate Management</b>	6 CP
1 SM has to be selected from M4S01 - M4S20 (s. Tab. 4):		
SM1	<b>compulsory elective module 1</b>	6 CP

In this study focus four compulsory modules are predetermined:

- Project Management in Construction and Real Estate Industry
- Machinery and Process Engineering
- Production Planning and Control in Construction
- Sustainability in Real Estate Management

In addition, one compulsory elective module, study focus module, has to be selected (s. Tab. 4).

Beside numerous field trips as part of several lectures a one day field trip takes place annually at the beginning of the winter term. The attendance at this fall field trip is obligatory for students selected the study focus 'Technology and Management in Construction' (SF 4).

Furthermore, a 'large' field trip of several days' duration is offered also annually in the week following the Whitsun holidays. All students planning to prepare their master's thesis in this study focus shall attend this once.

**Table 4: Modules in Study Focus Technology and Management in Construction**

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
compulsory modules:								
M4P3:	Economics and Management in Construction <sup>1,5a)</sup>	6	Cost Estimation (G)	L/E		2	ngA wE	1 5
			Building Laws (G)	L		2		
M4P4:	Sustainability in Real Estate Management	6	Sustainability in Real Estate Management (G)	L/E		2	wE	6
			Real Estate Life Cycle Management (G)	L		1		
			Facility and Real Estate Management II (D)	L		1		
M4P5:	Project Management in Construction and Real Estate Industry	6	Project Management in Construction and Real Estate Industry (G)	L/E	4		ngA EoT	1 5
M4P6:	Machinery and Process Engineering	6	Construction Equipement (G)	L	2		ngA wE	1 5
			Process Engineering (G)	L	2			
M4P7:	Production Planning and Control in Construction <sup>2,5b)</sup>	6	Site Management (G)	L		1	ngA wE	1 5
			Site Planning and Handling (G)	L/E		3		
Sum compulsory modules		24			8	8		
compulsory elective modules:								
M4S01:	Business and Human Resource Management <sup>1,6a)</sup>	6	Business and Human Resources (G)	L/E		3	wE	6
			Site Management (G)	L		1		
M4S06:	Environmentally-friendly Recycling and Disassembly of Buildings	6	Project Studies (G)	L/E		2	oE	6
			Disassembly Process Engineering (G)	L/E		2		
M4S07:	Upgrading of Existing Buildings and Energetic Refurbishment	6	Upgrading of Existing Buildings (G)	L/E	3		EoT wE	1,5 4,5
			Energetic Refurbishment (G)	L	1			
M4S08:	Real Estate Management	6	Controlling in Real Estate Management (G)	L	1		oE	6
			Basics of Real Estate Valuation (G)	L	1			
			Corporate und Public Real Estate Management (G)	L	1			
			Project Development with Case Study (G)	L	1			
M4S09:	Lean Construction	6	Lean Construction (G)	L/E	4		EoT wE	1,5 4,5
M4S10:	Advanced Studies in Construction Engineering	6	Tunnel Construction and Blasting Engineering (G)	L	2		wE	6
			Operation Methods for Foundation and Marine Construction (G)	L	1			
			Operation Methods for Earthmoving (G)	L	1			
M4S12:	Decommissioning of Nuclear Facilities	6	Removal and Decontamination of Nuclear Facilities (G)	L/E	2		oE	6
			New Development and Optimization of Decommissioning Machine Technology (G)	L/E	2			
M4S13:	Facility Management in Hospitals and Hospital Management	6	Facility Management in Hospitals (G)	L/E	3		EoT	6
			Hospital Management (G)	L	1			
M4S15:	Turnkey Construction <sup>1,7a)</sup>	6	Turnkey Construction I (G)	L		1	wE	6
			Turnkey Construction II (G)	L/E		2		
			Claim Management (G)	L		1		

(continuing next page)

**Table 4: Modules in Study Focus Technology and Management in Construction (continued)**

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
M4S16:	Building Information Modeling (BIM)	6	Building Information Modeling (BIM) (G)	L/E		4	EoT	6
M4S17:	Research Seminar Construction Management	6	Research Seminar Construction Management I (G)	S		2	EoT	6
			Research Seminar Construction Management II (G)	S	2			
M4S18:	Equipment and special Construction Techniques in Building Practice	6	Equipment and special Construction Techniques in Building Practice I (D)	L		2	oE	6
			Equipment and special Construction Techniques in Building Practice II (D)	L	2			
M4S19:	Digitalization in Facility and Real Estate Management	6	Digitalization in Facility and Real Estate Management (G)	L/E	4		EoT	6
M4S20:	Digital Technologies in Field Information Modeling	6	Digital Technologies in Field Information Modeling (E)	L/E		4	EoT	6
M4S21:	Digital Engineering and Construction	6	Digital Engineering and Construction (E)	L/E	4		EoT	6
M4S22:	Leadership and Communication <sup>2,6b)</sup>	6	Leadership and Communication (G)	L/E		4	wE	6
M4S23:	Real Estate und Facility Management - on Site Lectures <sup>3)</sup>	6	Real Estate und Facility Management - on Site Lectures (G)	L/E	4		EoT	6
M4S24:	Facility Management <sup>3)</sup>	6	Facility Management III (G)	L/E	4		wE	6
M4S25:	Technology and Production Methods in Turnkey Construction and Civil Engineering Works <sup>2,7b)</sup>	6	Turnkey Construction (G)	L/E		2	wE	6
			Civil Engineering Structures and Regenerative Energies (G)	L/E		2		
M4S26:	Lean Integrated Project Delivery (Lean IPD) <sup>4)</sup>	6	Lean Integrated Project Delivery (G)	L/E		3	EoT wE	3 3
M4S27:	Agile Projekt Management in Facility and Real Estate Management <sup>4)</sup>	6	Agile Projekt Management in Facility and Real Estate Management (E)	L/E		4	EoT	6
M4S28:	Seminar Construction Machinery <sup>2)</sup>	6	Seminar Construction Machinery (G)	S/E		4	EoT	6
<b>Sum compulsory elective modules</b>		<b>120</b>			<b>44</b>	<b>35</b>		

**explanations to Table 4:**

## general:

M4PX Study Focus IV, compulsory modules

M4SXX Study Focus IV, compulsory elective modules

LC learning control

CP credit point

HpW /

SWS hours per week

W / S winter term / summer term

G / E language German / English

1) Module will not be offered anymore as from summer term 2022.

2) Module will be offered newly as from summer term 2022.

3) Module will be offered newly as from winter term 2022/23.

4) Module will be offered newly as from summer term 2023.

5a) Module must not be selected together with the module M4P7 offered newly.

5b) Module must not be selected together with the module M4P3 not offered anymore.

6a) Module must not be selected together with the module M4S22 offered newly.

6b) Module must not be selected together with the module M4S01 not offered anymore.

7a) Module must not be selected together with the module M4S25 offered newly.

7b) Module must not be selected together with the module M4S12 not offered anymore.

## type of course:

L lecture

L/E lecture and exercise, separate or integrated

S seminar

## type of learning control:

wE written examination

oE oral examination

EoT examination of other type

ngA not graded

accomplishment



## 2.2.5 Study Focus 'Geotechnical Engineering' (SF 5)

Civil engineers working in geotechnics are dealing with all aspects of the interaction between (underground) structures or infrastructures and the surrounding soil or rock. The graduates of the study focus '*Geotechnical Engineering*' are prepared very well for the interface of civil engineering and geosciences regarding problems of preservation, utilization and design of the ground as living and cultural space, in particular of planning, designing and constructing underground structures and infrastructure, by their broad professional expertise in material science and construction.

All modules offered in the study focus 'Geotechnical Engineering' are summarized in Table 5. This table provides also information in which semester the associated courses and how the course assessment take place.

Study Focus Geotechnical Engineering (SF 5)		
5 PM are fixed:		
PM1	<b>M5P1 - Theoretical Soil Mechanics</b> SS	6 CP
PM2	<b>M5P2 - Earthworks and Foundation Engineering</b> WS	6 CP
PM3	<b>M5P3 - Rock Mechanics and Tunnelling</b> SS	6 CP
PM4	<b>M5P4 - Basics in Numerical Modelling</b> WS	6 CP
PM5	<b>M1P1 - Design and Construction of Components in Reinforced Concrete *)</b> WS	6 CP
*) If PM5 is covered by selection of the Study Focus 'Construction Engineering' (SF 1), SM1 or SM2 has to be selected instead:		
SM1	<b>M5S02 - Ground Investigation</b> SS	6 CP
SM2	<b>M5S03 - Applied Geotechnics</b> SS	6 CP

In this study focus five compulsory modules are predetermined:

- Theoretical Soil Mechanics
- Earthworks and Foundation Engineering
- Rock Mechanics and Tunnelling
- Basics in Numerical Modelling
- Design and Construction of Components in Reinforced Concrete

In case that the compulsory module Design and Construction of Components in Reinforced Concrete (M1P1) is already allocated by the selection of Construction Engineering (SF 1) as second study focus one of the compulsory elective modules M5S02 or M5S03 has to be selected instead.

Starting the studies in the winter term it is recommended to attend the compulsory module Basics in Numerical Modelling (M5P4) in advance to the compulsory module Theoretical Soil Mechanics (M5P1) if the basics in mathematics and continuum mechanics are not obtained otherwise. Generally, the studies can be started with M5P2, M5P4 and M1P1 in winter term and likewise with M5P1, M5P3 and eventually M5S02 or M5S03 in summer term.

A few compulsory elective modules are depending in content and difficulty on compulsory modules, so that the compliance of an order is recommended. These are:

- Special Issues of Soil Mechanics (M5S01) following Theoretical Soil Mechanics (M5P1)
- Applied Geotechnics (M5S03) following Earthworks and Foundation Engineering (M5P2)
- Ground Water and Earth Dams (M5S04) following Earthworks and Foundation Engineering (M5P2)
- Rock Engineering and Underground Construction (M5S05) following Rock Mechanics and Tunnelling (M5P3)
- Numerical Modelling in Geotechnics (M5S06) following Basics in Numerical Modelling (M5P4)
- Coupled Geomechanical Processes (M5S10) following Rock Mechanics and Tunnelling (M5P3)

The attendance of the annual Whitsun excursion of the Institute of Soil Mechanics and Rock Mechanics (IBF) is recommended at least once during the master program.

**Table 5: Modules in Study Focus Geotechnical Engineering**

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(bauI)					W	S		
<i>compulsory modules:</i>								
M5P1:	Theoretical Soil Mechanics	6	Theoretical Soil Mechanics (G)	L/E		4	wE	6
M5P2:	Earthworks and Foundation Engineering	6	Foundation Types (G)	L/E	2		ngA wE	2 4
			Basics in Earthworks and Embankment Dams (G)	L/E	2			
M5P3:	Rock Mechanics and Tunnelling	6	Basics in Rock Mechanics (G)	L/E		2	ngA wE	1 5
			Basics in Tunnel Construction (G)	L/E		2		
M5P4:	Basics in Numerical Modelling <sup>1)</sup>	6	Continuum Mechanics (G)	L	2		oE	3
			Numerics in Geotechnics (G)	L	2		oE	3
M1P1:	Design and Construction of Components in Reinforced Concrete *)	6	Design and Construction of Components in Reinforced Concrete (G)	L/E	2/2		ngA wE	2 4
<b>Sum compulsory modules</b>		<b>30</b>			<b>12</b>	<b>8</b>		
<i>compulsory elective modules:</i>								
M5S01:	Special Issues of Soil Mechanics	6	Unsaturated, Viscous and Cyclic Soil Behaviour - Theory and Element Tests (G)	L/E	2		oE	6
			Soil Dynamics (G)	L/E	2			
M5S02:	Ground Investigation *)	6	Soil Mechanical Laboratory Exercises (G)	E		2	oE	6
			Geomechanical Field Exercise (G)	E		2		
M5S03:	Applied Geotechnics *)	6	Foundations and Retaining Structures (G)	L/E		2	wE	6
			Special Foundation Engineering and Design (G)	L/E		2		
M5S04:	Ground Water and Earth Dams	6	Geotechnical Ground Water Problems (G)	L/E		2	oE	6
			Embankment Dams (Advanced) (G)	L/E		2		
M5S05:	Rock Engineering and Underground Construction	6	Aboveground Rock Engineering (G)	L/E	2		wE	6
			Tunnel Construction in Soils and in Existence (G)	L/E	2			
M5S06:	Numerical Modelling in Geotechnics	6	Exercises in Numerical Modelling (G)	E		2	oE	6
			FEM Applications in Geotechnical Modelling (G)	L		2		
M5S07:	Geotechnical Testing and Measuring Technology	6	Rock Testing (G)	L	1		oE	6
			Testing in Dam and Wastefill Engineering (G)	L	1			
			Geotechnical Measuring Technology (G)	L/E	2			
M5S08:	Special Underground Engineering	6	Ground Improvement, Grouting and Soil Freezing (G)	L/E		2	oE	3
			Anchoring, Piling and Slurry Wall Technology (G)	L/E		2	oE	3

(continuing next page)

\*) Since module M1P1 is already taken by combination with Study Focus I 'Construction Engineering', module M5S02 or M5S03 has to be selected instead.

**Table 5: Modules in Study Focus Geotechnical Engineering (continued)**

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(baui)					W	S		
M5S09:	Environmental Geotechnics	6	Landfills (G)	L/E	2		oE	3
			Brownfield Sites - Investigation, Evaluation, Rehabilitation (G)	L	2		oE	3
M5S10:	Coupled Geomechanical Processes <sup>2)</sup>	6	Special Issues in Rock Mechanics (G)	L/E	2		EoT	3
			Transport of Heat and Fluids <sup>3)</sup> (E)	L	2		wE	3
			Applied Geothermics <sup>3)</sup> (E)	L		2	wE	3
Sum compulsory elective modules		60			20	22		

**explanations to Table 5:**

## general:

M5PX Study Focus V, compulsory modules

M5SXX Study Focus V, compulsory elective modules

LC learning control

CP credit point

HpW / SWS hours per week

W / S winter term / summer term

G / E language German / English

<sup>1)</sup> Module must not be selected together with module M1S32 (SF 1).<sup>2)</sup> In the module two examinations have to be taken, one of these can be selected.<sup>3)</sup> Course with examination selectable.

## type of course:

L lecture

L/E lecture and exercise, separate or integrated

E exercise

## type of learning control:

wE written examination

oE oral examination

ngA not graded

accomplishment

## 2.3 Mentoring, module selection, individual curriculum

The selection options within the studies require that each student compiles an individual curriculum (comp. ER/SPO § 19 Par. 4). This comprises the selection of the two study focuses with the respective modules and the selection of the modules within the subject Subject-Specific Supplements (supplementary modules). This selection has to be supervised by a **mentor** chosen by the student (comp. ER/SPO § 17a). The mentor has to be a professor of the KIT Department Civil Engineering, Geo and Environmental Sciences and to be involved in one of the selected study focuses.

By the selection of the study focuses the respective **compulsory modules** are determined (s. Tab. 1 - 5 ). According to the predefined number of compulsory modules the necessary number of **compulsory elective modules** have to be taken from the list of the respective selected study focus (s. Tab. 1 - 5 ) in order to take modules in amount of 30 CP within the respective study focus. Within the subject Subject-Specific Supplements four **compulsory or compulsory elective modules** from all study focuses of the master degree program Civil Engineering, if not already selected, or from any thematically related master degree program have to be selected freely.

For the selection of the modules within the study focuses and the supplementary studies the forms for module selection available on the web page of the Examination Committee Master Civil Engineering, <https://www.tmb.kit.edu/english/5583.php> (in German), has to be filled in by the student and to be transferred by the mentor to the [study program coordinator](#) to be stored in the Campus Management System. The module selection shall be stored there in time to register for the exams in the first semester of the master degree program (comp. ER/SPO § 19 Par. 4), so that the management of the examinations (registration, deregistration if applicable, result booking etc.) can be processed smoothly. The individual curriculum can be viewed any time via the portal Campus Management for Students, <https://campus.studium.kit.edu/english/index.php>.

The selection of the modules have to be made with care. On the one hand, the assignment of the modules to the respective part of the program, Focus Studies or Supplementary Studies respectively, will be transferred to the master degree certificate. On the other hand, changes of the module selection has to be agreed by the selected mentor and should be limited to exceptional cases, e.g. if a compulsory elective module is not offered at short notice. As far as the respective module is not yet begun, changes of the module selection are generally possible.

## 2.4 Interdisciplinary Qualifications

The module [Interdisciplinary Qualifications](#) (comp. also ER/SPO § 15a) compiles the student by herself or himself respectively with an extent of 6 CP from the offer on key competences of the KIT House of Competence (HoC) as well as the Centre for Cultural and General Studies (ZAK), from the offer of General Studies of ZAK or language courses of the 'Sprachenzentrum' (SpZ, center of language studies). In special cases the [Examination Committee Master Civil Engineering](#) can accept or recognize further suitable courses as interdisciplinary qualifications beyond the mentioned options. Supporting by the mentor is presumed. Courses accepted generally by the Examination Committee are available directly as selection option in the module.

The registration to the courses from the offer on key competences of HoC and ZAK as well as to the language courses of SpZ is done directly at HoC, ZAK or SpZ. The taken examinations were regularly uploaded as 'Not assigned grades'. They can now (as from winter term 2021/22) be **self assigned in two steps**. Firstly, the respective 'Teilleistungen' with the title 'Self Assignment HoC-ZAK-SpZ ...' have to be **selected** in the module Interdisciplinary Qualifications according to the grading scale, not graded or graded. Then, the respective not assigned exam has to be **assigned** to one of the selected 'Teilleistungen'. When credited the title and the credit points are taken over from the exam automatically. For crediting of exams that could not be assigned by oneself the form [assignment of non-assigned activity statements](#) (in German) has to be submitted to the [Study Program Service](#) of the department ('Studiengangservice Bau-Geo-Umwelt').

The registration to a learning control of courses from the offer of General Studies of ZAK or another course accepted by the [Examination Committee Bachelor Civil Engineering](#) shall be done online. That the [Study Program Service](#) of the department ('Studiengangservice Bau-Geo-Umwelt') has to be informed in time, so that the respective learning control can be selected in the campus management system within the registration period. For accepted courses the respective approval has to be provided.

The module Interdisciplinary Qualifications is completed without grade. After consultation with the lecturer a grade can be reported but is not included in the calculation of the overall grade.

## 2.5 Beginning and completion of a module

Every module and every examination is allowed to be credited only once (comp. ER/SPO § 7 Par. 5). The binding decision whether a module is selected is made by the student at the time of registering for the corresponding examination, also partial examination (comp. ER/SPO § 5 Par. 2). The student can reset this binding selection by deregistration in time. After attendance of the examination, especially of a partial examination, a module cannot be replaced by another one any more. By request to the [Examination Committee Master Civil Engineering](#) the assignment can be changed.

A module is **completed** if the general examination of the module has been passed (grade min. 4.0). In case that the module examination consists of several partial examinations, it holds: The module is completed if all partial examinations are passed (grade min. 4.0) so that the minimum requirement of credits of this module have been met.

## 2.6 Registration, deregistration, repetition of examinations

The **registration** to examinations, also to not graded accomplishments and examination prerequisites, takes place online via the portal Campus Management for Students, <https://campus.studium.kit.edu/english/index.php>. The following functions can be accessed there after login:

- register to and deregister from examinations
- retrieve examination results
- assign key competences of HoC, ZAK, SpZ by oneself
- print transcript of records

A successful online registration covers the admission to the examination. A confirmation for this is provided by the portal Campus Management for Students and can serve as proof for a made registration in case of doubts. If there occurs a problem with an attempt of an online registration the **study program coordinator** has to be informed as soon as possible in addition to the examiner on order to solve the problem in advance to the date of examination. In case of an oral examination the online registration is to be combined directly with the negotiation of an examination date with the examiner.

A registered examination has either to be taken or a **deregistration** has to be made in advance to the deadline of deregistration. In particular, this is valid if for instance the date of an oral examination is shifted to the next semester because the management of the examinations has to be made in terms of the semester. The rules for the deregistration from an examination are given by the ER/SPO § 10. The deregistration from examinations of other kinds as well as from not graded accomplishments (ER/SPO § 10 Par. 3) have to be made latest at the date of submission or presentation.

Principally, a failed examination can be repeated once, latest by the end of the examination period of the next but one semester to this examination (comp. ER/SPO § 8). If failing a written repeat examination a specific oral repeat examination can be taken. This is part of the repeat examination and will not be evaluated independently. After the specific oral repeat examination the overall grade of the repeat examination is determined, either grade 4.0 (passed) or grade 5.0 (failed).

If the **repeat examination** (including a specific oral repeat examination) will be failed as well, the **examination claim** is lost. A potential request for a **second repetition** has to be made without delay after losing the examination claim. Requests for a second repetition of an examination (s. <https://www.tmb.kit.edu/5583.php>; *in German*) require the approval of the **Examination Committee Master Civil Engineering**. A counseling interview is mandatory.

Further information is available in the examination regulation (ER/SPO, <https://www.sle.kit.edu/english/vorstudium/master-civil-engineering.php>; *in German*), and from the **Examination Committee Master Civil Engineering** or the 'Fachschaft' (student council).

## 2.7 Students with disability or chronic disease

Students with disability or chronic disease have the opportunity to get preferred access to participation limited courses, to adapt the order of taking certain courses to their requirements, or to take examinations of single modules in individually arranged form or period ('Nachteilsausgleich' - compensation for disadvantages, comp. ER/SPO § 13). The student has to present the respective attestations.

The student submits an informal request with the respective attestations to the **Examination Committee Master Civil Engineering**. The **Examination Committee Master Civil Engineering** defines in agreement with the examiner the details for the respective examination and informs the student in time.

## 2.8 Crediting and recognition of already obtained accomplishments

Already obtained accomplishments can be recognized generally under the conditions of the ER/SPO (comp. ER/SPO § 18). The recognition has to be made with the respective recognition form of the Examination Committee Master Civil Engineering (<https://www.tmb.kit.edu/english/5583.php>; *in German*). There, it has to be stated unambiguously at which place in the curriculum the recognized accomplishment has to be credited.

If the accomplishments are mainly **identical** with modules from the curriculum (name, objectives, content) this is confirmed on the form by the respective lecturer.

If the accomplishments are **not identical** with modules from the curriculum they can be recognized as well, if the obtained competences contribute to achieve the qualification goals of the study program. These are included into the individual curriculum in agreement with the mentor. The recognition is made by the **Examination Committee Master Civil Engineering**. Usually, modules in extent of 12 CP at maximum can be credited in the subject Subject-Specific Supplements. Additional credit points get lapsed.

The recognition of accomplishments obtained **outside of the higher education system** is made also with the respective recognition form of the Examination Committee Master Civil Engineering (<https://www.tmb.kit.edu/english/5583.php>; *in German*). A recognition is possible if the obtained competences contribute to achieve the qualification goals of the study program. The **Examination Committee Master Civil Engineering** examines in which extent the obtained knowledge and skills can be recognized and which parts of the higher education study can be replaced by them. It is allowed to replace not more than 50 % of the higher education study. These are included in the individual curriculum in agreement with the mentor.

The recognition form has to be submitted to the **Examination Committee Master Civil Engineering** which transfers it for crediting the accomplishments. Further information about recognitions can be found on the web page of the Examination Committee Master Civil Engineering (<https://www.tmb.kit.edu/english/PAM.php>).

## 2.9 Admission, preparation and completion of the master's thesis

The **Master's Thesis** has to be prepared usually in semester 4 in one of the selected study focuses (comp. also ER/SPO § 14). The topic of the master's thesis has to be assigned by a professor either of the KIT Department of Civil Engineering, Geo- and Environmental Sciences or of a domestic or foreign institution of higher education of the state or officially recognized by the state. If the topic shall be assigned by a person which is not member of the KIT Department of Civil Engineering, Geo- and Environmental Sciences, a permission of the [Examination Committee Master Civil Engineering](#) is required using the respective form (s. <https://www.tmb.kit.edu/english/5583.php>; *in German*). The wishes of the students may be respected when formulating the topic. In case that the master's thesis shall be prepared outside of KIT the leaflet 'Merkblatt - Externe Abschlussarbeiten' ([http://www.haa.kit.edu/downloads/KIT\\_ALLGEMEIN\\_Merkblatt\\_Externe\\_Abschlussarbeiten.pdf](http://www.haa.kit.edu/downloads/KIT_ALLGEMEIN_Merkblatt_Externe_Abschlussarbeiten.pdf); *in German*) has to be considered.

Those are admitted to the master's thesis who has passed successfully modules of extent of minimum 42 CP within the master program Civil Engineering. Obtained results in the module Interdisciplinary Qualifications cannot be counted for this purpose. The supervisor initiates that the master's thesis will be uploaded to the campus management system. After notification via e-mail the master's thesis has to be **registered online** at the portal Campus Management for Students. The **admission** is made after verification of the required prerequisites and eventual further conditions. As these steps have to be completed **before starting** the thesis (date of beginning), they shall be initiated at least two weeks in advance.

The duration of preparation is six months. The master's thesis can be written in another language than German if accepted by the supervisor. It has to be completed by a **presentation** that is considered in the grading within one month after submission. It is very much recommended to have gained already all technical and soft skills required for the preparation of the topic of the master's thesis before beginning the thesis project.

## 2.10 Additional accomplishments

An **additional accomplishment** is a voluntarily taken examination, which is not considered in the overall grade (comp. ER/SPO § 15). In total, additional accomplishments can be taken in extent of 30 CP at maximum from the entire offer of KIT.

The examination in the desired additional accomplishment shall be registered online by the student in time within the registration period. A few additional accomplishments are available in the module [Further Examinations](#). There not available and desired additional accomplishment or additional modules respectively must be forwarded via e-mail to the Study Program Service of the department ('[Studiengangservice Bau-Geo-Umwelt](#)'). This makes the desired selection available in the campus management system so that the registration to the exam is possible online. By request to the [Examination Committee Master Civil Engineering](#) the assignment can be changed subsequently.

All taken additional accomplishments are listed in the transcript of records. If a module is completed this module can be included in the master degree certificate as additional module on request by the student. This applies also to additional accomplishments which were recognized by the [Examination Committee Master Civil Engineering](#).



## 3 Further information

### 3.1 About the module handbook . . .

The **module handbook** is the relevant document in which the structure of the program is described and therefore it provides assistance for the orientation during the studies. It describes the modules belonging to the program and contains information about:

- the structure of the modules,
- the extent of the modules (in CP),
- the interdependencies of the modules,
- the learning outcomes of the modules,
- the type of assessment and examinations,
- the computation of the grade of the module and
- the placement of the module in the course of study.

Each module consists of one or more interrelated courses, which are completed by one or more **examinations** or **not graded accomplishment**. The extent of each module is characterized by 6 CP, which will be credited after the successful completion of the module. The module handbook provides the necessary information that the students can customize content and time schedule of the interdisciplinary studies according to personal needs, interest and job perspective.

In addition to the module handbook the **course catalog** and the institutes (web pages) provide important information. These are updated every semester concerning variable course details (e.g. time and location of the course) as well as short-term modifications.

### 3.2 About module examinations, examination committee . . .

The module examinations can be taken as a general examination or as several partial examinations. If the module examination is offered as a **general examination**, the entire content of the module will be reviewed in a single examination. If the module examination consists of **partial examinations**, the content of each course will be reviewed in corresponding partial examinations. Then the module examination can be taken over several semesters. Also not graded accomplishments can be part of the module examination, e.g. as examination prerequisites.

The Examination Committee Master Civil Engineering, <https://www.tmb.kit.edu/english/PAM.php>, is responsible for all legal questions in the context of examinations. For instance, all requests on second repetition, extension of deadlines or recognitions are submitted to this. It decides about their approval.

### 3.3 About changes in module offer . . .

The offer of modules changes in the course of the semesters. Modules can be discontinued or added or the module examination may change. If possible, such changes are announced in the module handbook with sufficient time in advance, at latest at the beginning of the semester as from they are valid (s. Chapt. [Current changes](#)).

Usually, it is valid that students who started a module (s. selection and completion of a module) can complete this in that form as started. The respective examinations are provided onwards over a certain time period usually at least one semester after time of change. In general, a consultation with the examiner is recommended in such a case.

### 3.4 Contact persons

#### Dean of Study Affairs:

Prof. Dr. Peter Vortisch  
Institute for Transport Studies, Bldg. 10.30, R. 305  
consultation: on appointment  
Phone: 0721/608-42255  
Email: peter.vortisch@kit.edu

#### Study Program Coordination:

PD Dr. Ulf Mohrlök  
KIT Department of Civil Engineering, Geo and Environmental Sciences, Bldg. 10.81, R. 311  
consultation: on appointment  
Phone: 0721/608-46517  
Email: ulf.mohrlok@kit.edu

#### Examination Committee Master Civil Engineering:

Prof. Dr.-Ing. Kunibert Lennerts (chairperson)  
Dr.-Ing. Heike Schmidt-Bäumler (person in charge)  
Institute of Technology and Management in Construction, Bldg. 50.31, R. 005 (ground floor)  
consultation: Wed. 13.00 – 14.00 h  
Phone: 0721/608-46008  
Email: pam@bgu.kit.edu  
Web: <https://www.tmb.kit.edu/english/PAM.php>

#### Students' Advisory Service:

Dr.-Ing. Harald Schneider  
Institute of Technology and Management in Construction, Bldg. 50.31, R. 008 (ground floor)  
consultation: on appointment  
Phone: 0721/608-43881  
Email: harald.schneider@kit.edu

#### Study Program Service ('Studiengangservice Bau-Geo-Umwelt'):

KIT Department of Civil Engineering, Geo and Environmental Sciences, Bldg. 10.81, R. 312  
consultation: s. <http://www.bgu.kit.edu/english/studiengangservice.php>  
Email: studiengangservice@bgu.kit.edu  
Web: <http://www.bgu.kit.edu/english/studiengangservice.php>

#### Fachschaft:

Students in Civil Engineering  
Bldg. 10.81 (Altes Bauing. Geb.), R. 317.1 (3<sup>rd</sup> floor)  
consultation: s. <http://www.fs-bau.kit.edu>  
Phone: 0721/608-43895  
Email: fsbau@lists.kit.edu  
Web: <http://www.fs-bau.kit.edu>

### 3.5 Abbreviations, translations

CP/LP	credit points	Leistungspunkte
ER/SPO	examination regulations	Studien- und Prüfungsordnung
HpW/SWS	contact hour per week	Semesterwochenstunde
PM	compulsory module	Pflichtmodul
S	summer term	Sommersemester
Sem.	semester	Semester
SM	compulsory elective module	Schwerpunktmodul
W	winter term	Wintersemester



## 4 Current changes

In the following, the important changes are listed as from summer term 2022. Although this process was done with great care, other/minor changes may exist.

### modules not offered any more as from summer term 2022:

Technical Hydraulics [bauim2S17-SM3]  
Flow and Sediment Dynamics in Rivers [bauim2S35-WB8]  
Economics and Management in Construction [bauim4P3-]  
Business and Human Resource Management [bauim4S01-]  
Turnkey Construction [bauim4S15-]

### modules newly offered as from summer term 2022:

Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis [bauim1S48-KNN]  
River Processes [bauim2S49-WB9], replaces module Flow and Sediment Dynamics in Rivers [bauim2S35-WB8]  
Production Planning and Control in Construction [bauim4P7-]  
Leadership and Communication [bauim4S22-]  
Technology and Production Methods in Turnkey Construction and Civil Engineering Works [bauim4S15-]  
Seminar Construction Machinery [bauim4S28-]

### modules newly offered as from winter term 2022/23:

Real Estate und Facility Management - on Site Lectures [bauim4S23-]  
Facility Management [bauim4S24-]

### modules newly offered as from summer term 2023:

Lean Integrated Project Delivery (Lean IPD) [bauim4S26-]  
Agile Project Management in Facility and Real Estate Management [bauim4S27-]

### changes of the courses assigned to the modules as from summer term 2022:

Hydraulic Engineering [bauim2P6-ADVHYENG]:  
The course River Engineering (6222701), 2 HpW/SWS, replaces the course Multiphase Flow in Hydraulic Engineering (6222701), 2 HpW/SWS.

### changed examinations and not graded accomplishments as from summer term 2022:

Applied Dynamics of Structures [bauim1S04-BAUDYN]:  
The module examination is a written examination with 6 CP.

Hydraulic Engineering [bauim2P6-ADVHYENG]:  
The module examination consists of the two not graded accomplishments Design Exercise River Engineering and Design Exercise Hydraulic Structures as examination prerequisites with 1 CP each and the written examination Hydraulic Engineering with 4 CP.

Track Guided Transport Systems - Operation and Capacity [bauim3S18-EBBETRKAP]:  
The module examination is a written examination with 6 CP.

Project Management in Construction and Real Estate Industry [bauim4P5-]:  
The module examination consists of a not graded accomplishment with 1 CP and an examination of other type with 5 CP.

Coupled Geomechanic Processes [bauim5S10-GEKOPPRO]:  
The module examination consists of the examination of other type Special Issues in Rock Mechanics with 3 CP and a selectable written examination in the field of Geothermics with 3 CP.

## 5 Modules

### M

### 5.1 Module: Design and Construction of Components in Reinforced Concrete (bauIM1P1-BEMISTB) [M-BGU-100033]

**Responsible:** Prof. Dr.-Ing. Alexander Stark  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** Study Focus I / Structural Engineering (Compulsory Modules)  
 Study Focus I / Geotechnical Engineering (Compulsory Elective Modules)  
 Subject-Specific Supplements  
 Study Focus II / Structural Engineering (Compulsory Modules)  
 Study Focus II / Geotechnical Engineering (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-BGU-100170	Student Research Project 'Reinforced Concrete'	2 CR	Stark
T-BGU-100015	Design and Construction of Components in Reinforced Concrete	4 CR	Stark

#### Competence Certificate

- 'Teilleistung' T-BGU-100170 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100015 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

#### Prerequisites

none

#### Competence Goal

Based on the module 'Basics in Reinforced Concrete' and cross-cutting modules such as 'Structural Analysis' the students can recognize complex subjects of reinforced concrete and apply their methods. They can assign given problems to the respective design problems, conduct these subsequently and apply the current standards. Furthermore, the students can interpretate the results of a design and evaluate them with respect to their correctness and profitability.

#### Content

- design and detailing of structural members
- strut-and-tie models
- punching
- serviceability limit state
- structural fire design
- introduction to prestressed concrete

#### Module grade calculation

grade of module is grade of the exam

#### Annotation

none

#### Workload

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 30 h
- preparation of student research project: 60 h
- examination preparation: 30 h

total: 180 h

#### Recommendation

courses Basics of Reinforced Concrete I+II (6200509, 6200601)

**Literature**

lecture notes

**M****5.2 Module: Steel and Composite Structures (bauM1P2-STAHLEBAU) [M-BGU-100034]**

**Responsible:** Prof. Dr.-Ing. Thomas Ummenhofer  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-100171	<a href="#">Student Research Project 'Steel Structures'</a>	2 CR	Ummenhofer
T-BGU-100016	<a href="#">Steel and Composite Structures</a>	4 CR	Ummenhofer

**Competence Certificate**

- 'Teilleistung' T-BGU-100171 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100016 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can design and construct structures in steel and steel composite construction method. Further, they can calculate structures and building components made of thin-walled, cold formed steelwork components. They are able to proof fire protection in steel constructions and to design torsion-loaded components of any cross section.

**Content**

- basics of steel composite structures
- light-weight steel construction
- fire protection in steel constructions
- the theory of torsion

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 25 h
- preparation of student research project: 45 h
- examination preparation: 50 h

total: 180 h

**Recommendation**

lecture Basics in Steel Structures (6200504)

**Literature**

DIN EN 1993-1-1, Dezember 2010: Eurocode 3: Bemessung und Konstruktion von Stahlbauten - Teil 1-1: Allgemeine Bemessungsregeln und Regeln für den Hochbau: Beuth Verlag GmbH, Berlin.

DIN EN 1993-1-2, Dezember 2010: Eurocode 3: Bemessung und Konstruktion von Stahlbauten - Teil 1-2: Allgemeine Regeln - Tragwerksbemessung für den Brandfall: Beuth Verlag GmbH, Berlin.

DIN EN 1993-1-3, Dezember 2010: Eurocode 3: Bemessung und Konstruktion von Stahlbauten - Teil 1-3: Allgemeine Regeln - Ergänzende Regeln für kaltgeformte Bauteile und Bleche: Beuth Verlag GmbH, Berlin.

DIN EN 1994-1-1, Dezember 2010: Eurocode 4: Bemessung und Konstruktion von Verbundtragwerken aus Stahl und Beton - Teil 1-1: Allgemeine Bemessungsregeln und Anwendungsregeln für den Hochbau: Beuth Verlag GmbH, Berlin.

**M****5.3 Module: Surface Structures and Dynamics of Structures (bauM1P3-FTW-BD) [M-BGU-100035]**

**Responsible:** Prof. Dr.-Ing. Peter Betsch  
Prof. Dr.-Ing. Steffen Freitag

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

**Part of:** [Study Focus I / Structural Engineering \(Compulsory Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	3

Mandatory			
T-BGU-107818	<a href="#">Student Research Project 'Surface Structures'</a>	1 CR	Freitag
T-BGU-107819	<a href="#">Student Research Project 'Dynamics of Structures'</a>	1 CR	Betsch
T-BGU-100017	<a href="#">Surface Structures</a>	2 CR	Freitag
T-BGU-100077	<a href="#">Dynamics of Structures</a>	2 CR	Betsch

**Competence Certificate**

- 'Teilleistung' T-BGU-107818 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-107819 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100017 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-100077 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students gain the ability to write up and apply the essential principles for surface structures (theory, models, analytical and numerical solution procedures and error analysis) as basis for design and construction. They are further able to analyze the vibration behavior of structures in the context of mechanical modeling. The students can apply concepts for the avoidance of vibrations and the reduction of vibrations to a tolerable extent and can describe fundamental vibration phenomena by means of small scale building models.

**Content**

Surface Structures:

- panel structures models and basic equations
- PDE and BCs for panel structures and analytical solutions
- FEM for panel structures (general/rot. symmetry)
- practical related solutions for panel structures with truss models
- plate structures models and basic equations
- PDE and simplifications for plate structures
- analytical solutions for plate structures, incl. serial solutions
- FEM for plate structures (general/rot. symmetry)
- practical related solutions for plate structures
- elastic foundation, temperature load and influence surfaces
- introduction to shell structures

Dynamics of Structures:

Vibratory structural-mechanical constructions with finite degrees of freedom are considered. The vibration analysis is based on linearized equations of motion and their solutions. Non-damped and damped free oscillations caused by different kinds of excitations are discussed. This includes measures avoiding and reducing vibrations of structures.

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Surface Structures lecture: 30 h
- Dynamics of Structures lecture: 30 h

independent study:

- preparation and follow-up lectures Surface Structures: 15 h
- preparation of student research project 'Surface Structures' (not graded accomplishment): 20 h
- examination preparation Surface Structures (partial exam): 25 h
- preparation and follow-up lectures Dynamics of Structures: 15 h
- preparation of student research project 'Dynamics of Structures' (not graded accomplishment): 20 h
- examination preparation Dynamics of Structures (partial exam): 25 h

total: 180 h

**Recommendation**

lectures in Structural Analysis I+II (6200401, 6200501);

laboratory course Dynamics of Structures (6215905) in addition to the lecture Dynamics of Structures (6215701), can be selected as additional accomplishment in the module Further Examinations (M-BGU-103951)

**Literature**

Surface Structures:

lecture notes Flächentragwerke

Hake, E. , Meskouris, K. (2001): Statik der Flächentragwerke, Springer.

Altenbach, H., Altenbach, J., Naumenko, K. (1998): Ebene Flächentragwerke, Grundlagen der Modellierung und Berechnung von Scheiben und Platten, Springer.

Dynamics of Structures:

lecture notes: P. Vielsack: Grundlagen der Baudynamik

**M****5.4 Module: Bracing and Stability in Reinforced Concrete (bauIM1S01-STABISTB) [M-BGU-100003]**

**Responsible:** Prof. Dr.-Ing. Alexander Stark  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100018	<a href="#">Bracing and Stability in Reinforced Concrete</a>	6 CR	Stark

**Competence Certificate**

- 'Teilleistung' T-BGU-100018 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Based on the module 'Basics in Reinforced Concrete', 'Design and Construction of Components in Reinforced Concrete' and cross-cutting modules such as 'Structural Analysis' the students can transfer and apply the methods from the module 'Non-linear Analysis of Beam Structures' to the subject of reinforced concrete with respect to bracing and stability of buildings. Furthermore, the students can analyse and solve problems in special issues of reinforced concrete. Given problems can be assigned to the respective design problems, be conducted subsequently and the current standards can be applied.

**Content**

- bracing and stability of buildings
- design of columns
- non-linear calculation methods to determine sectional forces
- time-dependent material behaviour
- serviceability limit state

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

**Recommendation**

course Basics of Reinforced Concrete I (6200601), module Design and Construction of Components in Reinforced Concrete [bauIM1P1-BEMISTB]

**Literature**

lecture notes



**M****5.5 Module: Basics of Prestressed Concrete (bauIM1S02-GDLSPANNB) [M-BGU-100036]**

**Responsible:** Prof. Dr.-Ing. Alexander Stark  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100019	<a href="#">Basics of Prestressed Concrete</a>	6 CR	Stark

**Competence Certificate**

- 'Teilleistung' T-BGU-100019 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students know the basics and can reconstruct the functional principle of prestressed concrete. The students can explain the already obtained knowledge in the subjects 'Strength of Materials', 'Structural Analysis' and 'Design and Construction of Components in Reinforced Concrete' and can transfer these to the methods in prestressed concrete. The students are able to conduct design of buildings in structural engineering safely and economically by reference to current standards.

**Content**

- Types and systems for prestressing
- loss of prestressing forces (friction, time-variant, immediate, etc.)
- proof in ultimate limit state and in serviceability limit state

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

**Recommendation**

module Design and Construction of Components in Reinforced Concrete [bauIM1P1-BEMISTB]

**Literature**

lecture notes

**M****5.6 Module: Solid Construction Bridges (bauim1S03-MASSBRUE) [M-BGU-100037]**

**Responsible:** Prof. Dr.-Ing. Alexander Stark  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100020	<a href="#">Solid Construction Bridges</a>	6 CR	Stark

**Competence Certificate**

- 'Teilleistung' T-BGU-100020 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Based on the module 'Basics of Prestressed Concrete' the students can explain the peculiarity of bridge constructions. In addition, they can describe the principle procedure of the design of solid construction bridges and can conduct these. Hence, the students can describe the differences to classical structural engineering and the introduction to current standards.

**Content**

- construction methods, production and impacts
- proof in ultimate limit state and in serviceability limit state
- types of supports

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

**Recommendation**

module Basics of Prestressed Concrete [bauim1S02-GDLSPANNB]

**Literature**

lecture notes

**M****5.7 Module: Applied Dynamics of Structures (bauM1S04-BAUDYN) [M-BGU-100038]**

**Responsible:** Prof. Dr.-Ing. Alexander Stark  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	2 terms	German	4	1

Mandatory			
T-BGU-100021	<a href="#">Applied Dynamics of Structures</a>	6 CR	Stark

**Competence Certificate**

- 'Teilleistung' T-BGU-100021 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can transfer their basic knowledge in dynamics to field of solid construction. They are able to evaluate buildings with respect to their susceptibility to vibrations and to identify the relevant dynamic loads. Further, the students are able develop possible countermeasures and to investigate the efficiency of the measures. The student can describe the basic seismological relationships regarding soil-building-interaction, so that they can design basic structures under impact of earthquake loads.

**Content**

Applied Dynamics of Structures:

- basics of dynamics of structures
- man-made excited, machinery excited, wind excited vibrations and counteractions

Earthquake Engineering:

- basics in earthquake engineering
- presentation of practical relevant calculation methods
- modeling, calculation, designing, and construction of buildings

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

as from summer term 2022 written examination

**Workload**

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

- Applied Dynamics of Structures lecture, exercise: 30 h
- Earthquake Engineering lecture, exercise: 30 h

independent study:

- preparation and follow-up lectures, exercises Applied Dynamics of Structures: 30 h
- preparation and follow-up lectures, exercises Earthquake Engineering: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**Literature**

Stempniewski, L.; Haag, B. (2010): Baudynamik-Praxis, Beuth

**M****5.8 Module: Material Science, Welding and Fatigue (bauM1S06-SCHWEISSEN) [M-BGU-100039]**

**Responsible:** Dr.-Ing. Philipp Weidner  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100023	<a href="#">Material Science, Welding and Fatigue</a>	6 CR	Weidner

**Competence Certificate**

- 'Teilleistung' T-BGU-100023 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can

- assess the usability of different steel materials for different requirements,
- design constructionally weld joints and define requirements for their production and quality assurance,
- differentiate the usability of different welding techniques,
- design and construct steel components stressed by fatigue,
- evaluate failures of steel components.

**Content**

- materials: denotation of steels, physical and technological properties
- fatigue: influencing parameters, calculation concepts
- welding technology: welding techniques, welding instructions
- quality management: building law, implementation categories, competences
- fracture toughness: linear fracture mechanics
- designing of welded constructions: internal stresses, welding distortion
- material testing: non-destructive testing, material and weld joint failures

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

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

**Recommendation**

courses Theory of Building Materials (6200206), Basics in Steel Structures (6200504)

**Literature**

lecture accompanying documents

DIN EN 1993-1-9: Bemessung und Konstruktion von Stahlbauten - Teil 1-9: Ermüdung

DIN EN 1993-1-10: Bemessung und Konstruktion von Stahlbauten - Teil 1-10: Stahlsortenauswahl im Hinblick auf Bruchzähigkeit und Eigenschaften in Dickenrichtung

DIN EN 1090: Ausführung von Stahltragwerken und Aluminiumtragwerken

**M****5.9 Module: Construction of Steel and Composite Bridges (bauIM1S07-STAHLBRÜ) [M-BGU-100040]**

**Responsible:** Prof. Dr.-Ing. Thomas Ummenhofer  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100024	<a href="#">Construction of Steel and Composite Bridges</a>	6 CR	Ummenhofer

**Competence Certificate**

- 'Teilleistung' T-BGU-100024 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can evaluate steel and steel composite bridges with respect to design, construction, production, conduct design calculations and design constructive details.

**Content**

- historical development
- design basics
- construction types for main beams
- bridge bearings
- assembly process
- design examples

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

**Recommendation**

course Basics in Steel Structures (6200504), module Steel and Composite Structures [bauIM1P2-STAHLBAU]

**Literature**

lecture accompanying documents

DIN EN 1993-1-1, Dezember 2010: Eurocode 3: Bemessung und Konstruktion von Stahlbauten - Teil 1-1: Allgemeine Bemessungsregeln und Regeln für den Hochbau: Beuth Verlag GmbH, Berlin.

DIN EN 1993-2 (Dezember 2010): Eurocode 3: Bemessung und Konstruktion von Stahlbauten - Teil 2: Stahlbrücken. Beuth Verlag GmbH, Berlin.

DIN EN 1994-1-1, Dezember 2010: Eurocode 4: Bemessung und Konstruktion von Verbundtragwerken aus Stahl und Beton - Teil 1-1: Allgemeine Bemessungsregeln und Anwendungsregeln für den Hochbau: Beuth Verlag GmbH, Berlin.

DIN EN 1994-2 (Dezember 2010): Eurocode 4: Bemessung und Konstruktion von Verbundtragwerken aus Stahl und Beton - Teil 2: Allgemeine Bemessungsregeln und Anwendungsregeln für Brücken. Beuth Verlag GmbH, Berlin.

Mehlhorn, Gerhard: Handbuch Brücken - Entwerfen, Konstruieren, Berechnen, Bauen und Erhalten. Springer-Verlag, Berlin. 2007

**M****5.10 Module: Hollow Section Structures (bauIM1S08-HOHLPROFIL) [M-BGU-100004]****Responsible:** Dr.-Ing. Stefan Herion**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)[Subject-Specific Supplements](#)[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100086	<a href="#">Hollow Section Structures</a>	6 CR	Herion

**Competence Certificate**

- 'Teilleistung' T-BGU-100086 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can design and construct predominantly static and non predominantly static stressed constructions made of hollow sections considering their connections.

**Content**

- appliance in steel- and bridge engineering
- joint constructions
- fatigue behavior
- calculation examples

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

**Recommendation**

course Basics in Steel Structures (6200504)

**Literature**

lecture notes: 'Hohlprofilkonstruktionen', Karlsruher Institut für Technologie (KIT), Versuchsanstalt für Stahl, Holz und Steine



**M****5.11 Module: Glass, Plastic and Cable Structures (bauIM1S09-GlaKunSe) [M-BGU-100041]**

**Responsible:** Dr.-Ing. Daniel Ruff  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100025	<a href="#">Glass, Plastic and Cable Structures</a>	6 CR	Ruff

**Competence Certificate**

- 'Teilleistung' T-BGU-100025 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can describe the historical evolution of glass materials, the material characteristics of currently used glass products in construction engineering as well as structural behavior of products of glass and glass-steel structures considering the specific properties of stainless steels. They are able to conduct proofs of load-carrying capacity according to current technical standards (e.g. DIN 18008).

The students can explain the manufacturing, characteristics, processing capacities and applications of plastics in construction engineering. In addition, the students can describe the principles of construction and design of adhesive bonds.

The students can describe the assembly, production and characteristics of high-strength tension members (steel cables, cords, tension bar members), the associated end-connections and their application in construction engineering. They are able to conduct simple proofs of structural safety for high-strength tension members according to Eurocode for predominantly statically stressed structures. In addition, they can explain the assembly of large structures with cables (stadium roofs, suspension bridges).

**Content**

- glass in civil engineering
- stainless steels, upgrading products
- construction details, design of glass structures
- plastics in civil engineering, adhesive bonds, construction details
- design of wires, cables, cords
- tension bar systems
- end-connections, buffles
- static structural behavior
- dynamic structural behavior
- design of structures with high-strength tension members
- construction details of high-strength tension members
- assembly of cable structures

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

**Recommendation**

course Basics in Steel Structures (6200504)

**Literature**

lecture accompanying documents

Siebert, G., Maniatis, I: Tragende Bauteile aus Glas: Grundlagen, Konstruktion, Bemessung, Beispiele. Verlag Ernst & Sohn, Berlin, 2012.

DIN 18008 Teil 1 bis Teil 6: Glas im Bauwesen. Beuth-Verlag, Berlin, 2010 bis 2015.

Domininghaus, H. et. al.: Kunststoffe: Eigenschaften und Anwendungen. Springer-Verlag, Berlin, 2012.

Hellerich, W.: Werkstoff-Führer Kunststoffe. Springer-Verlag, Berlin, 2010.

DIN EN 1993-1-11: 2010-12: Eurocode 3: Bemessung und Konstruktion von Stahlbauten – Teil 1-11: Bemessung und Konstruktion von Tragwerken mit Zuggliedern aus Stahl. Beuth-Verlag, Berlin.

Feyrer, K: Drahtseile: Bemessung, Betrieb, Sicherheit. Springer-Verlag, Berlin, 2001.

Seidel, M: Textile Hüllen - Bauen mit biegeweichen Tragelementen: Materialien, Konstruktion, Montage. Verlag Ernst & Sohn, Berlin, 2008.

**M****5.12 Module: Building Preservation of Steel and Timber Structures (bauM1S11-BAUING-BSH) [M-BGU-100043]**

**Responsible:** Dr.-Ing. Matthias Frese  
Prof. Dr.-Ing. Thomas Ummenhofer

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

**Part of:** Study Focus I / Structural Engineering (Compulsory Elective Modules)  
Subject-Specific Supplements  
Study Focus II / Structural Engineering (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	4

Mandatory			
T-BGU-110856	Building Preservation in Steel Structures	3 CR	Ummenhofer
T-BGU-110857	Building Preservation in Timber Structures	3 CR	Frese

**Competence Certificate**

- 'Teilleistung' T-BGU-110856 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-110857 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

The module must not be taken together with the modules Building Preservation and Innovations in Metal and Lightweight Structures [bauM1S46-BWE-INNO-MLB] as well as Building Preservation and Innovations in Timber Structures [bauM1S47-BWE-INNO-HB].

**Competence Goal**

The students can explain the procedure of investigation and evaluation of old building fabric. They can describe the characteristics of old steel and cast productions made of iron materials as well as the timber quality (in-situ strength grading of timber). They are able to name typical defects of steel and timber structures. They conduct realistic static computations of old constructions and determine the remaining lifetime. They can explain methods for repairing and strengthening of steel and timber structures on the base of concepts conserving cultural heritage and taking into consideration carpentry and engineered solutions.

**Content**

- historical overview
- properties of old steels, cast materials and old, built-in timber
- investigation of structures and building parts
- damage-mechanisms in steel and timber structures
- investigation of bearing capacity and remaining lifetime
- restoration and strengthening procedures

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Preservation of Steel Structures lecture: 30 h
- Preservation of Timber Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lectures Preservation of Steel Structures: 30 h
- examination preparation Preservation of Steel Structures (partial examination): 30 h
- preparation and follow-up lectures/exercises Preservation of Timber Structures: 30 h
- examination preparation Preservation of Timber Structures (partial examination): 30 h

total: 180 h

**Recommendation**

participation in module Timber Structures [bauM1S12-BAUING-HB]

**Literature**

lecture accompanying documents

**M****5.13 Module: Timber Structures (bauIM1S12-BAUING-HB) [M-BGU-100044]**

**Responsible:** Prof. Dr.-Ing. Philipp Dietsch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100028	<a href="#">Timber Structures</a>	6 CR	Dietsch

**Competence Certificate**

- 'Teilleistung' T-BGU-100028 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

After the successful completion of the module, the students are able to differentiate construction types, used in modern timber buildings, and to design wall, floor and roof elements used in timber frame construction. The students know the state-of-the-art in construction with plane timber elements including cross-laminated timber and timber-concrete composites. The students are able to design plane timber elements under special consideration of shear deformations, including gamma-method and shear analogy.

The students are able to design large-span timber structures under consideration of the special characteristics of timber as a construction material, i.e. taking into account the anisotropic behavior of wood and its reaction to moisture. The students are able to understand the particularities in the design of beams with special structural forms and to perform stability verifications under consideration of the stiffness of connections. They are able to design important details, connections and related reinforcement.

**Content**

Based on the contents taught on Bachelors level (e.g. Basics in Timber Structures), the students receive further insight into the design of elements used in modern timber construction. Within this, the first focus is given to plane elements made of cross-laminated timber and timber-concrete composites. The second focus is on the design of large-span timber structures.

The subjects covered can be defined as follows.

- timber houses: structural typologies and development
- wall and floor elements
- cross-laminated timber: Characteristics and design
- timber-concrete-composite structures
- timber products and structural elements in timber engineering
- connections and stiffness of connections
- glued connections
- reinforcement of connections
- stability and bracing systems
- notched beams and holes in beams
- structural fire design

All topics are accompanied by exercise sessions in which the essential design methods are applied.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

**Recommendation**

none

**Literature**

PowerPoint slides. Scriptum of exercise session. Notes of the students, taken during lectures, are necessary.

Scriptum to specific course contents

EN 1995-1-1 with DIN EN 1995-1-1/NA:2013-08

Secondary literature:

Blaß, H.-J., Sandhaas, C.; Timber Engineering; KIT Scientific Publishing; 2017

Wallner-Novak, M. et al.; Cross-laminated timber; Part 1: Structural design, Part 2: Applications; pro Holz; 2014 / 2018

**M****5.14 Module: Non-linear Analysis of Beam Structures (bauIM1S14-NILI-STAB) [M-BGU-100046]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100030	<a href="#">Non-linear Analysis of Beam Structures</a>	6 CR	Freitag

**Competence Certificate**

- 'Teilleistung' T-BGU-100030 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can formulate and apply the main essential principles of the nonlinear analysis of beam structures (ultimate load design, II. Order theory, extensions and error analysis) as the basis for design and construction. They are able to compare and combine different methods.

**Content**

- material nonlinearity: basics of ultimate load design, plastic hinge 1st order theory
- incremental and direct calculation of the ultimate load, limit value theorems
- geometrical nonlinearity: equilibrium of 2nd order theory
- displacement methods
- predeformation
- iteration procedures
- stability problems
- combination of geometrical and material nonlinearity

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

**Recommendation**

courses Structural Analysis I+II (6200401, 6200501)

**Literature**

lecture notes 'Nichtlineare Modellierung von Stabtragwerken'

**M****5.15 Module: Computational Analysis of Structures (bauiM1S15-CTWM) [M-BGU-100047]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100174	<a href="#">Student Research Project 'Computational Analysis of Structures'</a>	2 CR	Freitag
T-BGU-100031	<a href="#">Computational Analysis of Structures</a>	4 CR	Freitag

**Competence Certificate**

- 'Teilleistung' T-BGU-100174 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100031 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can formulate and apply the essential principles for the computational modeling of structures (FE models for beam and surface structures, modeling of practical problems, error analysis) as basis for design and construction.

**Content**

- numerical simulation of 2D/3D beams, surface structures
- modeling of 2D/3D beams, surface structures
- exactness and improvement of the solutions
- folded plates
- rotational shells
- adaptive mesh generation
- stationary heat conduction 2D/3D and further problems of building physics
- commercial software for design and construction

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 30 h
- preparation of student research project (exam prerequisite): 50 h
- examination preparation: 40 h

total: 180 h

**Recommendation**

module Surface Structures and Dynamics of Structures [bauiM1P3-FTW-BD]



**Literature**

lecture notes 'Computergestützte Tragwerksmodellierung'

Krätzig, W.B., Basar, Y. (1997): Tragwerke 3 - Theorie und Anwendung der Methode der Finiten Elemente, Springer.

Werkle, H. (2007): Finite Elemente in der Baustatik, Statik und Dynamik der Stab- und Flächentragwerke, Vieweg.

**M****5.16 Module: FE-Applications in Practical Engineering (bauIM1S16-FE-PRAXIS) [M-BGU-100048]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100032	<a href="#">FE-Applications in Practical Engineering</a>	6 CR	Freitag

**Competence Certificate**

- 'Teilleistung' T-BGU-100032 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can conduct and check computer aided modeling of structures by using commercial FE-codes (beams, surface structures) for practical civil engineering projects.

**Content**

- application of different commercial software for the modeling of beam- and surface structures
- structural analysis and design
- discussion of approximation behaviour of numerical methods at examples
- analytical comparative calculations
- software comparisons
- control options.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

**Recommendation**

module Computational Analysis of Structures [bauIM1S15-CTWM]

**Literature**

lecture notes Computational Analysis of Structures

**M****5.17 Module: Shell Structures and Stability of Structures (bauM1S17-STABISHELL) [M-BGU-100049]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100254	<a href="#">Student Research Project 'Shell Structures and Stability of Structures'</a>	2 CR	Freitag
T-BGU-100033	<a href="#">Shell Structures and Stability of Structures</a>	4 CR	Freitag

**Competence Certificate**

- 'Teilleistung' T-BGU-100254 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100033 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can formulate and apply analytical and computational modeling of shell structures and of stability problems.

**Content**

- shell structures in nature and technique
- membrane and bending theory of rotational shells
- analytical solutions for rotational shells
- force value method for rotational shells,
- FE-modeling of shell structures
- basics of stability theory for structures
- analytical solutions for stability endangered structures
- sensitivity and imperfections for beam and surface structures
- numerical models for path following
- bifurcation
- buckling of shells
- practical examples

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Shell Structures lecture, exercise: 30 h
- Stability of Structures lecture, exercise: 30 h

independent study:

- preparation and follow-up lectures, exercises Shell Structures: 15 h
- preparation and follow-up lectures, exercises Stability of Structures: 15 h
- preparation of student research project (exam prerequisite): 50 h
- examination preparation: 40 h

total: 180 h

**Recommendation**

course Surface Structures (6214701)

**Literature**

lecture notes Schalentragerwerke

lecture notes Stabilität der Tragwerke

**M****5.18 Module: Numerical Methods in Structural Analysis (bauIM1S18-FEM-BS) [M-BGU-100050]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100034	<a href="#">Numerical Methods in Structural Analysis</a>	6 CR	Freitag

**Competence Certificate**

- 'Teilleistung' T-BGU-100034 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students will can develop finite element programs for beam and surface structures on the basis of methods from structural analysis and can integrate the numerical methods.

**Content**

- development of a program for truss structures with VBA
- input and output of data
- element stiffness matrices, transformation, solving of equations
- calculation of stress resultants
- programming force density method for cable structures
- iterative procedures for designing
- visualization of results
- FEM for surface structures
- numerical integration for surface structures
- discussion of FEM with approximation with low order interpolation functions
- elimination of numerical stiffness effects using specific integration and interpolation techniques

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**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

**Recommendation**

module Computational Analysis of Structures [bauIM1S15-CTWM]

**Literature**

lecture notes Computational Analysis of Structures

**M****5.19 Module: Non-linear Analysis of Surface Structures (bauIM1S19-NILI-FTW) [M-BGU-100051]**

**Responsible:** Prof. Dr.-Ing. Werner Wagner  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100035	<a href="#">Non-linear Analysis of Surface Structures</a>	6 CR	Wagner

**Competence Certificate**

- 'Teilleistung' T-BGU-100035 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can classify and apply the essential principles of nonlinear analysis of surface structures. Hence, they are able to conduct even difficult static computations and use the required tools therefore methodically in an appropriate manner.

**Content**

- geometric nonlinear models of surface structures
- nonlinear material models for thin structures
- analytical and numerical surface structure analysis
- introduction to the modeling of shell structures
- application of stability and dynamic problems
- modeling of laminated structures
- practical examples

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**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

**Recommendation**

course Surface Structures (6214701), module Computational Analysis of Structures [bauIM1S15-CTWM]

**Literature**

lecture notes

**M****5.20 Module: Basics of Finite Elements (bauIM1S20-GRUNDFE) [M-BGU-100052]**

**Responsible:** Prof. Dr.-Ing. Peter Betsch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	4

Mandatory			
T-BGU-109908	<a href="#">Homework 'Basics of Finite Elements'</a>	1 CR	Betsch
T-BGU-100047	<a href="#">Basics of Finite Elements</a>	5 CR	Betsch

**Competence Certificate**

- 'Teilleistung' T-BGU-109908 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100027 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can describe the structure and the functionality of FE codes. They can formulate the basics of variational principles of FEM as well as the Lagrangian element family of different order of projection for one-dimensional, planar and spatial problems in the fields of linear strength of materials and heat transport. They know, that it is an approximate solution method for boundary value problems, and they are aware of its limits. They can get familiar quickly with commercial FE codes and can use them reasonably.

**Content**

The theoretical principles as well as the numerical implementation of Finite Element Methods are covered. The major terms are discussed such as weak form of the boundary value problem, test function, projection function, continuity requirements, domain discretization, Galerkin approximation, stiffness matrix, assembly, iso-parametric concept, numerical integration and accuracy of finite element approximation.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- processing exercises sheets: 30 h
- examination preparation: 45 h

total: 180 h

**Recommendation**

none

**Literature**

- [1] Cook, Malkus, Plesha: Concept and Applications of Finite Element Analysis, 1989.
- [2] Hughes: The Finite Element Method, 1987.
- [3] Zienkiewicz, Taylor: The Finite Element Method, Volume 1,2 & 3, 2000.
- [4] Bathe: Finite-Elemente-Methoden, 2001.

**M****5.21 Module: Fracture and Damage Mechanics (bauIM1S21-BRUCHMECH) [M-BGU-100053]**

**Responsible:** Prof. Dr.-Ing. Thomas Seelig  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100087	<a href="#">Fracture and Damage Mechanics</a>	6 CR	Seelig

**Competence Certificate**

- 'Teilleistung' T-BGU-100087 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students are able to apply the basic principles and methods of fracture and damage mechanics as used for the analysis of fissured structures and the description of complex material behavior. They can establish relationships between continuum mechanical descriptions and material specific aspects.

**Content**

- phenomenology and mechanisms of fracture
- linear elastic fracture mechanics (crack tip fields, K-concept, energy balance, J-integral, small scale yielding)
- elastic plastic fracture mechanics (Dugdale model, HRR-field, J-controlled crack growth)
- dynamic fracture mechanics (dynamic loading, fast running cracks)
- micromechanics of heterogeneous solids (defects and eigenstrain, RVE-concept, homogenization)
- damage mechanics (mechanisms of brittle and ductile damage, micromechanical and phenomenological models, softening and localization)

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**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

**Recommendation**

course Introduction to Continuum Mechanics (6200607)



**Literature**

- [1] Anderson, T.L.: Fracture Mechanics - Fundamentals and Application. CRC Press, 1995
- [2] Gdoutos, E.E.: Fracture Mechanics - An Introduction. Kluwer Acad. Publ., 1993
- [3] Gross, D., Seelig, Th: Bruchmechanik - mit einer Einführung in die Mikromechanik, Springer, 2016
- [4] Knott, J.F.: Fundamentals of Fracture Mechanics. Butterworth, 1973
- [5] Krajcinovic, D.: Damage Mechanics. Elsevier, 1996
- [6] Kuna, M.: Numerische Beanspruchungsanalyse von Rissen. Springer, 2008
- [7] Mura, T.: Micromechanics of Defects in Solids. Martinus Nijhoff Publishers, 1982
- [8] Nemat-Nasser, S., Hori, M.: Micromechanics - Overall Properties of Heterogeneous Materials. North-Holland, 1993
- [9] Zehnder, A.T.: Fracture Mechanics. Springer, 2012

**M****5.22 Module: Material Models in Solid Mechanics (bauIM1S22-MATTHEO) [M-BGU-100054]**

**Responsible:** Prof. Dr.-Ing. Thomas Seelig  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100044	<a href="#">Material Models in Solid Mechanics</a>	6 CR	Seelig

**Competence Certificate**

- 'Teilleistung' T-BGU-100044 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students know the phenomena of inelastic material behavior as well as the continuum mechanical methods for their theoretical description and they can explain them.

**Content**

- general purpose of material theories and constitutive laws
- elasticity (isotropic / anisotropic material models)
- phenomenology of inelastic material behavior (residual deformation, rate-dependence / creep, plastic incompressibility / dilatancy, pressure-dependence / independence, damage)
- concepts of constitutive modeling (internal variables, yield condition, flow rule, hardening laws, incremental constitutive equations)
- material theories: viscoelasticity, plasticity, viscoplasticity
- applications (metals, geomaterials, concrete, thermoplastic polymers, wood)

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**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

**Recommendation**

course Introduction to Continuum Mechanics (6200607)

**Literature**

- [1] Chen, W.F., Hahn, D.J.: Plasticity for Structural Engineers. Springer, 1988
- [2] de Souza Neto, E.A., Peric, D., Owen, D.R.J.: Computational Methods for Plasticity. Wiley, 2008
- [3] Doghri, I.: Mechanics of Deformable Solids. Springer, 2000
- [4] Khan, A.S., Huang, S.: Continuum Theory of Plasticity. Wiley, 1995
- [5] Lemaitre, J., Chaboche, J.L.: Mechanics of Solid Materials. Cambridge University Press, 1990
- [6] Lubliner, J.: Plasticity Theory. Macmillan, 1990; Dover, 2008
- [7] Seelig, Th.: Anwendungsorientierte Materialtheorien. Lecture notes

**M****5.23 Module: Concrete Construction Technology (bauIM1S24-BETONTECH) [M-BGU-100056]**

**Responsible:** Prof. Dr.-Ing. Frank Dehn  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100036	<a href="#">Concrete Construction Technology</a>	6 CR	Dehn

**Competence Certificate**

- 'Teilleistung' T-BGU-100036 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Concrete Technology lecture/exercise: 45 h
- Deformation and Fracture Processes lecture: 15 h

independent study:

- preparation and follow-up lecture/exercises Concrete Technology: 45 h
- preparation and follow-up lectures Deformation and Fracture Processes: 15 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**M****5.24 Module: Durability and Service Life Design (bauIM1S25-DAUERLEB) [M-BGU-100057]****Responsible:** Dr.-Ing. Michael Vogel**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)[Subject-Specific Supplements](#)[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100037	<a href="#">Durability and Service Life Design</a>	6 CR	Vogel

**Competence Certificate**

- 'Teilleistung' T-BGU-100037 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Corrosion Processes and Life Time lecture/exercise: 45 h
- Analytic Methods lecture: 15 h

independent study:

- preparation and follow-up lecture/exercises Corrosion Processes and Life Time: 45 h
- preparation and follow-up lectures Analytic Methods: 15 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

course Building Chemistry (6200108)

**M****5.25 Module: Building Preservation of Concrete and Masonry Constructions (bauIM1S26-BBM) [M-BGU-100058]****Responsible:** Dr.-Ing. Engin Kotan**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)[Subject-Specific Supplements](#)[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)**Credits**  
6**Grading scale**  
Grade to a tenth**Recurrence**  
Each summer term**Duration**  
1 term**Language**  
German**Level**  
4**Version**  
2

Mandatory			
T-BGU-100175	<a href="#">Student Research Project 'Building Preservation of Concrete and Masonry Constructions'</a>	1 CR	Kotan
T-BGU-100038	<a href="#">Building Preservation of Concrete and Masonry Constructions</a>	5 CR	Kotan

**Competence Certificate**

- 'Teilleistung' T-BGU-100175 with not graded accomplishment according to § 4 Par. 3

- 'Teilleistung' T-BGU-100038 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

After successful completion of the module the students have detailed knowledge about the relevant causes and processes of degradation in concrete and masonry constructions. Thus they are able to take appropriate measures to enhance the durability of solid buildings and to plan and execute effective measures to repair damaged concrete and masonry constructions. Moreover the students have also the knowledge about the main aspects and basic techniques of building reinforcement.

**Content**

This course provides fundamental knowledge of the possibilities to preserve concrete and masonry constructions. Besides an introduction into the characteristics of masonry, plaster, concrete and reinforced concrete structures, various damage patterns and their origins are discussed. Based on the knowledge of the essential damage processes, efficient measures for the increase of the durability are described, which include material and constructional precautions as well as additional preventive measures. Furthermore the course focuses on the repair of already damaged concrete and masonry constructions. In this connection different research methods for the analysis of damages are presented and various possibilities are shown to predict the time-development of these damages. Finally repair materials as well as procedures are described which are necessary for the realization of a durable repair measure. A further main part of the course covers the different possibilities of an additional reinforcement of concrete and masonry constructions. Applicable materials and their characteristics in design and construction are introduced and discussed. In the accompanying exercises the subject matter shall independently be developed and the practical realization will be practised by means of several design problems.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions lecture, exercise: 45 h
- Building Analysis lecture: 15 h

independent study:

- preparation and follow-up lectures, exercises Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions: 25 h
- preparation and follow-up lectures Building Analysis: 15 h
- preparation of student research project "Building Preservation of Concrete and Masonry Constructions": 40 h
- examination preparation: 40 h

total: 180 h

**Recommendation**

none

**Literature**

Hand-outs and (selection):

- [1] Blaich, J.: Bauschäden - Analyse und Vermeidung; EMPA; Stuttgart, 1999
- [2] Pfefferkorn, W.: Rißschäden an Mauerwerk, Ursachen erkennen - Rißschäden vermeiden; Stuttgart, IRB Verlag, 1994
- [3] Reichert, H.: Konstruktiver Mauerwerksbau, Bildkommentar zur DIN 1053-1, Rudolf Müller Verlag, Köln, 1999
- [4] Ruffert, G.: Ausbessern und Verstärken von Betonbauteilen; 2. Aufl.; Beton Verlag, 1982
- [5] SIVV - Handbuch: Schützen, Instandsetzen, Verbinden und Verstärken von Betonbauteilen; Verarbeiten von Kunststoffen im Betonbau beim Deutschen Beton- und Bautechnik-Verein E.V.; IRB Verlag, Stuttgart, 2008
- [6] Stark, J.; Wicht, B.: Dauerhaftigkeit von Beton - Der Baustoff als Werkstoff, Hrsg.: Bauhaus-Univ. Weimar, F.A. Finger-Institut für Baustoffkunde -FIB-; 2001
- [7] Tausky, R.: Betontragwerke mit Außenbewehrung; Birkhäuser Verlag, Basel, 1993

**M****5.26 Module: Building Physics I (bauiM1S27-BAUPH-I) [M-BGU-103950]****Responsible:** Dr.-Ing. Engin Kotan**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

**Credits**  
 6

**Grading scale**  
 Grade to a tenth

**Recurrence**  
 Each winter term

**Duration**  
 1 term

**Language**  
 German

**Level**  
 4

**Version**  
 1

Mandatory			
T-BGU-100039	<a href="#">Applied Building Physics</a>	3 CR	Kotan
T-BGU-100040	<a href="#">Building Technology</a>	3 CR	Wirth

**Competence Certificate**

- 'Teilleistung' T-BGU-100039 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-100040 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Applied Building Physics lecture: 30 h
- Building Technology lecture: 30 h

independent study:

- preparation and follow-up lectures Applied Building Physics: 30 h
- examination preparation Applied Building Physics (partial exam): 30 h
- preparation and follow-up lectures Building Technology: 30 h
- examination preparation Building Technology (partial exam): 30 h

total: 180 h

**Recommendation**

none



**M****5.27 Module: Building Physics II (bauIM1S28-BAUPH-II) [M-BGU-100060]****Responsible:** Dr.-Ing. Engin Kotan**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Structural Engineering (Compulsory Elective Modules)  
Subject-Specific Supplements  
Study Focus II / Structural Engineering (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	4

Mandatory			
T-BGU-108024	Practical Noise Control	3 CR	Zander
T-BGU-100042	Practical Fire Protection	3 CR	Schröder

**Competence Certificate**

- 'Teilleistung' T-BGU-108024 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-100042 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Practical Noise Control lecture: 30 h
- Practical Fire Protection lecture: 30 h

independent study:

- preparation and follow-up lectures Practical Noise Control: 30 h
- examination preparation Practical Noise Control (partial exam): 30 h
- preparation and follow-up lectures Practical Fire Protection: 30 h
- examination preparation Practical Fire Protection (partial exam): 30 h

total: 180 h

**Recommendation**

none

**M****5.28 Module: Materials Testing and Measuring Techniques (bauIM1S29-MATPRÜF) [M-BGU-100061]**

**Responsible:** Dr.-Ing. Nico Herrmann  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100043	<a href="#">Materials Testing and Measuring Techniques</a>	6 CR	Herrmann

**Competence Certificate**

- 'Teilleistung' T-BGU-100043 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can explain the basic knowledge of materials testing in the field of construction materials and concrete structures connected with the application in engineering constructions (e.g. bridges, power plants, etc.). They can name the basics of measuring techniques and are able to record the relevant measuring parameters for high-level material testing. The students develop self-reliantly a measurement concept, which they apply and evaluate.

**Content**

- introduction to different measurement techniques and their principles
- material testing of construction materials and elements
- basics in testing techniques and concepts
- examples from current research projects

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

The number of participants in the courses is limited to 12 persons. In case of selection of participants participation will be preferentially provided to students further advanced in their studies.

**Workload**

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

- Measuring Techniques in Civil Engineering lecture, exercise: 30 h
- Materials Testing in the Field of Concrete lecture: 30 h

independent study:

- preparation and follow-up lectures, exercises Measuring Techniques in Civil Engineering: 30 h
- preparation and follow-up lectures Materials Testing in the Field of Concrete: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**M****5.29 Module: Continuum Mechanics of Heterogeneous Solids (bauIM1S32-KONTIMECH) [M-BGU-100064]**

**Responsible:** Prof. Dr.-Ing. Thomas Seelig  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	2 terms	German	4	2

Mandatory			
T-BGU-106196	<a href="#">Continuum Mechanics</a>	3 CR	Franke
T-BGU-108879	<a href="#">Micromechanics of Heterogeneous Solids</a>	3 CR	Schmidt

**Competence Certificate**

- 'Teilleistung' T-BGU-106196 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-108879 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

This module must not be selected together with the module Basics of Numeric Modeling [bauIM5P4-NUMGRUND].

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The module [M-BGU-100070 - Basics of Numeric Modeling](#) must not have been started.

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Continuum Mechanics lecture: 30 h
- Mechanics of Heterogeneous Solids lecture: 30 h

independent study:

- preparation and follow-up lectures Continuum Mechanics: 30 h
- preparation and follow-up lectures Mechanics of Heterogeneous Solids: 30 h
- examination preparation Continuum Mechanics: 30 h
- examination preparation Mechanics of Heterogeneous Solids: 30 h

total: 180 h

**Recommendation**

none

**Literature**

- Seelig, T.: Kontinuumsmechanik. Skript zur Vorlesung  
Bonet, J., Wood, R.D.: Nonlinear continuum mechanics for finite element analysis. Cambridge, 1997  
Doghri, I.: Mechanics of Deformable Solids. Springer, 2000  
Fung, Y.C.: Foundations of Solid Mechanics. Prentice Hall, 1965  
Malvern, L.: Introduction to the Mechanics of a Continuous Medium. Prentice Hall, 1969  
Parisch, H.: Festkörper-Kontinuumsmechanik. Teubner, 2003  
Literatur Mechanik heterogener Festkörper:  
Aboudi, J.: Mechanics of Composite Materials - A Unified Micromechanical Approach, Elsevier, 1991  
Christensen, R.M.: Mechanics of Composite Materials, Wiley, 1979  
Mura, T.: Micromechanics of Defects in Solids, Martinus Nijhoff Publishers, 1982  
Nemat-Nasser, S., Hori, M.: Micromechanics - Overall Properties of Heterogeneous Materials, North-Holland, 1993  
Gross, D., Seelig, Th.: Bruchmechanik - Mit einer Einführung in die Mikromechanik, Springer, 2011

**M****5.30 Module: Finite Elements in Solid Mechanics (bauIM1S37-FEFKM) [M-BGU-100578]**

**Responsible:** Prof. Dr.-Ing. Peter Betsch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100998	<a href="#">Finite Elements in Solid Mechanics</a>	6 CR	Betsch

**Competence Certificate**

- 'Teilleistung' T-BGU-100998 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lectures, exercises: 60 h

independent study:

- preparation and follow-up: 45 h
- working on programming exercises: 30 h
- examination preparation and examination: 45 h

total: 180 h

**Recommendation**

module 'Basics in Finite Elements' [bauIM1S20-GRUNDFE]

**M****5.31 Module: Numerical Structural Dynamics (bauIM1S38-NUMSTRDYN) [M-BGU-100579]**

**Responsible:** Prof. Dr.-Ing. Peter Betsch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100999	<a href="#">Computational Structural Dynamics</a>	6 CR	Betsch

**Competence Certificate**

- 'Teilleistung' T-BGU-100999 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lectures, exercises: 60 h

independent study:

- preparation and follow-up: 45 h
- working on programming exercises: 30 h
- examination preparation and examination: 45 h

total: 180 h

**Recommendation**

module Basics in Finite Elements [bauIM1S20-GRUNDFE]

**M****5.32 Module: Tank Construction (bauIM1S39-BEHBAU) [M-BGU-100580]****Responsible:** Dr. Peter Knödel**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Structural Engineering (Compulsory Elective Modules)  
Subject-Specific Supplements  
Study Focus II / Structural Engineering (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-BGU-101001	Term Paper Tank Construction	3 CR	Knödel
T-BGU-101000	Tank Construction	3 CR	Knödel

**Competence Certificate**

- 'Teilleistung' T-BGU-101001 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-101000 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can design and construct tank and silo structures and they can assess the influences on the structural behavior of shell structures:

- They can apply scientific methods for the system analysis of tanks.
- They can develop problem solutions beyond the application of the regulations for tank constructions.
- They have the ability to work interdisciplinarily at the interface to plant engineering and construction.
- They can compile complex technical facts and impart them to a plenary assembly.

**Content**

- classification of tank and silo types
- application related material selection
- actions on storage structures: characteristics of wind loads (e.g. flow around cylinders), filling, internal pressure, earthquakes and explosions
- structural behavior of shell structure
- strength and stability check by linear and non-linear calculations under comparison of handouts with FE models
- design and construction
- specific problems

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- lecture, exercise: 45 h
- discussion on term paper: 15 h

independent study:

- preparation and follow-up lectures, exercises: 20 h
- preparation of term paper (partial exam): 80 h
- examination preparation (partial exam): 20 h

total: 180 h

**Recommendation**

The contents of the lecture Basics in Steel Structures (6200504) are required. Contents of the modules Surface Structures and Dynamics of Structures [bauIM1P3-FTW-BD] as well as Steel and Composite Structures [bauIM1P2-STABISTB] are recommended.

**Literature**

lecture notes

DIN EN 1993-1-6: Bemessung und Konstruktion von Stahlbauten - Teil 1-6: Festigkeit und Stabilität von Schalen.

DIN EN 1993-4-1: Bemessung und Konstruktion von Stahlbauten - Teil 4-1: Silos.

DIN EN 1993-4-2: Bemessung und Konstruktion von Stahlbauten - Teil 4-2: Tankbauwerke.

Knödel, P.; Heß, A.; Ummenhofer, T.: Stählerne Tankbauwerke nach DIN EN 1993-4-2. In: Stahlbau-Kalender 2013, S. 523-563.

Radlbeck, C.; Knödel, P.; et al.: Bemessung und Konstruktion von Aluminiumtragwerken. In: Stahlbau Kalender 2016, S. 175-309.

Knödel, P.; Ummenhofer, T.; Ruckebrod, C.: Silos und Tanks. In: Stahlbau Kalender 2017, S. 595-692.

Knödel, P.; Ummenhofer, T.: Regeln für die Berechnung von Behältern mit der FEM. Stahlbau 86 (2017), S. 325-339.



**M****5.33 Module: Modeling in Solid Mechanics (bauIM1S40-MODFEST) [M-BGU-101673]**

**Responsible:** Prof. Dr.-Ing. Peter Betsch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-103223	<a href="#">Modeling Techniques in Solid Mechanics</a>	6 CR	Konyukhov

**Competence Certificate**

- 'Teilleistung' T-BGU-103223 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can explain and classify various numerical analysis of engineering structures based on geometrical models of different dimensionality bars, beams, shells and solids. They know the derivation of finite element models from the geometrical point of view together with corresponding hypothesis of deformation. They know, that this procedure is a model reduction and a continuous transformation from 3D continuum to the shell, beams and bar models. They can assign and use different computational methods and the corresponding set of finite elements for practical engineering problems.

**Content**

One- and multidimensional bodies are presented by differential geometry: provision of line and surface descriptions on the one hand and of selected curvilinear coordinate system for the description of three-dimensional solid bodies on the other hand. The kinematics of deformation is imparted in all cases with the associated forces on the one hand and the appropriate Dirichlet and Neumann boundary conditions on the other hand.

Available computational methods are explained: static methods with a-posteriori error estimation and mesh refinement; eigen value analyses and modal methods as well as their applications, e.g. with respect to stability problems; dynamic computations in implicit and explicit formulations; harmonic methods with application of resonance phenomena.

All models are illustrated with FEM software, including practical programming in ANSYS APDL.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

**Recommendation**

course Introduction to Continuum Mechanics (6200607); module Basics of Finite Elements [bauIM1S20-GRUNDFE]

**Literature**

1. P. Wriggers, Nichtlineare Finite-Element-Methoden, Springer, 508 p., 2008.
2. P. Wriggers, Nonlinear Finite Element Methods, Springer, 560 p., 2008.
3. O. C. Zienkiewicz, R. L. Taylor, J. Z. Zhu, The Finite Element Method. Its Basis and Fundamentals, ITS Basis and Fundamentals, Elsevier Ltd, Oxford; Auflage: 6th ed. 752 p., 2005.
4. Thomas J. R. Hughes, The Finite Element Method: Linear Static and Dynamic Finite Element Analysis, Dover Civil and Mechanical Engineering publication, 672 p., 2000.
5. T. Belytschko, W.K. Liu, B. Moran, Nonlinear Finite Elements for Continua and Structures, Wiley, 300 p., 2000.
6. <http://www.ansys.com/Support/Documentation7>. <http://www.lstc.com/download/manuals>

**M****5.34 Module: Contact Mechanics (bauIM1S41-KONTMECH) [M-BGU-104916]****Responsible:** Dr.-Ing. Marlon Franke**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2019)[Subject-Specific Supplements](#) (Usage from 4/1/2019)[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2019)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-109947	<a href="#">Contact Mechanics</a>	6 CR	Franke

**Competence Certificate**

- 'Teilleistung' T-BGU-109947 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students gain the ability to name the basics for the numerical simulation of contact problems. They can transfer these capabilities to the discussion of deformable bodies in contact. The students can describe the handling of general interface problems, non-smooth dynamics and inequality constraints. The students are able to apply formulations of interfaces based on collocation methods and recent integral formulations.

**Content**

The continuum mechanical description of deformable bodies (continua) with second-order condition is imparted. The formulation of contact conditions and friction laws is discussed. Further, methods for claiming of constraints is discussed. The contact contribution is emphasised particularly by the subsequent numerical implementation.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 45 h
- examination preparation: 75 h

total: 180 h

**Recommendation**

course Introduction to Continuum Mechanics (6200607), module Basics of Finite Elements [bauIM1S20-GRUNDFE]

**Literature**

[1] Laursen: Computational Contact and Impact Mechanics

[2] Wriggers: Computational Contact Mechanics

**M****5.35 Module: Digital Planning and Building Information Modeling (bauIM1S42-DIGIPLAN) [M-BGU-105135]****Responsible:** Tim Zinke**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 10/1/2019)  
[Subject-Specific Supplements](#) (Usage from 10/1/2019)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 10/1/2019)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-110382	<a href="#">Digital Planning and Building Information Modeling</a>	6 CR	Zinke

**Competence Certificate**

- 'Teilleistung' T-BGU-110382 with examination of other type according to § 4 Par. 2 No. 3  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

further information see German version

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures/exercises, tutorials: 40 h
- project work, modeling, preparation of BIM flat pattern plan and report with presentation: 80 h

total: 180 h

**Recommendation**

course Computer Aided Design (CAD) (6200520)

course Steel and Composite Structures (6212801 und 6212802)

**Literature**

- [1] Borrmann, A.; König, M.; Koch, C.; Beetz, J. (Hrsg.) (2015): Building Information Modeling – Technologische Grundlagen und industrielle Praxis. Wiesbaden: Springer Vieweg (VDI-Buch).  
 [2] Baldwin, M. (2018): Der BIM-Manager – Praktische Anleitung für das BIM-Projektmanagement. Berlin, Wien, Zürich: Beuth.  
 [3] Hausknecht, Kerstin; Liebich, Thomas (2017): BIM-Kompandium: Building Information Modeling als neue Planungsmethode. Stuttgart: Fraunhofer IRB.

**M****5.36 Module: Design and Construction in Metal and Lightweight Structures (bauIM1S43-ENTW-MLB) [M-BGU-105370]****Responsible:** Prof. Dr.-Ing. Thomas Ummenhofer**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)[Subject-Specific Supplements](#) (Usage from 4/1/2020)[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-110852	<a href="#">Design and Construction in Metal and Lightweight Structures</a>	6 CR	Ummenhofer

**Competence Certificate**

- 'Teilleistung' T-BGU-110852 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

**Prerequisites**

The module must not be taken together with the former module Structures in Steel and Timber [bauIM1S10-BAUING-TSH].

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

Module will be offered newly as from winter term 2020/21.

**Workload**

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

- lecture/exercise: 15 h
- feedback meetings: 10 h

independent study:

- working on design problems and structural details: 75 h
- preparation of report and final presentation: 75 h

total: 180 h

**Recommendation**

course Basics in Steel Structures;  
 module Steel and Composite Structures

**M****5.37 Module: Timber Structures: Materials and Appropriate Design (bauIM1S44-BST-HB) [M-BGU-105371]**

**Responsible:** Dr.-Ing. Matthias Frese  
Dr. Carmen Sandhaas

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

**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)  
[Subject-Specific Supplements](#) (Usage from 4/1/2020)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-110853	<a href="#">Timber Structures: Materials and Appropriate Design</a>	6 CR	Frese, Sandhaas

**Competence Certificate**

- 'Teilleistung' T-BGU-110853 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

The module must not be taken together with the present modules Timber and Wood-Based Materials [bauIM1S13-BAUING-HHW] as well as Structures in Steel and Timber [bauIM1S10-BAUING-TSH].

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

Module will be offered newly as from winter term 2020/21.

**Workload**

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

- Building Materials of Timber Structures lecture/exercise: 30 h
- Material Adapted Constructions of Timber Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lectures/exercises Building Materials of Timber Structures: 30 h
- preparation and follow-up lectures/exercises Material Adapted Constructions of Timber Structures: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

participation in module Timber Structures [bauIM1S12-BAUING-HB]

**Literature**

lecture accompanying documents as well as lecture notes 'Timber and Wood-Based Materials' and 'Structures in Timber'

**M****5.38 Module: Innovations and Developments in Steel and Timber Structures (bauIM1S45-INNO-MHB) [M-BGU-105372]**

**Responsible:** Dr.-Ing. Matthias Albiez  
Prof. Dr.-Ing. Philipp Dietsch

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

**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)  
[Subject-Specific Supplements](#) (Usage from 4/1/2020)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-110854	<a href="#">Innovations and Developments in Metal and Lightweight Structures</a>	3 CR	Albiez
T-BGU-110855	<a href="#">Innovations and Developments in Timber Structures</a>	3 CR	Dietsch

**Competence Certificate**

- 'Teilleistung' T-BGU-110854 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-110855 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

The module must not be taken together with the modules Building Preservation and Innovations in Metal and Lightweight Structures [bauIM1S46-BWE-INNO-MLB] as well as Building Preservation and Innovations in Timber Structures [bauIM1S47-BWE-INNO-HB].

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

Module will be offered newly as from winter term 2020/21.

**Workload**

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

- Innovation and Development in Metal and Lightweight Structures lecture/exercise: 30 h
- Innovation and Development in Timber Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lectures/exercises Innovation and Development in Metal and Lightweight Structures: 30 h
- examination preparation Innovation and Development in Metal and Lightweight Structures (partial examination): 30 h
- preparation and follow-up lectures/exercises Innovation and Development in Timber Structures: 30 h
- examination preparation Innovation and Development in Timber Structures (partial examination): 30 h

total: 180 h

**Recommendation**

participation in module Timber Structures [bauIM1S12-BAUING-HB]

**Literature**

lecture accompanying documents

**M****5.39 Module: Building Preservation and Innovations in Metal and Lightweight Structures (bauIM1S46-BWE-INNO-MLB) [M-BGU-105373]****Responsible:** Prof. Dr.-Ing. Thomas Ummenhofer**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)[Subject-Specific Supplements](#) (Usage from 4/1/2020)[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-110856	<a href="#">Building Preservation in Steel Structures</a>	3 CR	Ummenhofer
T-BGU-110854	<a href="#">Innovations and Developments in Metal and Lightweight Structures</a>	3 CR	Albiez

**Competence Certificate**

- 'Teilleistung' T-BGU-110856 with written examination according to § 4 Par. 2 No. 1

- 'Teilleistung' T-BGU-110854 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

The module must not be taken together with the modules Building Preservation of Steel and Timber Structures [bauIM1S11-BAUING-BSH] as well as Innovations and Developments in Steel and Timber Structures [bauIM1S45-INNO-MHB].

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

Module will be offered newly as from winter term 2020/21.

**Workload**

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

- Building Preservation of Steel Structures lecture: 30 h
- Innovation and Development in Timber Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lectures Building Preservation of Steel Structures: 30 h
- examination preparation Building Preservation of Steel Structures (partial examination): 30 h
- preparation and follow-up lectures/exercises Innovation and Development in Metal and Lightweight Structures: 30 h
- examination preparation Innovation and Development in Metal and Lightweight Structures (partial examination): 30 h

total: 180 h

**Recommendation**

none

**Literature**

lecture accompanying documents



**M****5.40 Module: Building Preservation and Innovations in Timber Structures (bauIM1S47-BWE-INNO-HB) [M-BGU-105374]**

**Responsible:** Prof. Dr.-Ing. Philipp Dietsch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)  
[Subject-Specific Supplements](#) (Usage from 4/1/2020)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-110857	<a href="#">Building Preservation in Timber Structures</a>	3 CR	Frese
T-BGU-110855	<a href="#">Innovations and Developments in Timber Structures</a>	3 CR	Dietsch

**Competence Certificate**

- 'Teilleistung' T-BGU-110857 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-110855 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

The module must not be taken together with the modules Building Preservation of Steel and Timber Structures [bauIM1S11-BAUING-BSH] as well as Innovations and Developments in Steel and Timber Structures [bauIM1S45-INNO-MHB].

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

Module will be offered newly as from winter term 2020/21.

**Workload**

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

- Building Preservation of Timber Structures lecture/exercise: 30 h
- Innovation and Development in Timber Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lectures Building Preservation of Timber Structures: 30 h
- examination preparation Building Preservation of Timber Structures (partial examination): 30 h
- preparation and follow-up lectures/exercises Innovation and Development in Timber Structures: 30 h
- examination preparation Innovation and Development in Timber Structures (partial examination): 30 h

total: 180 h

**Recommendation**

participation in module Timber Structures [bauIM1S12-BAUING-HB]

**Literature**

lecture accompanying documents

**M****5.41 Module: Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis (bauiM1S48-KNN) [M-BGU-105929]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)  
[Subject-Specific Supplements](#) (Usage from 4/1/2022)  
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-111932	<a href="#">Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis</a>	6 CR	Freitag

**Competence Certificate**

- 'Teilleistung' T-BGU-111932 with oral examination according to § 4 Par. 2 No. 2

**Prerequisites**

none

**Competence Goal**

The students achieve competences in structural analysis with uncertain data. They are trained to consider uncertain information for the modeling and the computation of structures. Additionally, the students get competences in the handling of artificial neural networks and optimization approaches in structural mechanics.

**Content**

Uncertainty models are presented for the quantification of uncertain data and the consideration of uncertain model assumptions. The computation with uncertain numbers is introduced by analytical approaches. But the focus is on numerical approaches, which can be applied to structural analyses, e.g., based on the finite element method. To reduce the computation time and the required computational resource, numerically efficient surrogate models are presented. Especially, artificial neural network models are discussed, which are also applied to the optimization of structures. The module consists of the following courses:

- Structural Analysis with Uncertain Data
- Artificial Neural Networks in Structural Analysis
- Structural Optimization

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

offered newly as from summer term 2022

**Workload**

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

- Structural Analysis with Uncertain Data, lecture: 30 Std.
- Artificial Neural Networks in Structural Analysis, lecture: 15 Std.
- Structural Optimization, lecture: 15 Std.

independent study:

- preparation and follow-up lectures Structural Analysis with Uncertain Data: 30 h
- preparation and follow-up lectures Artificial Neural Networks in Structural Analysis: 15 h
- preparation and follow-up lectures Structural Optimization: 15 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**M****5.42 Module: Urban Water Infrastructure and Management (bauIM2P10-URBIM) [M-BGU-103358]**

**Responsible:** PD Dr.-Ing. Stephan Fuchs  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** Study Focus I / Water and Environment (Compulsory Modules)  
 Study Focus I / Water and Environment (Compulsory Elective Modules)  
 Subject-Specific Supplements  
 Study Focus II / Water and Environment (Compulsory Modules)  
 Study Focus II / Water and Environment (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	English	4	2

Mandatory			
T-BGU-106600	Urban Water Infrastructure and Management	6 CR	Fuchs

**Competence Certificate**

- 'Teilleistung' T-BGU-106600 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students analyze and evaluate basic methods of urban water management. They recognize the interactions between natural and technical systems. They acquire knowledge necessary to identify process engineering solutions and to implement them into functional systems (infrastructure elements). Students are able to describe urban water management issues in the context of watersheds and to take appropriate and environmentally-sound decisions in terms of energy efficiency and costs.

**Content**

This module provides a deep understanding of basic principles needed for the design, analysis and evaluation of urban water systems. The concept of system analysis is introduced to develop models that consider the most important biological, chemical and physical processes and are used to solve water management problems. Based on a detailed consideration of individual elements (subsystems), an overall picture of the water management system Urban Settlement and its interaction with surface and groundwater bodies can be gained. For this purpose, theoretical tools are developed and modeling approaches are reviewed. Students consider the factors energy and costs in the analysis and assessment of water management systems.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

keine

**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: 90 h

**Recommendation**

course Sanitary Environmental Engineering (6200603)

**Literature**

Metcalf and Eddy (2003) Wastewater Engineering – Treatment and Reuse, McGraw-Hill, New York  
 Imhoff, K. u. K.R. (1999) Taschenbuch der Stadtentwässerung, 29. Aufl., Oldenbourg Verlag, München, Wien

**M****5.43 Module: Numerical Fluid Mechanics (bauIM2P5-NUMFLMECH) [M-BGU-103375]**

**Responsible:** Prof. Dr.-Ing. Markus Uhlmann  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Water and Environment \(Compulsory Modules\)](#)  
[Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Water and Environment \(Compulsory Modules\)](#)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	English	4	1

Mandatory			
T-BGU-106758	<a href="#">Numerical Fluid Mechanics</a>	6 CR	Uhlmann

**Competence Certificate**

- 'Teilleistung' T-BGU-106758 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students are enabled to describe the fundamental approaches of numerical solution of flow problems. They are capable of evaluating the advantages and disadvantages of these approaches in the various areas of application, enabling them to make an appropriate choice. Participants are able to apply the numerical methods to simple flow problems; this involves the generation and application of basic computer programs. They are able to analyze the results with respect to precision, stability and efficiency.

**Content**

This module constitutes a general introduction to the numerical solution of flow-related problems. The mathematical properties of the conservation equations are analyzed. The principles of numerical discretization are studied with the aid of the finite-difference and the finite-volume method. The concept of numerical stability is introduced, and various techniques of error analysis are presented theoretically and by way of examples

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**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

**Recommendation**

modules Hydromechanics [bauIBGP04-HYDRO] (understanding of physical processes of advection and diffusion, handling of Navier-Stokes equations) and Advanced Mathematics [bauIBGP05-HM1, bauIBGP06-HM2, bauIBGP08-HM3, bauIBFW1-PDGL] (analysis - partial differential equations, Fourier analysis, series expansion, complex numbers; linear algebra - matrices, determinants, eigenvalue analysis, numerics - discrete number representation, round-off, floating point operations, numerical treatment of partial differential equations)

**M****5.44 Module: Hydraulic Engineering (bauIM2P6-ADVHYENG) [M-BGU-103376]**

**Responsible:** Prof. Dr. Mario Jorge Rodrigues Pereira da Franca  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** Study Focus I / Water and Environment (Compulsory Modules)  
 Study Focus I / Water and Environment (Compulsory Elective Modules)  
 Subject-Specific Supplements  
 Study Focus II / Water and Environment (Compulsory Modules)  
 Study Focus II / Water and Environment (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	English	4	2

Mandatory			
T-BGU-111928	Design Exercise River Engineering	1 CR	Rodrigues Pereira da Franca
T-BGU-111929	Design Exercise Hydraulic Structures	1 CR	Rodrigues Pereira da Franca
T-BGU-106759	Hydraulic Engineering	4 CR	Rodrigues Pereira da Franca

**Competence Certificate**

- 'Teilleistung' T-BGU-111928 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-111929 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-106759 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students will be able to describe and analyse basic processes linked to the hydraulics of rivers and hydraulic structures. They are able to carry the design of engineering works in rivers and the dimensioning of hydraulic structures with suitable approaches.

Based on the acquired process knowledge, they are able to analyse the results of the design in a critical manner.

Students are able to use and link their knowledge logically. They can work in a reflexive and self-critical manner.

**Content**

The module provides students with theoretical and practical knowledge of hydraulics applied to problem solving in the context of river engineering and for the design of hydraulic structures.

The course *River Engineering* contains the following topics:

- overview of catchment and river network basic processes and in the context of human usage and safety considering at the same time preservation of natural processes;
- sediment management; calculation and design of river engineering works such channels, riverbank protection, levees, groynes, detention basins; river restoration works.

In the course *Design of Hydraulics Structures* the following topics will be discussed in depth:

- overview: Hydraulic structures and water management and their integration in the river system
- design procedure, engineer standards and state of the art in hydraulic structures

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

As from summer term 2022 two 'Design Exercises' are examination prerequisites.

**Workload**

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

- River Engineering lecture/exercise: 30 h
- Design of Hydraulic Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises River Engineering: 15 h
- working on the 'Design Exercise River Engineering' (examination prerequisite): 25 h
- preparation and follow-up lecture/exercises Design of Hydraulic Structures: 15 h
- working on the 'Design Exercise Hydraulic Structures' (examination prerequisite): 25 h
- examination preparation: 40 h

total: 180 h

**Recommendation**

none

**Literature**

Dey, Subhasish. Fluvial hydrodynamics. Berlin: Springer, 2014.

Hager, Willi H., et al. Hydraulic engineering of dams. CRC Press, 2020.

United States. Bureau of Reclamation. Design of small dams. US Department of the Interior, Bureau of Reclamation, 1987.

**M****5.45 Module: Water and Energy Cycles (bauIM2P8-WATENCYC) [M-BGU-103360]****Responsible:** Prof. Dr.-Ing. Erwin Zehe**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Water and Environment \(Compulsory Modules\)](#)  
[Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Water and Environment \(Compulsory Modules\)](#)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	English	4	1

Mandatory			
T-BGU-106596	<a href="#">Water and Energy Cycles</a>	6 CR	Zehe

**Competence Certificate**

- 'Teilleistung' T-BGU-106596 with examination of other type according to § 4 Par. 2 No. 3  
 details about the learning control see at the 'Teilleistung'

**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

**Annotation**

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

**Recommendation**

course Hydrology (6200511) and module Water Resources Management and Engineering [bauIBFW9-WASSRM];  
 knowledge of programming with Matlab or another similar programming 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****5.46 Module: Advanced Fluid Mechanics (bauIM2P9-ADVM) [M-BGU-103359]****Responsible:** Prof. Dr. Olivier Eiff**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Water and Environment \(Compulsory Modules\)](#)  
[Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Water and Environment \(Compulsory Modules\)](#)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	English	4	1

Mandatory			
T-BGU-106612	<a href="#">Advanced Fluid Mechanics</a>	6 CR	Eiff

**Competence Certificate**

- 'Teilleistung' T-BGU-106612 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students acquire a firm understanding of the fundamental mechanics of fluids with emphasis towards environmental flows on the basis of the local conservation laws. They are able to differentiate and apply the different set of assumptions and methods in order to better understand the different flow classes and solutions. They are capable of solving basic flow problems after forming the relevant assumptions. Participants are able to use the knowledge and competence gained for more detailed and applied studies of environmental flows.

**Content**

This module covers the fundamental mechanics of fluids forming the foundation of environmental fluid mechanics. The approach is based on the basic local conservation laws. Emphasis is on the phenomena and the possible analytical solutions associated with the various flow classes. Topics covered include the general and special forms of the governing equations, flow kinematics, viscous incompressible flows, ideal-fluid flows, shallow flows, and buoyancy effects in fluids. Waves and turbulence are also addressed as well as different methods of analysis such as scaling.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 30 h
- home work on exercises: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

modules Hydromechanics [bauIBGP04-HYDRO] and Advanced Mathematics for Civil Engineers [bauIBGP05-HM1, bauIBGP06-HM2, bauIBGP08-HM3, bauIBFW1-PDGL] (analysis, differential and integral calculus, ordinary and partial differential equations, linear algebra, Fourier analysis, complex numbers)

**Literature**

I.G. Currie, Fundamental Mechanics of Fluids, Fourth Edition 2012

**M****5.47 Module: Subsurface Flow and Contaminant Transport (bauIM2S03-HY3) [M-BGU-103872]****Responsible:** Prof. Dr.-Ing. Erwin Zehe**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	English	4	1

Mandatory			
T-BGU-106598	<a href="#">Transport and Transformation of Contaminants in Hydrological Systems</a>	6 CR	Zehe

**Competence Certificate**

- 'Teilleistung' T-BGU-106598 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**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

**Annotation**

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

**Recommendation**

modules Water and Energy Cycles [bauIM2P8-WATENCYC] and Hydrological Measurements in Environmental Systems [bauIM2S05-HY5]; 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****5.48 Module: Analysis of Spatial Data (bauim2S04-HY4) [M-BGU-103762]****Responsible:** Prof. Dr.-Ing. Erwin Zehe**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	English	4	1

Mandatory			
T-BGU-106605	<a href="#">Geostatistics</a>	6 CR	Zehe

**Competence Certificate**

- 'Teilleistung' T-BGU-106605 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students can explain and apply methods for analysis and simulation of spatially and temporally distributed environmental data. Based on this, they are capable of setting up experimental designs for environmental monitoring and evaluate the suitability of available data for different tasks. Students are able to critically assess the results of analysis and simulation tools and to quantify and evaluate the related uncertainties.

**Content**

- fundamentals of environmental systems theory, environmental monitoring and experimental design (data types, scale triplet, measuring methods)
- experimental variograms, directional variograms, indicator variograms, variogram fitting, anisotropy
- Kriging techniques: Ordinary Kriging, screening properties of Kriging, BLUE, pure nugget effect, cross validation, RMSE
- estimation of spatial patterns in nonstationary data (External Drift Kriging, Simple Updating)
- simulation of spatial patterns: turning Bands Simulation, smoothing problems of interpolation

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

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

**Recommendation**

basic knowledge in statistics

module Hydrological Measurements in Environmental Systems [bauim2S05-HY5]

knowledge of programming with Matlab; otherwise, it is strongly recommended to attend the course 'Introduction to Matlab' (6224907)

**Literature**

Bárdossy, A. (2001): Introduction into Geostatistics. Inst. f. Wasserbau, Universität Stuttgart.

Kitanidis, P. K. (1999): Introduction into Geostatistics. Applications in Hydrogeology. Cambridge University Press.

Bras, R. L. and Rodríguez-Iturbe, I. (1985): Random Functions and Hydrology. Addison-Wesley Massachusetts.

Brooker, I. (1982): Two-dimensional simulation by turning bands. Math. Geology 17 (1).

**M****5.49 Module: Hydrological Measurements in Environmental Systems (bauIM2S05-HY5) [M-BGU-103763]****Responsible:** Dr. Jan Wienhöfer**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)**Credits**  
6**Grading scale**  
Grade to a tenth**Recurrence**  
Each summer term**Duration**  
1 term**Language**  
English**Level**  
4**Version**  
1

Mandatory			
T-BGU-106599	<a href="#">Hydrological Measurements in Environmental Systems</a>	6 CR	Wienhöfer

**Competence Certificate**

- 'Teilleistung' T-BGU-106599 with examination of other type according to § 4 Par. 2 No. 3  
details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students know and understand measurement principles for catchment properties, catchment states, and water fluxes. They are able to independently plan and conduct measurements on various scales (soil column, plot, hillslope, catchment) in the field and the laboratory. Students can analyze observation data with statistical methods, and are able to quantify and evaluate the related uncertainties. Students are able to present the related results in teamwork.

**Content**

- introduction to environmental observations (scales, uncertainties), statistical data analysis and error analysis
- seminar on hydrological measurement devices in field and laboratory: Discharge, soil moisture, infiltration, hydraulic conductivity
- lab and field work (several days) where students conduct hydrological measurements

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

The course requires a minimum number of 6 and a maximum number of 30 participants. Please register online for the course (not exam!), 6224807, via the Campus portal (in exceptional cases via e-mail to the responsible lecturer). Participants are selected according to their progress of study considering the following order: students of *Water Science and Engineering*, students of *Civil Engineering*, students of *Geoecology*.

**Workload**

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

- laboratory and field exercise: 70 h

independent study:

- preparation and follow-up laboratory and field exercises: 10 h
- preparation of presentations and reports (exam): 100 h

total: 180 h

**Recommendation**

knowledge in hydrology

**Literature**

notes for field exercises

**M****5.50 Module: Environmental Communication (bauIM2S07-HY7) [M-BGU-101108]****Responsible:** Dr. Charlotte Kämpf**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Water and Environment (Compulsory Elective Modules)  
Subject-Specific Supplements  
Study Focus II / Water and Environment (Compulsory Elective Modules)**Credits**  
6**Grading scale**  
Grade to a tenth**Recurrence**  
Each winter term**Duration**  
1 term**Language**  
German**Level**  
4**Version**  
1

Mandatory			
T-BGU-106620	Examination Prerequisite Environmental Communication	0 CR	Kämpf
T-BGU-101676	Environmental Communication	6 CR	Kämpf

**Competence Certificate**

- 'Teilleistung' T-BGU-106620 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-101676 with examination of other type according to § 4 Par. 2 No. 3

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

(see German version)

**Content**

(see German version)

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- seminar (lecture): 20 h

independent study:

- preparation and follow-up seminar: 40 h
- preparation of literature annotations and short presentation (exam prerequisite): 45 Std.
- preparation of presentation, manuscript and poster (exam): 75 Std.

total: 180 h

**Recommendation**

none

**Literature**

(see German version)

**M****5.51 Module: Groundwater Management (bauIM2S08-HY8) [M-BGU-100340]****Responsible:** Dr. Ulf Mohrlök**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Water and Environment (Compulsory Elective Modules)  
Subject-Specific Supplements  
Study Focus II / Water and Environment (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	2 terms	English	4	1

Mandatory			
T-BGU-100624	Groundwater Hydraulics	3 CR	Mohrlök
T-BGU-100625	Numerical Groundwater Modeling	3 CR	Mohrlök

**Competence Certificate**

- 'Teilleistung' T-BGU-100624 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-100625 with examination of other type according to § 4 Par. 2 No. 3

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Based on the understanding of hydrogeological settings and fluid-mechanical processes in the subsurface students can characterize different kinds of groundwater systems by means of hydraulics. They can quantify the relevant flow and transport processes with simple analytical and numerical methods for different problems regarding groundwater quantity and quality. Thereby, they are able to conceive and evaluate the relations important for the management of groundwater resources.

**Content**

- groundwater systems
- fluid-mechanical processes in porous media
- methods of balancing groundwater flow and solute transport processes
- examples of groundwater management
- project work

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Groundwater Hydraulics lecture/exercise: 30 h
- Numerical Groundwater Modeling presentations/project discussions: 15 h

independent study:

- preparation and follow-up lecture/exercises, working on exercises Groundwater Hydraulics: 40 h
- examination preparation Groundwater Hydraulics (partial exam): 20 h
- project work Numerical Groundwater Modeling, incl. presentation and preparation of the report (partial exam): 80 h

total: 185 h

**Recommendation**

basic knowledge in fluid mechanics, hydrology, solute transport and numerical methods



**Literature**

Bear, J. (1979). Hydraulics of Groundwater. McGraw Hill.

Chiang, W.H. (2005). 3D - Groundwater Modeling with PMWIN: A Simulation System for Modeling Groundwater Flow and Transport Processes, 2/e, incl. CD-Rom. Berlin, Heidelberg, D.: Springer.

Fetter, C.W. (1999). Contaminant Hydrogeology , 2/e. Upper Saddle River, NJ, U.S.A.: Prentice Hall.

Mohrlok, U. (2009). Bilanzmodelle in der Grundwasserhydraulik: quantitative Beschreibung von Strömung und Transport im Untergrund, Karlsruhe, D.: Universitätsverlag.

Schwartz, F. and H. Zhang (2003). Fundamentals of Ground Water. New York, NY, U.S.A.: John Wiley & Sons.

**M****5.52 Module: Hydro Power Engineering (bauIM2S11-WB3) [M-BGU-100103]**

**Responsible:** Dr.-Ing. Peter Oberle  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100139	<a href="#">Hydro Power Engineering</a>	6 CR	Oberle

**Competence Certificate**

- 'Teilleistung' T-BGU-100139 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students are able to describe the different turbine types and can define selection criteria for their usage. They are able to reproduce the basic approaches in the planning and design of hydropower plants and to make own calculations to select turbines. They can select and apply the necessary tools in a methodical matter.  
 Students are able to discuss the current political conditions in terms of energy policy with other students and support their personal opinion on these issues with technical arguments.

**Content**

The course explains the technical background for planning and designing waterpower plants. Among others, it covers the constructional characteristics of river and high-pressure power plants, the operating modes and selection criteria of different types of turbines as well as electro-technical aspects of the plants' operation. In addition, ecological aspects and energy policy are considered as frame conditions. The lecture sessions are complemented by the presentation of current projects and excursions.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**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

**Recommendation**

course Hydraulic Engineering and Water Management (6200511)

**Literature**

Folienumdrucke;

Giesecke J., Mosonyi E., 2005, Wasserkraftanlagen, Planung, Bau und Betrieb, Springer Verlag, Berlin

**M****5.53 Module: Waterway Engineering (bauIM2S12-WB4) [M-BGU-103392]****Responsible:** Dr.-Ing. Andreas Kron**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Water and Environment (Compulsory Elective Modules)  
Subject-Specific Supplements  
Study Focus II / Water and Environment (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-106779	<a href="#">Seminar Paper 'Waterway Engineering'</a>	1 CR	Kron
T-BGU-106780	<a href="#">Waterway Engineering</a>	5 CR	Kron

**Competence Certificate**

- 'Teilleistung' T-BGU-106779 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-106780 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students are knowledgeable about the various types of navigable waterways and their hydraulic structures. They are able to describe and apply the hydraulic basics for the design of these hydraulic structures and the interaction between ship and waterway. Students can assign the tasks and responsibilities of waterway engineering to the administrative structure of the waterways and shipping.

**Content**

- inland waterways
- types of navigation locks and ship lifts
- hydraulics and design of navigation locks and ship lifts
- reinforcement of embankments, banks and beds
- interaction ship-waterway

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lectures/exercises: 30 h
- preparation of the seminar paper (exam prerequisite): 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

course Hydraulic Engineering and Water Management (6200511)

**M****5.54 Module: Environmental Fluid Mechanics (bauIM2S19-SM5) [M-BGU-103383]****Responsible:** Prof. Dr. Olivier Eiff**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)**Credits**  
6**Grading scale**  
Grade to a tenth**Recurrence**  
Each winter term**Duration**  
1 term**Language**  
English**Level**  
4**Version**  
1**Mandatory**

T-BGU-106767

[Environmental Fluid Mechanics](#)

6 CR Eiff

**Competence Certificate**

- 'Teilleistung' T-BGU-106767 with written examination according to § 4 Par. 2 No. 1  
details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students identify fundamental hydrodynamic processes in the natural environment in water and air applications and solve related problems. They can relate the observed phenomena to fundamental principles of hydrodynamics and to the specific nature of the flow conditions. They can critically evaluate the different models and approximations made to obtain solutions and predictions and can make first estimates.

**Content**

This module covers the fundamental concepts and flow models of environmental fluid mechanics in both water and air. The topics include turbulence structure in rivers and open channels, diffusion and dispersion, atmospheric boundary layers, internal waves, instabilities and mixing, stratified turbulence, buoyant jets and plumes.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

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

**Recommendation**

modules Advanced Fluid Mechanics [bauIM2P9-ADVFM], Analysis of Turbulent Flow [bauIM2S32-NS3]

**M****5.55 Module: Advanced Computational Fluid Dynamics (bauIM2S21-NS2) [M-BGU-103384]**

**Responsible:** Prof. Dr.-Ing. Markus Uhlmann  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	English	4	2

Mandatory			
T-BGU-106769	<a href="#">Parallel Programming Techniques for Engineering</a>	3 CR	Uhlmann
T-BGU-106768	<a href="#">Numerical Fluid Mechanics II</a>	3 CR	Uhlmann

**Competence Certificate**

- 'Teilleistung' T-BGU-106768 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-106769 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

module Numerical Fluid Mechanics [bauIM2P5-NUMFLMECH] must be completed

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The module [M-BGU-103375 - Numerical Fluid Mechanics](#) must have been passed.

**Competence Goal**

Students are able to numerically solve simplified flow problems based upon the Navier-Stokes equations in an independent fashion. This involves the design of a solution method, the analysis of its properties (concerning stability, precision, computational effort), the algorithmic implementation, the validation with respect to appropriate test cases, and the final documentation of the results. Furthermore, participants of this course are enabled to judge techniques for the use of massively parallel computer systems to solve fluid mechanics problems as to their efficiency and applicability. They are capable of applying the appropriate parallel programming techniques to selected model problems.

**Content**

In the present module, advanced skills in the numerical solution of fluid mechanics problems are imparted, building upon the material of the course Numerical Fluid Mechanics I. Here, various numerical solution methods for the time-dependent Navier-Stokes equations in several spatial dimensions are demonstrated with the aid of practical examples. This includes the following aspects: coupling and decoupling of velocity and pressure fields in incompressible flows, numerical treatment of discontinuities (shock waves, hydraulic jumps), computation of scalar transport, numerical tracking of inertial particles, linear stability analysis.

The course Parallel Programming Techniques for Engineering Problems conveys the fundamental programming concepts for massively-parallel computer systems. First, the common parallel computer architectures and the most widely used programming paradigms are introduced. Then techniques for implementing standard algorithms of numerical fluid mechanics (and other disciplines involving field problems) are presented, analyzed and practiced with the aid of the Message Passing Interface (MPI) standard.

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Parallel Programming Techniques for Engineering Problems lecture, exercise: 30 h
- Numerical Fluid Mechanics II lecture, exercise: 30 h

independent study:

- preparation and follow-up lectures, exercises Parallel Programming Techniques for Engineering Problems: 30 h
- examination preparation Parallel Programming Techniques for Engineering Problems (partial exam): 30 h
- preparation and follow-up lectures, exercises Numerical Fluid Mechanics II: 30 h
- examination preparation Numerical Fluid Mechanics II (partial exam): 30 h

total: 180 h

**Recommendation**

Programing skills in at least one compiler language (C,C++, FORTRAN or equivalent)

**Literature**

C. Hirsch "Numerical computation of internal and external flows" Butterworth-Heinemann, 2nd edition, 2007.  
J.H. Ferziger and M. Peric "Computational Methods for Fluid Dynamics", Springer, 3rd edition, 2001.  
N. Carriero "How to Write Parallel Programs: A First Course", MIT Press, 1990.  
T.G. Mattson, B.A. Sanders, B.L. Massingill "Patterns for Parallel Programming" Addison-Wesley, 2004.  
M. Snir, S. Otto, S. Huss-Lederman, D. Walker, J. Dongarra "MPI: The Complete Reference", MIT Press, 1995.

**M****5.56 Module: Project Studies in Water Resources Management (bauIM2S33-WB6) [M-BGU-103394]****Responsible:** Dr.-Ing. Frank Seidel**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)[Subject-Specific Supplements](#)[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-106783	<a href="#">Project Studies in Water Resources Management</a>	6 CR	Seidel

**Competence Certificate**

- 'Teilleistung' T-BGU-106783 with examination of other type according to § 4 Par. 2 No. 3  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture, exercise: 30 h

independent study:

- preparation and follow-up lectures, exercises: 30 h
- preparation of term paper (exam): 120 h

total: 180 h

**Recommendation**

module Flow and Sediment Dynamics in Rivers [bauIM2S35-WB8]

**M****5.57 Module: Numerical Flow Modeling in Hydraulic Engineering (bauIM2S34-WB7) [M-BGU-103390]****Responsible:** Dr.-Ing. Peter Oberle**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)[Subject-Specific Supplements](#)[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)**Credits**  
6**Grading scale**  
Grade to a tenth**Recurrence**  
Each winter term**Duration**  
1 term**Language**  
German**Level**  
4**Version**  
1

Mandatory			
T-BGU-106776	<a href="#">Numerical Flow Modeling in Hydraulic Engineering</a>	6 CR	Oberle

**Competence Certificate**

- 'Teilleistung' T-BGU-106776 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**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

**Recommendation**

basic knowledge of hydrology, hydraulic engineering and water management as well as open channel hydraulics

**Literature**

lecture notes



**M****5.58 Module: Hydraulic Structures (bauIM2S36-WB9) [M-BGU-103389]**

**Responsible:** Prof. Dr. Olivier Eiff  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each term	2 terms	English	4	2

Mandatory			
T-BGU-106774	<a href="#">Groundwater Flow around Structures</a>	3 CR	Trevisan
T-BGU-110404	<a href="#">Interaction Flow - Hydraulic Structures</a>	3 CR	Gebhardt

**Competence Certificate**

- 'Teilleistung' T-BGU-106774 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-110404 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

The module must not be selected together with the module Interaction Flow - Building Structure [bauIM2S16-SM2].

**Competence Goal**

Students are able to analyze and calculate steady and unsteady flow forces on hydraulic structures. They can describe groundwater flow processes and derive flow parameters with common measurement calculations. Based on the acquired knowledge, they can analyze concepts for preventing groundwater-related structural damage in a critical manner. Students characterize and categorize flow-induced structural vibrations. They can apply their knowledge to application examples.

**Content**

In this module, the following topics are discussed in depth:

- potential theory
- groundwater flow
- structural adjustment to groundwater flow
- determination of hydrostatic and hydrodynamic flow forces
- overview of sealing mechanisms: flood sluices, weirs, gates
- flow-induced structural vibrations

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Groundwater Flow around Structures lecture/exercise: 30
- Interaction Flow - Hydraulic Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Groundwater Flow around Structures: 30 h
- examination preparation Groundwater Flow around Structures (partial exam): 30 h
- preparation and follow-up lecture/exercises Interaction Flow - Hydraulic Structures: 30 h
- examination preparation Interaction Flow - Hydraulic Structures (partial exam): 30 h

total: 180 h

**Recommendation**

none

**Literature**

Erbisti, P.C.F., 2004, Design of Hydraulic Gates, Balkema Pub., Tokyo  
Naudascher, E, 1991, Hydrodynamic Forces, Balkema Pub., Rotterdam  
C. Lang, Skript Interaktion Strömung - Wasserbauwerk

**M****5.59 Module: Experimental Hydraulics and Measuring Techniques (bauIM2S37-WB10) [M-BGU-103388]****Responsible:** Dr.-Ing. Frank Seidel**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)[Subject-Specific Supplements](#)[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German/English	4	2

Mandatory			
T-BGU-106773	<a href="#">Experimental Hydraulics II</a>	3 CR	Seidel
T-BGU-110411	<a href="#">Flow Measurement Techniques</a>	3 CR	Gromke

**Competence Certificate**

- 'Teilleistung' T-BGU-106773 with examination of other type according to § 4 Par. 2 No. 3

- 'Teilleistung' T-BGU-110411 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

The module must not be selected together with the module Experimental Techniques II: Measurement Techniques [bauIM2S18-SM4].

**Competence Goal**

Students are able to describe the principles of different flow measurement methods and combine this information with the basics of today's flow measurement technology. They have basic knowledge about the structure and can analyze the suitability of measurement methods and set application boundaries. Students have basic knowledge about experimentation in hydraulics. They know the similarity mechanical requirements and assign them to the hydromechanical basics. Students are able to analyze applications in the field of multiphase hydraulics and select suitable model concepts. They can present their own thoughts and ideas in a structured manner and discuss the themes with specialists.

**Content**

In this module, the following topics will be discussed in depth:

- basic equations in fluid mechanics
- measurement methods and their fields of application
- experimental models with movable beds
- experiments related to multiphase flow problems (water-air, water-solid)

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Flow Measurement Techniques lecture/exercise: 30 h
- Experimental Hydraulics II lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Flow Measurement Techniques: 30 h
- examination preparation Flow Measurement Techniques (partial exam): 30 h
- preparation and follow-up lecture/exercises Experimental Hydraulics II: 30 h
- preparation of term paper (partial exam): 30 h

total: 180 h

**Recommendation**

module Experiments in Fluid Mechanics [bauIM2S39-SM6], hydraulic lab practice

**M****5.60 Module: Water Distribution Systems (bauIM2S38-WB11) [M-BGU-104100]****Responsible:** Dr.-Ing. Peter Oberle**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2018)  
[Subject-Specific Supplements](#) (Usage from 4/1/2018)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2018)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	English	4	1

Mandatory			
T-BGU-108485	<a href="#">Project Report Water Distribution Systems</a>	2 CR	Oberle
T-BGU-108486	<a href="#">Water Distribution Systems</a>	4 CR	Oberle

**Competence Certificate**

- 'Teilleistung' T-BGU-108485 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-108486 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students will have profound knowledge of the components and operational requirements of water supply systems. They are enabled to plan, design and optimize water distribution systems. They are capable to critically analyze concepts and designs based on their knowledge. Participants are able to set up and apply numerical models of water distribution systems for planning and analysis. Students have competences in work organization, presentation and discussion of results.

**Content**

The module covers the following topics:

- fundamentals of water distribution
- fundamentals of water distribution system modeling
- introduction to the software Epanet (water distribution system model) and ArcGIS (geographic information system)
- water demand
- water losses
- calibrating a water distribution system model
- designing pipe networks, storage tanks and pump stations
- application of the technical standards (DVGW)

The participants apply the theoretical knowledge to analyze and design an exemplary water distribution network.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 30 h
- project work water distribution (exam prerequisite): 60 h
- examination preparation: 30 h

total: 180 h

**Recommendation**

hydromechanics (specifically pipe hydraulics)

**Literature**

Mutschmann und Stimmelmayer (2007). Taschenbuch der Wasserversorgung, 14. Aufl., Vieweg.

Walski, T. M., Chase, D. V., Savic, D. A., Grayman, W., Beckwith, S. und Koelle, E. (2003). Advanced Water Distribution Modeling Management, Haestad Methods Inc., Waterbury.

Schrifttum zur Vorlesung (auf Deutsch und Englisch)

**M****5.61 Module: Experiments in Fluid Mechanics (bauIM2S39-SM6) [M-BGU-103377]****Responsible:** Prof. Dr. Olivier Eiff**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	English	4	1

Mandatory			
T-BGU-106760	<a href="#">Experiments in Fluid Mechanics</a>	6 CR	Eiff

**Competence Certificate**

- 'Teilleistung' T-BGU-106760 with examination of other type according to § 4 Par. 2 No. 3  
details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students relate the hydrodynamics theory and physical concepts to the observed physical reality. They apply their knowledge and skills for the comparative analysis of basic flow situations in physical models, using appropriate measurement technologies. They assess and evaluate the results and limitations by comparing their results with theoretical deductions. They extend their results of phenomena-oriented experiments with regard to practical applications in technical hydraulics and environmental flows. Acquired competence: operation of test facilities and instrumentation, data analysis and basic statistical error analysis, team work, written and oral communication.

**Content**

Lecture:

- typical set-up of hydraulic and aerodynamic models
- dimensional analysis, dimensionless parameters
- measurement instrumentation
- introduction to statistical error analysis
- analogy numerical/physical modeling, model distortion
- technical writing and oral presentation

Physical experiments:

- pipe flow with orifice plate
- open channel flow with gates and hydraulic jumps
- Venturi pipe flow with cavitation- Settling velocities of spheres
- diffusion of a turbulent air jet
- turbulent wake
- dam leakage

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture/lab exercise: 60 h

independent study:

- preparation and follow-up lectures: 30 h
- preparation of laboratory reports (part of the examination): 60 h
- preparation of oral examination (part of the examination): 30 h

total: 180 h

**Recommendation**

module Advanced Fluid Mechanics (bauIM2P9)

**Literature**

Tropea, C. et.al., 2007, Springer Handbook of Experimental Fluid Mechanics, Springer Verlag Berlin

Muste, M., Aberle, J., Admiraal, D., Ettema, R., Garcia, M. H., Lyn, D., Nikora, V., Rennie, C., 2017, Experimental Hydraulics: Methods, Instrumentation, Data Processing and Management, Taylor and Francis

**M****5.62 Module: Freshwater Ecology (bauIM2S41-SW8) [M-BGU-104922]****Responsible:** PD Dr.-Ing. Stephan Fuchs**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2019)  
[Subject-Specific Supplements](#) (Usage from 4/1/2019)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2019)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	English	4	1

Mandatory			
T-BGU-109956	<a href="#">Applied Ecology and Water Quality</a>	3 CR	Fuchs, Hilgert
T-BGU-109957	<a href="#">Field Training Water Quality</a>	3 CR	Fuchs, Hilgert

**Competence Certificate**

- 'Teilleistung' T-BGU-109956 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-109957 with examination of other type according to § 4 Par. 2 No. 3

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students get familiar with the basic principles of water ecology in surface waters. They are able to explain interactions between abiotic control factors (flow, chemistry, structure) and their relevance for the ecological status of standing waters and streams and to evaluate them critically. They become acquainted with field and laboratory techniques to establish water quality. With the help of these methods, they evaluate data-quality of information collected in the field regarding chemical, biological and structural water quality and determine the level of uncertainty intrinsic to the data-collection methods. Using case studies, students are able to convey and evaluate positive results as well as restrictions from water restoration processes.

**Content**

As part of the module, water ecology principles, their practical significance and implementation of restoring measures are presented. The following topics are covered:

- pollutants loads discharged into water bodies: discharge points, pollutants, sediment problems
- sampling methods
- oxygen content
- methods for the assessment of water quality and water general status
- practical exercises to measure water quality and condition in the field

Students get acquainted with practical examples of water protection and water remediation measures and they interpret and discuss them as part of an individual assignment. For this purpose, they implement their own framework, based on visible requirements and achievable targets.

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

The number of participants in the courses is limited to 12 persons. The registration is to be made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoecology* and further study programs. The attendance at the first meeting is mandatory. In case of absence the place will be assigned to a person on the waiting list.



**Workload**

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

- Applied Ecology and Water Quality lecture/seminar: 30 h
- Field Training Water Quality (block): 30 h

independent study:

- preparation of the seminar paper with presentation (partial examination): 60 h
- preparation of the report on Field Training Water Quality (partial examination): 60 h

total: 180 h

**Recommendation**

none

**Literature**

Wetzel, Limnology, 3rd Edition, Academic Press 2001

Jürgen Schwörbel, Methoden der Hydrobiologie, UTB für Wissenschaft 1999

kursbegleitende Materialien

**M****5.63 Module: River Basin Modeling (bauim2S42-SW9) [M-BGU-103373]****Responsible:** PD Dr.-Ing. Stephan Fuchs**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Water and Environment (Compulsory Elective Modules)  
Subject-Specific Supplements  
Study Focus II / Water and Environment (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	2 terms	English	4	2

Mandatory			
T-BGU-111061	Mass Fluxes in River Basins	3 CR	Fuchs
T-BGU-106603	River Basin Modeling	3 CR	Fuchs

**Competence Certificate**

- 'Teilleistung' T-BGU-111061 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-106603 with examination of other type according to § 4 Par. 2 No. 3

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students are able to explain the basic relationships between water-driven material cycles in river basins and their budget in aquatic ecosystems. They are able to analyze the impact of anthropogenic activities on water condition and quality. Students gain knowledge regarding transport pathways of substances and biochemical and physical interactions in water bodies in order to formulate mathematical model approaches. Using simulation models, they are able to quantify substance emissions; to predict the impact from external influences on the water quality relevant processes and; to perform different scenario analysis. Students are capable of evaluating model results in terms of their plausibility and uncertainty.

**Content**

This module provides students with a broad-based understanding of the fundamentals of materials flows (N, P, pollutants) and their relevant transport pathways in river basins. Different modeling approaches for a quantitative description of the processes will be presented. Students receive a single-user version of the simulation tool MoRE (Modeling of Regionalized Emissions). They have to develop and implement their own model in small groups and interpret simulation results.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

As from summer term 2021 the not graded accomplishment 'Mass Fluxes in River Basins' is examination prerequisite.

**Workload**

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

- Mass Fluxes in River Basins lecture: 30 h
- Modeling Mass Fluxes in River Basins exercise: 30 h

independent study:

- preparation and follow-up lectures Mass Fluxes in River Basins: 30 h
- working on exercises and final presentation Mass Fluxes in River Basins (not graded examination prerequisite): 30 h
- project work on River Basin Modeling (exam): 60 h

total: 180 h

**Recommendation**

modules Urban Water Infrastructure and Management [bauim2P10-URBIM], Freshwater Ecology [bauim2S41-SW8]

**Literature**

Schwoerbel, J. (1993): Einführung in die Limnologie, 7. Aufl., Fischer Verlag, Stuttgart  
Kummert, R. (1989): Gewässer als Ökosysteme: Grundlagen des Gewässerschutzes, 2. Aufl., Teubner Verlag, Stuttgart  
Stumm, W.; Morgan, J.J. (1996): Aquatic Chemistry – Chemical equilibria and rates in natural waters, Wiley Interscience, NY

**M****5.64 Module: Wastewater Treatment Technologies (bauIM2S43-SW10) [M-BGU-104917]****Responsible:** PD Dr.-Ing. Stephan Fuchs**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2019)  
[Subject-Specific Supplements](#) (Usage from 4/1/2019)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2019)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	English	4	3

Mandatory			
T-BGU-111282	<a href="#">Term Paper 'Wastewater Treatment Technologies'</a>	3 CR	Fuchs
T-BGU-109948	<a href="#">Wastewater Treatment Technologies</a>	3 CR	Fuchs

**Competence Certificate**

- 'Teilleistung' T-BGU-111282 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-109948 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students acquire knowledge about typical techniques and facilities in wastewater treatment at local and international level. They are able to perform a technical evaluation and describe dimensioning approaches taking into consideration legal boundary conditions. Students analyze, evaluate and optimize operation of plant technologies. They focus on energy-efficient plant designs considering the most relevant factors affecting the total costs. Students can analyze the situation in emerging and developing countries making a comparison with that in industrialized countries. Based on that, they are able to develop water-related management strategies.

**Content**

Students gain deep knowledge about design and operation of typical process technologies in municipal wastewater treatment in Germany and abroad. They analyze, evaluate the applied technologies and take decisions when new and more holistic oriented methods can be implemented. Different mechanical, biological and chemical treatment technologies are considered, whereby the treatment of waste water from households and industry as well as the treatment of rainwater is discussed. The visits of different facilities in Germany complete the course.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

The number of participants in the course is limited to 30 persons. The registration is to be made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoecology* and further study programs. The topics for the Term Paper are assigned at the beginning of the course.

**Workload**

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 30 h
- preparation of Term Paper 'Wastewater Treatment Technologies' (exam prerequisite): 60 h
- examination preparation: 30 h

total: 180 h

**Recommendation**

module 'Wasser and Environment' [bauIBFP4-WASSER]

**Literature**

Imhoff, K. u. K.R. (1999) Taschenbuch der Stadtentwässerung, 29. Aufl., Oldenbourg Verlag, München, Wien  
ATV-DVWK (1997) Handbuch der Abwassertechnik: Biologische und weitergehende Abwasserreinigung, Band 5, Verlag Ernst & Sohn, Berlin  
ATV-DVWK(1997) Handbuch der Abwassertechnik: Mechanische Abwasserreinigung, Band 6, Verlag Ernst & Sohn , Berlin  
Sperling, M.; Chernicaro, C.A.L. (2005) Biological wastewater treatment in warm climate regions, IWA publishing, London  
Wilderer, P.A., Schroeder, E.D. and Kopp, H. (2004) Global Sustainability - The Impact of Local Cultures. A New Perspective for Science and Engineering, Economics and Politics WILEY-VCH

**M****5.65 Module: Introduction to Environmental Data Analysis and Statistical Learning (bauIM2S44-ENV DAT) [M-BGU-104880]****Responsible:** Dr.-Ing. Uwe Ehret**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2019)  
[Subject-Specific Supplements](#) (Usage from 4/1/2019)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2019)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	English	4	1

Mandatory			
T-BGU-109950	<a href="#">Homework 'Introduction to Environmental Data Analysis and Statistical Learning'</a>	2 CR	Ehret
T-BGU-109949	<a href="#">Introduction to Environmental Data Analysis and Statistical Learning</a>	4 CR	Ehret

**Competence Certificate**

- 'Teilleistung' T-BGU-109950 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-109949 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can explain and apply methods for analysis and simulation of environmental data. Based on this they are capable of evaluating the suitability of available data, analysis and simulation methods for different tasks. The students are able to critically assess the results of analysis and simulation tools and to quantify and evaluate the related uncertainties.

**Content**

- explorative data analysis
- data storage / data bases
- probability theory (short summary)
- statistical tests (short summary)
- Bayesian methods
- information theory
- time series
- statistical learning / machine learning basics
- supervised learning
- unsupervised learning

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 20 h
- preparation of Homework 'Introduction to Environmental Data Analysis and Statistical Learning' (exam prerequisite): 60 h
- examination preparation: 40 h

total: 180 h

**Recommendation**

preliminary knowledge in statistics and Matlab programming skills, e.g. successful completion of Introduction to Matlab (WSEM-CC772)

**Literature**

Daniel Wilks (2011): Statistical Methods in the Atmospheric Sciences, Volume 100, 3rd Edition, ISBN 978-0-1238-5022-5, Academic Press.

Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani (2014): An Introduction to Statistical Learning, ISBN 978-1-4614-7137-0, Springer.

Thomas M. Cover, Joy A. Thomas (2006): Elements of Information Theory, 2nd Edition, ISBN: 978-0-471-24195-9, Wiley.

**M****5.66 Module: Fluid Mechanics of Turbulent Flows (bauIM2S45-NS4) [M-BGU-105361]****Responsible:** Prof. Dr.-Ing. Markus Uhlmann**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)  
[Subject-Specific Supplements](#) (Usage from 4/1/2020)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	English	4	1

Mandatory			
T-BGU-110841	<a href="#">Fluid Mechanics of Turbulent Flows</a>	6 CR	Uhlmann

**Competence Certificate**

- 'Teilleistung' T-BGU-110841 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Participants are able to describe the characteristics of turbulent flows, and to quantify their effect upon the transport rates of momentum, heat and mass. They are aware of the problems associated with computationally determining turbulent flow quantities. With this knowledge, they are able to weigh the pros and cons of the different modeling approaches; they are further able to choose an appropriate approach for a given application.

**Content**

The mathematical description of the physics of turbulence is successively developed. The module presents the phenomenology of turbulent flows, introduces the statistical description of turbulent flow processes, discusses the characteristics of free and wall-bounded shear flows, and presents an analysis of the turbulent energy cascade.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

The module will be offered newly as from summer term 2020. It will replace the module Analysis of Turbulent Flows by parts.

**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

**Recommendation**

Basic fluid mechanics (experience in working with the Navier-Stokes equations)

Mathematics (analysis – partial differential equations, Fourier series, vectors/tensors, matrices and eigenvalues; statistics)

Knowledge in programming with Matlab is recommended; otherwise it is strongly recommended to participate in the course 'Introduction to Matlab'.

**M****5.67 Module: Modeling of Turbulent Flows - RANS and LES (bauIM2S46-NS5) [M-BGU-105362]****Responsible:** Prof. Dr.-Ing. Markus Uhlmann**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)  
[Subject-Specific Supplements](#) (Usage from 4/1/2020)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	English	4	1

Mandatory			
T-BGU-110842	<a href="#">Modeling of Turbulent Flows - RANS and LES</a>	6 CR	Uhlmann

**Competence Certificate**

- 'Teilleistung' T-BGU-110842 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Participants are able to weigh the pros and cons of the different modeling approaches; they are further able to choose an appropriate approach for a given application. Participants have the ability to critically evaluate the expected outcome of a range of turbulence models with respect to their predictive capabilities and the required computational effort.

**Content**

In this module covers the required mathematical tools and the most useful modeling approaches for fluids engineering problems. First the statistical approach to turbulence modeling, based upon Reynolds averaging (RANS) is presented, starting with the simplest algebraic model and ranging up to Reynolds stress transport models. Furthermore, an introduction to the concept of large-eddy simulation (LES) is given.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

The module will be offered newly as from winter term 2020/21. It will replace the module Analysis of Turbulent Flows by parts.

**Workload**

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

- Modeling of Turbulent Flows - RANS and LES lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises Modeling of Turbulent Flows - RANS and LES: 60 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

Basic fluid mechanics (experience in working with the Navier-Stokes equations)

Mathematics (analysis – partial differential equations, Fourier series, vectors/tensors, matrices and eigenvalues; statistics)

Knowledge in programming with Matlab is recommended; otherwise it is strongly recommended to participate in the course 'Introduction to Matlab'.

Taking the module Fluid Mechanics of Turbulent Flows [bauIM2S45] preliminarily is strongly recommended.



**M****5.68 Module: Interaction Flow - Building Structure (bauIM2S47-SM2) [M-BGU-105503]****Responsible:** Prof. Dr. Olivier Eiff**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 10/1/2020)  
[Subject-Specific Supplements](#) (Usage from 10/1/2020)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 10/1/2020)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	English	4	1

Mandatory			
T-BGU-110404	<a href="#">Interaction Flow - Hydraulic Structures</a>	3 CR	Gebhardt
T-BGU-111060	<a href="#">Building and Environmental Aerodynamics</a>	3 CR	Gromke

**Competence Certificate**

- 'Teilleistung' T-BGU-110404 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-111060 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

The module must not be selected together with the modules Interaction Flow - Building Structure [bauIM2S16-SM2] and Hydraulic Structures [bauIM2S36-WB9].

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The module [M-BGU-103389 - Hydraulic Structures](#) must not have been started.

**Competence Goal**

The students have the competence to analyse and calculate steady and unsteady flow loading on hydro-engineering and aerodynamic structures as well as natural structures. They characterize flow induced vibrations and can categorize and pre-estimate them. With typical applications the connection between theory and practice is given.

**Content**

The particularities of gates (lock gates, weir gates, submerged gate leaves) in hydraulic steel engineering are presented, their construction and calculation of their loading will be discussed.

The course Building- and Environmental Aerodynamics gives an introduction to the natural wind and its interaction with the built and natural environment. In the focus are wind load on buildings and wind induced vibrations as well as flow processes in the natural environment regarding natural wind shelter, fresh air ventilation to urban areas and wind comfort.

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Interaction Flow - Hydraulic Structure lecture/exercise: 30 h
- Building and Environmental Aerodynamics lecture, exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Interaction Flow - Hydraulic Structure: 30 h
- examination preparation Interaction Flow - Hydraulic Structure (partial exam): 30 h
- preparation and follow-up lectures, exercises Building and Environmental Aerodynamics: 30 h
- examination preparation Building and Environmental Aerodynamics (partial exam): 30 h

total: 180 h

**Recommendation**

course Hydromechanics (6200304),

modules Advanced Fluid Mechanics [bauIM2P9-ADVFM], Technical Hydraulics [bauIM2S17-SM3]

**Literature**

Wickert, G., Schmaußer, G., 1971, Stahlwasserbau, Springer Verlag, Berlin

Schmaußer, G., Nölke, H., Herz, E., 2000, Stahlwasserbauten - Kommentar zur DIN 19704, Ernst und Sohn Verlag, Berlin

Naudascher, E., 1991, Hydrodynamic Forces, Balkema Pub., Rotterdam

Naudascher, E., Rockwell, D., 2005, Flow-Induced Vibrations, Dover Publ., N.Y.

Erbisti, P.C.F., 2004, Design of Hydraulic Gates, Balkema Pub., Tokyo

Lewin, J., 1995, Hydraulic Gates and Valves in free surface flow and submerged outlets, Th. Telford Pub., London

Hucho, W., 2002: "Aerodynamik der stumpfen Körper", Vieweg-Verlag, ISBN 3-528-06870-1

Holmes, J.D., 2007: "Wind Loading on Structures", Taylor & Francis, ISBN 978-0-415-40946-9

Oertel, H., Ruck, S.: 2012: "Bioströmungsmechanik", Vieweg - Teubner, ISBN: 978-3-8348-1765-5

Oertel, H. jr. (Hrsg.), 2008: "Prandtl - Führer durch die Strömungslehre", Vieweg-Teubner, ISBN 978-3-8348-0430-3

**M****5.69 Module: Integrated Design Project in Water Resources Management (bauIM2S48-HY9) [M-BGU-105637]**

**Responsible:** Dr.-Ing. Uwe Ehret  
Dr.-Ing. Frank Seidel

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

**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2021)  
[Subject-Specific Supplements](#) (Usage from 4/1/2021)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2021)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	English	4	1

Mandatory			
T-BGU-111275	<a href="#">Integrated Design Project in Water Resources Management</a>	6 CR	Ehret, Seidel

**Competence Certificate**

- 'Teilleistung' T-BGU-111275 with written examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students are able to independently undergo the basic steps of planning and design in water resources management. They can identify engineering problems and apply the respective design approaches.

Students are able to work in a self-organized and reflexive manner. They are able to use and link their knowledge logically and have organizational skills in the areas of teamwork and presentation.

**Content**

In this module, students will work in teams to independently plan and design a flood protection measure for a small catchment. This comprises:

- identifying the legally required flood protection level
- establishing and comparing possible flood protection strategies
- setting up a hydrological model for the project catchment
- establishing hydrological design values based on design storms applied to the hydrological model, and designing flood values from extreme value statistics
- designing the outlet works and the flood release system of a flood retention basin based on the hydrological flood values with a special focus in capacity and energy dissipation.

In the lectures, the following topics required to successfully accomplish the design project will be covered:

- basic introduction to Water Resources Management
- basic planning methodology in water management projects
- basic hydrological modeling
- introduction to extreme-value statistics and design storms
- introduction to the related design standards and legal requirements (DIN 19700 and others)
- introduction to the design of hydraulic structures with a special focus on flood retention basins
- principals of Computer Aided Design (AutoCAD)
- background on operation and maintenance of flood retention basins
- practical example: excursion to a build flood retention basin

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

newly offered as from summer term 2021

**Workload**

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

- lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises: 30 h
- preparation of the study project and the report (examination): 120 h

total: 180 h

**Recommendation**

basic knowledge in hydrology, hydrological modeling, hydromechanics, hydraulic engineering

Matlab skills (for hydrological modeling), e.g. successful completion of Introduction to Matlab (WSE-CC772)

**M****5.70 Module: River Processes (bauIM2S49-WB9) [M-BGU-105927]**

**Responsible:** Prof. Dr. Mario Jorge Rodrigues Pereira da Franca  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)  
[Subject-Specific Supplements](#) (Usage from 4/1/2022)  
[Study Focus II / Water and Environment \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	English	4	1

Mandatory			
T-BGU-111930	<a href="#">River Processes</a>	6 CR	Rodrigues Pereira da Franca

**Competence Certificate**

- 'Teilleistung' T-BGU-111930 with examination of other type according to § 4 Par. 2 No. 3  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

This module must not be selected together with the module Flow and Sediment Dynamics in Rivers [bauIM2S35-WB8] not offered anymore.

**Competence Goal**

The module provides students with theoretical and practical knowledge of landscape and river processes, related to hydromorphodynamics and transported phases. The students will be able to transfer immature scientific knowledge into engineering praxis.

After successfully completing the course on *Landscape and River Morphology*, the student will be able to:

- describe the main morphology processes happening at the landscape and river scale,
- describe and identify the governing processes of singularities in the river networks such as confluences, bifurcations, bends, among others,
- identify possible implications of climate change in morphological processes of the river basin,
- identify the main hydromorphodynamic processes relevant to river ecology,
- transfer immature knowledge from scientific literature into engineering praxis.

After successfully completing the course on *Transport Processes in Rivers*, the student will be able to:

- describe the engineering and ecological implications of different types of moving elements (debris) in rivers,
- identify relevant sources and sinks of debris transported by rivers,
- quantify transport processes relative to river debris,
- plan monitoring campaigns based on state-of-the-art techniques.

Transfer scientific literature in river debris into practical applications.

**Content**

The course *Landscape and River Morphology* contains the following topics:

- morphology processes at the landscape scale
- morphology processes at the river scale
- intersection of hydromorphodynamic processes with engineering praxis
- safety and stability of river networks
- fluvial ecomorphology

The course *Transport Processes in Rivers* studies the sources, transport and transformations, and sinks of different types of elements:

- sediment transport (bed and suspended load)
- woody and vegetation debris
- plastic and urban (cars and urban furniture) debris
- bubbles and gas transfer
- contaminant plumes

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Landscape and River Morphology lecture/exercise: 30 h
- Transport Processes in Rivers lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Landscape and River Morphology: 10 h
- preparation of the seminar paper Landscape and River Morphology: 40 h
- preparation and follow-up lecture/exercises Transport Processes in Rivers: 10 h
- preparation of the seminar paper Transport Processes in Rivers: 40 h
- preparation of colloquium: 20 h

total: 180 h

**Recommendation**

basic knowledge in hydromechanics and hydraulic engineering

**M****5.71 Module: Urban and Regional Planning (bauIM3P1-PLSTAREG) [M-BGU-100007]****Responsible:** Prof. Dr.-Ing. Peter Vortisch**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** Study Focus I / Mobility and Infrastructure (Compulsory Modules)  
 Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)  
 Subject-Specific Supplements  
 Study Focus II / Mobility and Infrastructure (Compulsory Modules)  
 Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100050	Urban and Regional Planning	6 CR	Soylu, Wilske

**Competence Certificate**

- 'Teilleistung' T-BGU-100050 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The aim is to provide an overview of important tasks for spatial planning, of the legal principles, methods and strategies for solving spatial problems on urban and regional level. The students shall be able to develop planning strategies, particularly in the field of planning on a supra-local level.

**Content**

In the lectures basic goals and tasks of planning of different levels, procedures and instruments, the relationship between governmental and private planning are taught. The scientific contexts are developed systematically to strengthen the various methodological approaches to understand and evaluate them. Particular attention will be paid inter alia to changing conditions, such as demographic and economic developments.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Urban Planning lectures/exercises: 30 h
- Regional Planning lectures: 30 h

independent study:

- preparation and follow-up Urban Planning lectures/exercises: 30 h
- preparation and follow-up Regional Planning lectures: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

module Mobility and Infrastructure [bauIBFP5-MOBIN]

**Literature**

list of literature to module

**M****5.72 Module: Models and Methods in Traffic Engineering and Transportation  
Planning (bauIM3P2-VERMODELL) [M-BGU-100008]**

**Responsible:** Prof. Dr.-Ing. Peter Vortisch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** Study Focus I / Mobility and Infrastructure (Compulsory Modules)  
 Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)  
 Subject-Specific Supplements  
 Study Focus II / Mobility and Infrastructure (Compulsory Modules)  
 Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100012	Models and Methods in Traffic Engineering and Transportation Planning	6 CR	Vortisch

**Competence Certificate**

- 'Teilleistung' T-BGU-100012 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

see German version

**Content**

Methods and models in transport planning as well as the relevant tools and methods for the traffic engineer. Transport Planning:

- four-Step-Algorithm
- aggregate versus individual models
- choice modeling

Traffic Engineering:

- measuring traffic flow data
- description of traffic conditions / fundamental diagram
- capacity of roads and intersections with and without traffic signals

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Methods and Models in Transportation Planning lectures/exercises: 30 h
- Traffic Engineering lectures/exercises: 30 h

independent study:

- preparation and follow-up Methods and Models in Transportation Planning lectures/exercises: 30 h
- preparation and follow-up Traffic Engineering lectures/exercises: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**Literature**

lecture notes with additional references / exercises



**M****5.73 Module: Infrastructure Management (bauiM3P3-STRINFRA) [M-BGU-100009]****Responsible:** Prof. Dr.-Ing. Ralf Roos**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Mobility and Infrastructure \(Compulsory Modules\)](#)  
[Study Focus I / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Mobility and Infrastructure \(Compulsory Modules\)](#)  
[Study Focus II / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-106300	<a href="#">Infrastructure Management</a>	6 CR	Roos

**Competence Certificate**

- 'Teilleistung' T-BGU-106300 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The graduates are able to apply and develop respectively methods and techniques for different tasks related to the life cycle of a road (design, construction, operation and maintenance) and to examine these with regard to their technical suitability and economic feasibility. Further, they have the competence to be able to apply these methods to other problems and in different fields and modify them respectively.

**Content**

The module addresses further topics about design and construction of roads such as aspects of safety, junctions, construction materials, way of construction and drainage. In the phase of operation of a road after release for traffic logistical and technical aspects of the operation service (road control, snow and ice control, green belt care etc.) as well as the maintenance of roads (status recognition and evaluation, surface and structure properties, pavement management a.o.) come to the fore which are important for smooth and safe traffic flow. These are discussed in the classes fundamentally.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Design and Construction of Highways lectures: 30 h
- Operation and Maintenance of Highways lectures: 30 h

independent study:

- preparation and follow-up Design and Construction of Highways lectures: 30 h
- preparation and follow-up Operation and Maintenance of Highways lectures: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**M****5.74 Module: Track Guided Transport Systems - Technical Design and Components (bauIM3P4-EBTECHNIK) [M-BGU-100010]****Responsible:** Jan Tzschaschel**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Mobility and Infrastructure \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)  
[Subject-Specific Supplements](#) (Usage from 4/1/2020)  
[Study Focus II / Mobility and Infrastructure \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)

**Credits**  
6**Grading scale**  
Grade to a tenth**Recurrence**  
Each winter term**Duration**  
1 term**Language**  
German**Level**  
4**Version**  
1

Mandatory			
T-BGU-100052	<a href="#">Track Guided Transport Systems - Technical Design and Components</a>	6 CR	Tzschaschel

**Competence Certificate**

- 'Teilleistung' T-BGU-100052 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students are enabled to analyse the field of guided transport systems in its thematic complexity, to recognise the technical context and develop solutions to problems.

**Content**

- law, organisation and development of railways
- basics of dynamics of train movements
- introduction to planning and design of train stations and railway line layout
- introduction to the layout and dimensioning of the superstructure
- future developments of railway traffic

**Module grade calculation**

grade of the module is grade of the exam

**Annotation****IMPORTANT:****The module will be offered once again as from summer term 2020.****Workload**

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

- lectures/exercises: 60 h

independent study:

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

total: 180 h

**Recommendation**

none

**Literature**

Zilch, Diederichs, Katzenbach: Handbuch f. Bauingenieure, Springer-Verlag  
 Pahl, J.; Systemtechnik des Schienenverkehrs, Springer Vieweg

**M****5.75 Module: Laws and Proceedings Concerning Traffic and Roads (bauIM3P5-VERFRECHT) [M-BGU-100011]****Responsible:** Prof. Dr.-Ing. Ralf Roos**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** Study Focus I / Mobility and Infrastructure (Compulsory Modules)  
 Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)  
 Subject-Specific Supplements  
 Study Focus II / Mobility and Infrastructure (Compulsory Modules)  
 Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-106297	Laws and Proceedings Concerning Traffic and Roads	6 CR	Hönig, Roos, Vortisch

**Competence Certificate**

- 'Teilleistung' T-BGU-100050 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The graduates know the legal framework concerning construction and operating of roads and can justify and question decisions. Furthermore, they understand methods concerning environmental impact analysis of infrastructure, they can technically argue and classify evaluations of variants. In addition, they are able to apply assessment and evaluation techniques for the planning of infrastructure projects, to modify them with respect to specific applications and to analyse their results.

**Content**

Constitutional framework, environmental impact of roads, changing topics concerning mainly procedures in highway engineering Methodologies and application of standardized assessment and decision techniques (Cost-Benefit-Analyses, Value Benefit Analysis etc.) in transport planning

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Laws concerning Traffic and Roads lectures: 30 h
- Environmental Impact Assessment lectures: 15 h
- Assessment and Evaluation Techniques lectures: 15 h

independent study:

- preparation and follow-up Laws concerning Traffic and Roads lectures: 30 h
- preparation and follow-up Environmental Impact Assessment lectures: 15 h
- preparation and follow-up Assessment and Evaluation Techniques lectures: 15 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**M****5.76 Module: Urban Renewal (bauIM3S01-PLSTUMB) [M-BGU-100013]****Responsible:** Prof. Dr.-Ing. Peter Vortisch**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)  
Subject-Specific Supplements  
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-108441	History of Urban Planning	3 CR	Vogt
T-BGU-108442	Urban Management	3 CR	Karmann-Woessner

**Competence Certificate**

- 'Teilleistung' T-BGU-108441 with oral written according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-108442 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The aim is to convey the principles and methods of urban renewal. In the module adaptation strategies are taught, by which cities and city regions react to changing conditions. These changes -such as climate change, demographics or changing economic practices- are encountered by urban concepts city-wide, on the level of city quarters or on the building level. In addition to the urban redevelopment in Germany selected references from Europe are examined.

**Content**

Based on the core module "Urban and Regional Planning" this lecture is focused on adaptation strategies of cities and urban regions. In addition to a classification in the current discussions on urban redevelopment basic methods and tools are taught. The students of the module Urban Renewal shall be able to elaborate strategies of urban renewal and redevelopment. The basic methodological framework is the discussion of projects as examples for good practice. The module will be supplemented by courses such as "History of Urban Planning and the Built Environment" to consider the historical development and cultural heritage. In addition, in the course "Building Theory" urban qualities and implementation on the building level are taught.

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Urban Management lectures/exercises: 30 h
- Urban Planning I: History of Urban Planning and the Built Environment lectures: 30 h

independent study:

- preparation and follow-up Urban Management lectures/exercises: 30 h
- examination preparation Urban Management: 30 h
- preparation and follow-up Urban Planning I: History of Urban Planning and the Built Environment lectures: 30 h
- examination preparation History of Urban Planning: 30 h

total: 180 h

**Recommendation**

none

**Literature**

list of literature to module

**M****5.77 Module: Space and Infrastructure (bauIM3S02-PLRAUMINF) [M-BGU-100014]****Responsible:** PD Dr.-Ing. Martin Kagerbauer**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)  
Subject-Specific Supplements  
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-111278	Exercises Space and Infrastructure	1 CR	Kagerbauer, Keller
T-BGU-100056	Space and Infrastructure	5 CR	Kagerbauer, Keller

**Competence Certificate**

- 'Teilleistung' T-BGU-111278 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100056 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

As from summer term 2021 the Exercises Space and Infrastructure, T-BGU-111278, is examination prerequisite.

**Workload**

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

- Logistics, Supply and Disposal lecture/exercises: 30 h
- Fundamentals of Geographic Information Systems for Modelling and Planning lectures/exercises: 60 h

independent study:

- preparation and follow-up Logistics, Supply and Disposal lectures: 10 h
- preparation and follow-up Fundamentals of Geographic Information Systems for Modelling and Planning lectures/exercises: 10 h
- preparation of the Exercises Space and Infrastructure (not graded examination prerequisite): 25 h
- examination preparation: 45 h

total: 180 h

**Recommendation**

none

**Literature**

list of literature to module

**M****5.78 Module: Traffic Management und Simulation Methods (bauIM3S03-VERMANAGE) [M-BGU-100015]**

**Responsible:** Prof. Dr.-Ing. Peter Vortisch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each term	1 term	German	4	1

Mandatory			
T-BGU-100008	<a href="#">Traffic Management und Simulation Methods</a>	6 CR	Vortisch

**Competence Certificate**

- 'Teilleistung' T-BGU-100008 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Acquisition of the specific and advanced knowledge and the relevant methodologies in the field of traffic engineering. Basic considerations in the development and the application of simulation models in transport planning and traffic engineering.

**Content**

In excess of the basic module "Model approaches and methods in transportation" more advanced methods of traffic engineering will be dealt with (advanced signalisation, control of routes and networks). Furthermore methods for the development of simulation models as well as their application will be in the focus (application of professional software tools for transport planning and traffic engineering). Another issue are transport telematics and intelligent transportation system.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Traffic Management and Transport Telematics lectures/exercises: 30 h
- Traffic Flow Simulation lectures/exercises: 30 h

independent study:

- preparation and follow-up Traffic Management and Transport Telematics lectures/exercises: 30 h
- preparation and follow-up Traffic Flow Simulation lectures/exercises: 30
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**Literature**

lecture notes

guidelines ('Handbuch zur Bemessung von Straßen', 'Richtlinien für Lichtsignalanlagen'),  
 software documentations

**M****5.79 Module: Planning of Transportation Systems (bauIM3S04-VERPLAN) [M-BGU-100016]****Responsible:** Prof. Dr.-Ing. Peter Vortisch**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each term	1 term	German	4	1

Mandatory			
T-BGU-100013	<a href="#">Planning of Transportation Systems</a>	6 CR	Vortisch

**Competence Certificate**

- 'Teilleistung' T-BGU-100013 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students know all common means of transport and their properties. They can assess advantages and disadvantages of the means of transport from the perspective of users, operators and the environment, and they can make decisions about the system adapted to the situation. They understand the systemic interrelation of means of transport, infrastructure and mobility behaviour. The students know the methods of transportation planning common in practice and can these critically evaluate and develop further.

**Content**

- means of transport and their properties: capacity, velocity and energy consumption;
- environmental impacts: pollutant emission, noise and traffic safety;
- origin and evolution of traffic demand;
- examples of transport systems: bicycle traffic as system, planning procedures in public transport,
- boundary conditions of strategic planning: target systems, civic participation, policy influence;
- application of models;
- activity development;
- impact investigation and evaluation;
- examples: federal road plan, international master plans;
- transport development plans

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

As from summer term 2020 the learning control is a written exam.

**Workload**

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

- Characteristics of Transportation Systems lectures: 30 h
- Strategic Transport Planning lectures: 30 h

independent study:

- preparation and follow-up Characteristics of Transportation Systems lectures: 30 h
- preparation and follow-up Strategic Transport Planning lectures: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

course Transportation (6200406)

**Literature**

lecture notes and materials are available for downloading



**M****5.80 Module: Highway Design (bauIM3S05-STRENTW) [M-BGU-100017]****Responsible:** Dr.-Ing. Matthias Zimmermann**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)  
Subject-Specific Supplements  
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each term	1 term	German	4	2

Mandatory			
T-BGU-109917	Study Project Design of a Rural Road	2 CR	Roos, Zimmermann
T-BGU-100057	Highway Design	4 CR	Roos, Zimmermann

**Competence Certificate**

- 'Teilleistung' T-BGU-109917 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100057 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The graduates can apply methods as well as manual and computer aided procedures for the design of a road in position elevation and cross section and design new roads. Furthermore, they are able to develop and evaluate variants of new roads considering traffic, topographic, ecologic and economic requirements as well as to assess road designs in compliance with the technical regulations.

**Content**

In this module the procedure of finding the route of a bypass road will be discussed and applied to a specific planning example. After defining the boundary conditions for the draft of this bypass road design solutions are developed in the map, in the gradient diagram and in the cross-section manually by small teams. The results are discussed. Here also, tests are made whether the standards are satisfied and related to requirements of the spatial route planning. In parallel to this manual route planning of the road, the procedure of a computer aided road design is addressed in theory as well as practically at basic design examples. The exercises are conducted by use of the both most popular design codes.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- IT-based Road Design lectures/exercises: 30 h
- Highway Design Project Study lectures/exercises: 30 h

independent study:

- preparation and follow-up IT-based Road Design lectures/exercises: 30 h
- preparation and follow-up Highway Design Project Study lectures/exercises: 30 h
- attestation of study project (examination prerequisite): 20 h
- examination preparation: 40 h

total: 180 h

**Recommendation**

preliminary attendance of the compulsory module Infrastructure Management [bauIM3P3-STRINFRA]

**M****5.81 Module: Road Construction (bauIM3S06-STRBAUT) [M-BGU-100006]****Responsible:** Prof. Dr.-Ing. Ralf Roos**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)  
Subject-Specific Supplements  
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)**Credits**  
6**Grading scale**  
Grade to a tenth**Recurrence**  
Each winter term**Duration**  
1 term**Language**  
German**Level**  
4**Version**  
1

Mandatory			
T-BGU-100058	Road Construction	6 CR	Roos

**Competence Certificate**

- 'Teilleistung' T-BGU-100058 with oral examination according to § 4 Par. 2 No. 2  
details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The graduates are able to dimension and to test roadway constructions build of asphalt and concrete empirically and by calculation and to assess the impact of internal and external influencing factors on roadway constructions. Furthermore, they are able to explain mechanisms of failure, to question and to evaluate failures as well as to test material parameters by experimental techniques in the lab.

**Content**

In this module material models, influencing factors on roadway constructions as well as basics and parameters for an empirical and calculatory dimensioning of transportation routes are addressed deeply. Furthermore, deficiencies and failures of roadway constructions are presented and failure mechanisms are explained. In the practical training experiments on the determination of material parameters of unconsolidated materials, bitumen and asphalt are conducted, analysed and evaluated as well as the application of dimensioning methods are examined at real-world examples.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Practical Laboratory Training in Road Construction lectures/exercises: 30 h
- Pavement Structural Design and Failure Analysis lectures: 30 h

independent study:

- preparation and follow-up Practical Laboratory Training in Road Construction lectures/exercises: 30 h
- preparation and follow-up Pavement Structural Design and Failure Analysis lectures: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

preliminary attendance of the compulsory module Infrastructure Management [mobiM301-STRINFRA]

**M****5.82 Module: Project Integrated Planning (bauiM3S09-PROJEKTIP) [M-BGU-100018]****Responsible:** Prof. Dr.-Ing. Ralf Roos**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-BGU-109916	<a href="#">Group Exercise Project Integrated Planning</a>	5 CR	Roos
T-BGU-100061	<a href="#">Project Integrated Planning</a>	1 CR	Roos

**Competence Certificate**

- 'Teilleistung' T-BGU-109916 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100061 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The graduates are able to analyze the planning requirements of the different subject areas in the field mobility and infrastructure and to apply them to a specific example. They identify the weak points, develop realizable solutions and discuss them in the framework of a multi-disciplinary weighing process. Furthermore, they can work self-organized and have organisational and didactic competences with respect to team work and presentation.

**Content**

A typical practical task in the field of spatial and infrastructure planning has to be elaborated (e.g. ideas contest in town planning). The students have to take charge of certain planning tasks from the fields town planning, transport studies, highway engineering and track guided transport systems and develop different solution concepts based on a conflict and deficiency analysis. In order to obtain an integrated planning concept the requirements of the involved subject areas have to be considered. Subsequent to a weighing process, they select well-founded a acceptable and sustainable concept which they develop further and present in 3 phases to a realizable solution on different levels of detail.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- on-site meeting, technical group meetings, presentations: 15 h

independent study:

- preparation and follow-up: 15 h
- team exercise (examination prerequisite, part per person): 135 h
- examination preparation and examination: 15 h

total: 180 h

**Recommendation**

preliminary attendance of at least 2 compulsory modules in the study focus Mobility and Infrastructure

**M****5.83 Module: Intermodality in Freight, Long-Distance and Air Transport (bauIM3S11-VERINTER) [M-BGU-100020]****Responsible:** Bastian Chlond**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each term	2 terms	German	4	4

Mandatory			
T-BGU-106611	<a href="#">Freight Transport</a>	3 CR	Chlond
T-BGU-106301	<a href="#">Long-Distance and Air Traffic</a>	3 CR	Chlond

**Competence Certificate**

- 'Teilleistung' T-BGU-106611 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-106301 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Knowledges about the characteristics of freight transportation, long distance travel and air travel against the background of the globalization and and EU-integration Knowledge about the challenges and the design and of intermodal transport services.

**Content**

- relevant factors for the demand in freight transport
- methods for demand forecasts and planning in freight transport
- measures for influencing the demand in freight transport as well as their efficiency
- particularities of the airline industry in a global market shown in case studies
- organisation of the airline industry
- particularities of Long Distance Travel
- methodology of the Federal Transport Master Plan
- evolution of Long Distance Transport Systems

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Freight Transport lectures/exercises: 30 h
- Long-distance and Air Traffic lectures: 30 h

independent study:

- preparation and follow-up Freight Transport lectures/exercises: 30 h
- examination preparation Freight Transport (partial exam): 30 h
- preparation and follow-up Long-distance and Air Traffic lectures: 30 h
- examination preparation Long-distance and Air Traffic (partial exam): 30 h

total: 180 h

**Recommendation**

none

**Literature**

lecture accompanying documents

**M****5.84 Module: Road Safety (bauIM3S12-STRVSICH) [M-BGU-100021]****Responsible:** Dr.-Ing. Matthias Zimmermann**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)  
Subject-Specific Supplements  
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	3

Mandatory			
T-BGU-109915	Seminar Paper Road Safety	3 CR	Zimmermann
T-BGU-100062	Road Safety	3 CR	Zimmermann

**Competence Certificate**

- 'Teilleistung' T-BGU-109912 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100062 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The graduates are able to apply methods and techniques for the improvement of road safety, to evaluate the safety of road networks, road sections and junctions, to identify accident black spots, to analyse accidents and their causes as well as to develop measures to improve road safety and evaluate them in their effect. Furthermore, they are able to self-organized and have organisational and didactic competences available related to team work and presentations.

**Content**

In this course the theoretical basics of road safety are repeated and fundamental improvements are discussed.

During the following seminar in highway engineering changing regional accident black spots are analysed and improvements for the road authorities are worked out and will be presented.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Safety Management in Highway Engineering lectures/exercises: 30 h
- Seminar in Highway Engineering: 30 h

independent study:

- preparation and follow-up Safety Management in Highway Engineering lectures/exercises: 30 h
- preparation of seminar paper (examination prerequisite): 60 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**M****5.85 Module: Special Topics in Highway Engineering (bauIM3S13-STRSPEZ) [M-BGU-100022]****Responsible:** Prof. Dr.-Ing. Ralf Roos**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-106734	<a href="#">Special Topics in Highway Engineering</a>	6 CR	Hess, Roos

**Competence Certificate**

- 'Teilleistung' T-BGU-106734 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The graduates are able to apply methods and techniques for specific aspects in the life cycle of a road, to modify them for the application case and to analyse the obtained knowledge. They are able to investigate the organisation and implementation of the operation and maintenance of a road, for instance, to reveal the weak points and to develop improvement possibilities.

**Content**

In this module the duties of the management of existing roads are acquired and the technical and commercial control from the point of view of the road authorities are explained. Further, different methods for the simulation, analysis and evaluation of additional problems and special aspects in highway engineering are presented and discussed by means of varying topics of design, construction, operation and maintenance of roads (e.g. statistical analysis of large data sets, simulation of traffic flow under particular boundary conditions, construction material analysis in lab experiments, innovative contractual forms for construction and operation of roads, econ. privatization).

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Technical and Economic Management Tools in Highway Engineering lectures: 30 h
- Simulations and Analysis Methods in Highway Engineering lectures: 15 h
- Special Topics in Highway Engineering lectures: 15 h

independent study:

- preparation and follow-up Technical and Economic Management Tools in Highway Engineering lectures: 30 h
- preparation and follow-up Simulations and Analysis Methods in Highway Engineering lectures: 15 h
- preparation and follow-up Special Topics in Highway Engineering lectures: 15 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

preliminary attendance of the compulsory module Infrastructure Management [bauIM3P3-STRINFRA]

**M****5.86 Module: City Transport Facilities (bauim3S17-STRIVA) [M-BGU-100026]****Responsible:** Prof. Dr.-Ing. Ralf Roos**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** Study Focus I / Mobility and Infrastructure (Compulsory Modules) (Usage from 10/1/2018)  
 Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)  
 Subject-Specific Supplements  
 Study Focus II / Mobility and Infrastructure (Compulsory Modules) (Usage from 10/1/2018)  
 Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-BGU-109912	Exercises and Student Research Project City Transport Facilities	2 CR	Roos
T-BGU-100083	City Transport Facilities	4 CR	Roos

**Competence Certificate**

- 'Teilleistung' T-BGU-109912 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-100083 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The graduates are able to plan and design city transport facilities related to car, bicycle, pedestrian and public traffic as well as to test, evaluate and optimize existing infrastructure. Further, they are able to assess the different usage requirements of different types of transportation and to consider them appropriately in design planning.

**Content**

Manifold requirements are put on city transport facilities in contrast to overland roads: usage from transit to access traffic, usage for stationary traffic, weak road users such as bicyclist and pedestrians, the demand of moving traffic, for stay and recreation activities up to the designing of the transport facilities considering the cityscape. Contemporarily, a variety of carriers of traffic are found within urban areas which have to be taken into consideration for designing roads and junctions as well as the network of transportation routes. All aspects are covered, discussed and their handling is practised at practically relevant case studies within this module.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lectures/exercises: 45 h

independent study:

- preparation and follow-up lectures/exercises: 30 h
- preparation of exercises and student research project (examination prerequisite): 70 h
- examination preparation: 40 h

total: 185 h

**Recommendation**

none



**M****5.87 Module: Track Guided Transport Systems - Operation and Capacity (bauIM3S18-EBBETRKAP) [M-BGU-100581]****Responsible:** Jan Tzschaschel**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)**Credits**  
6**Grading scale**  
Grade to a tenth**Recurrence**  
Each summer term**Duration**  
1 term**Language**  
German**Level**  
4**Version**  
1

Mandatory			
T-BGU-101002	<a href="#">Track Guided Transport Systems - Operation and Capacity</a>	6 CR	Tzschaschel

**Competence Certificate**

- 'Teilleistung' T-BGU-101002 with written examination according to § 4 Par. 2 No. 1  
details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The Students can analyse, structure and describe formally problems in the field of operation of track guided transport systems. They are able to process methodically questions of security and capacity of railway tracks and to propose solutions.

**Content**

- operation and signal systems
- safety and signalbox technologies
- time table compilation
- performance and capacity of railway lines
- proof of safety
- operation and dimensioning of marshalling yards

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

as from summer term 2022 written examination

**Workload**

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

- Operation Track Guided Systems lectures: 30 h
- Operation Systems and Track Guided Infrastructure Capacity lectures: 30 h

independent study:

- preparation and follow-up Operation Track Guided Systems lectures: 30 h
- preparation and follow-up Operation Systems and Track Guided Infrastructure Capacity lectures: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**Literature**

Fiedler, Grundlagen der Bahntechnik, Werner-Verlag, Düsseldorf  
Hausmann, Enders, Grundlagen des Bahnbetriebs, Bahn-Fachverlag, Heidelberg  
Pachl, Systemtechnik des Schienenverkehrs, Teubner-Verlag, Stuttgart

**M****5.88 Module: Analysis and Evolution of Mobility (bauim3S20-VERANAMOB) [M-BGU-100583]****Responsible:** PD Dr.-Ing. Martin Kagerbauer**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Mobility and Infrastructure \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each term	2 terms	German	4	2

Mandatory			
T-BGU-101004	<a href="#">Analysis and Evolution of Mobility</a>	6 CR	Kagerbauer

**Competence Certificate**

- 'Teilleistung' T-BGU-101004 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students master the methods to capture and to analyse the mobility behaviour of the people and recognize trends in the behaviour. They know up to date mobility offers and are able to evaluate these from the point of view of users and operators.

**Content**

- capturing mobility: measurements and surveys, data preparation
- analysis: statistical methods and software tools therefore (SAS, R), also practical exercises at PC
- new forms of mobility, e.g. sharing systems for cars and bicycles
- mobility services: rideshare services, intermodal information systems etc.
- analysis of functionality, interrelations and backgrounds of these mobility forms

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Transportation Data Analysis lectures/exercises: 30 h
- Mobility Services and new Forms of Mobility lectures/exercises: 30 h

independent study:

- preparation and follow-up Transportation Data Analysis lectures/exercises: 30 h
- preparation and follow-up Mobility Services and new Forms of Mobility lectures/exercises: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

course Transportation (6200406)

**M****5.89 Module: Special Issues of Public Transport (bauim3s22-VERSPEZOEV) [M-BGU-103357]****Responsible:** Prof. Dr.-Ing. Peter Vortisch**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Mobility and Infrastructure (Compulsory Elective Modules)  
Subject-Specific Supplements  
Study Focus II / Mobility and Infrastructure (Compulsory Elective Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each term	1 term	German	4	3

**Election notes**

Two of the courses with the associated examinations are to be selected.

Electives (Election: 2 items as well as 6 credits)			
T-BGU-101005	<a href="#">Tendering, Planning and Financing in Public Transport</a>	3 CR	Vortisch
T-BGU-100014	<a href="#">Seminar in Transportation</a>	3 CR	Chlond, Vortisch
T-BGU-106608	<a href="#">Information Management for Public Mobility Services</a>	3 CR	Vortisch
T-BGU-111057	<a href="#">Sustainability in Mobility Systems</a>	3 CR	Kagerbauer

**Competence Certificate**

two learning controls have to be selected:

- 'Teilleistung' T-BGU-101005 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-100014 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-106608 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-111057 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

see German version

**Content**

see German version

**Module grade calculation**

grade of the module is CP weighted average of grades of the selected partial exams

**Annotation**

none

**Workload**

contact hours (1 HpW = 1 h x 15 weeks), depending on selected courses:

- Tendering, Planning and Financing in Public Transport lectures: 30 h
- Seminar in Transportation: 30 h
- Information Management for public Mobility Services lectures/exercises: 30 h
- Sustainability in Mobility Systems lectures: 30 h

independent study, depending on selected courses:

- preparation and follow-up Tendering, Planning and Financing in Public Transport lectures: 30 h
- examination preparation Tendering, Planning and Financing in Public Transport (selectable partial exam): 30 h
- preparation of term paper and presentation (selectable partial exam): 60 h
- preparation and follow-up Information Management for public Mobility Services lectures/exercises: 30 h
- preparation accompanying exercises Information Management for public Mobility Services (selectable partial exam): 30 h
- preparation and follow-up Sustainability in Mobility Systems lectures: 30 h
- examination preparation Sustainability in Mobility Systems (selectable partial exam): 30 h

total: 180 h

**Recommendation**

course Transportation (6200406)

**M****5.90 Module: Sustainability in Real Estate Management (bauIM4P4-) [M-BGU-100112]****Responsible:** Prof. Dr.-Ing. Kunibert Lennerts**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Modules\)](#)[Subject-Specific Supplements](#)[Study Focus II / Technology and Management in Construction \(Compulsory Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100149	<a href="#">Sustainability in Real Estate Management</a>	6 CR	Lennerts

**Competence Certificate**

- 'Teilleistung' T-BGU-100149 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can present the essential interrelationships within sustainable construction and operation and understand the importance of multi-criteria analyses. The students analyse current scientific publications in this field independently with the aim of arguing thematically and scientifically in society. They can explain the focus of international real estate sustainability certification systems, describe differences in their assessment methodology and highlight their advantages and disadvantages.

Furthermore, the students can apply selected assessment criteria of the systems presented. The students understand questions of economic and ecological assessment along the life cycle of buildings and can independently carry out life cycle analyses. They can interpret the results of life cycle analyses and to evaluate system limits and calculation parameters in published analyses.

Furthermore, the students know the process of award procedures in FM and can discuss these in connection with public procurement law. Furthermore, they can explain and benchmark the essential contents of outsourcing FM services and their effects. Furthermore, they understand the importance of information technology in facility management.

**Content**

- definition and history of the term sustainability
- study of current peer-reviewed papers
- economic, ecological, and socio-cultural significance of the built environment
- costs and environmental impacts of real estate
- national and international sustainability assessment procedures for real estate
- calculation methods for life cycle costs
- life cycle assessment for buildings
- external costs in building construction and their integration in life cycle costing
- outsourcing and procurement regulations in facility management
- data collection (CAFM) in facility management
- presentation of measurement criteria for SLA and KPI and digitalisation
- Balanced Scorecard

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Sustainability in Real Estate Management lecture/exercise: 30 h
- Life Cycle Management of Real Estate lecture: 15 h
- Facility and Real Estate Management II lecture: 15 h

independent study:

- preparation and follow-up lecture/exercises Sustainability in Real Estate Management: 30 h
- preparation and follow-up lectures Life Cycle Management of Real Estate: 15 h
- preparation and follow-up lectures Facility and Real Estate Management II: 15 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

courses Facility und Real Estate Management I (6200414), Life Cycle Management (6200615)

**M****5.91 Module: Project Management in Construction and Real Estate Industry (bauIM4P5-) [M-BGU-100338]****Responsible:** Prof. Dr.-Ing. Shervin Haghsheno**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Technology and Management in Construction (Compulsory Modules)  
Subject-Specific Supplements  
Study Focus II / Technology and Management in Construction (Compulsory Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	4

Mandatory			
T-BGU-100622	Project Management in Construction and Real Estate Industry	5 CR	Haghsheno
T-BGU-108011	Student Research Project 'Scheduling and Building Site Facilities'	1 CR	Schneider

**Competence Certificate**

- 'Teilleistung' T-BGU-108011 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100622 with examination of other type according to § 4 Par. 2 No. 3

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students have advanced knowledge in the field of project management in the application of construction and real estate management. The focus is particularly on the phases of project preparation (project set-up) and design. They are aware of the importance of comprehensive requirements planning and can apply methods for requirements planning and evaluate concerning completeness and plausibility. In addition, the students can explain procurement and project delivery methods and select and adapt them to the existing framework conditions of a project. They can also present the essential aspects of schedule, cost, quality, and risk management and adapt them to the project framework conditions. They can also explain approaches which can be used to shape project culture.

**Content**

Based on the basics of project management, selected topics in the field of project management in the application of construction and real estate management are deepened in this module.

The emphasis is placed on the following fields of action and competence:

- project preparation incl. determination of requirements,
- procurement models and award processes,
- project execution models incl. project organization and contract models,
- quality, schedule, and cost management,
- risk management,
- project culture.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

The students work as teams within the framework of a case study. The results of the case study are documented in form of a report and presented by the students at the end of the module. The module follows the 'flipped classroom' approach.

**Workload**

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

- lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises: 60 h
- teamwork, preparation of the paper and presentations (examination): 60 h
- preparation of student research project (not graded accomplishment): 30 h

total: 180 h

**Recommendation**

course 'Project Management' (6200106)

**Literature**

- Ahrens, H.; Bastian, K.; Muchowski, L. (Hrsg.) (2021): Handbuch – Projektsteuerung, Baumanagement. Fraunhofer IRB Verlag.
- Allison, M.; Ashcraft, H.; Cheng, R.; Klawens, S.; Pease, J. (2018): Integrated Project Delivery - An Action Guide for Leaders.
- Ausschuss der Verbände und Kammern der Ingenieure und Architekten für die Honorarordnung e.V. (Hrsg.) (2020): Heft Nr. 9: Projektmanagement in der Bau- und Immobilienwirtschaft - Standards für Leistungen und Vergütung. Reguvis Fachmedien.
- Breyer, W. (2017): Partnering Modelle - ein internationaler Vergleich. In: Planen, Errichten und Betreiben. Digitalisierung im Bau. 4. Internationaler BBB-Kongress. Hrsg. von Fritz Berner. BBB Professoren. Stuttgart: Institut für Baubetriebslehre, Universität Stuttgart, S. 163–177.
- Eitelhuber, A. et al. (Hrsg.) (2008). Partnering in der Bau- und Immobilienwirtschaft: Projektmanagement- und Vertragsstandards in Deutschland. Handbücher: Rechtswissenschaften und Verwaltung. Kohlhammer, Stuttgart. ISBN: 9783170198616.
- Eschenbruch, K. (2009). Projektmanagement und Projektsteuerung für die Immobilien- und Bauwirtschaft. Die rechtlichen Grundlagen für Leistung, Vergütung, Nachträge, Haftung, Vergabe und Vertragsgestaltung – Kommentar zum Vertragsmusterrecht und Leistungsbild Bund – mit Vertragsmustern aus der Praxis für öffentliche und private Auftraggeber. 3. Aufl., Werner, Neuwied. ISBN: 978-3-8041-1467-8.
- Fiedler, M. (2018): Lean Construction – Das Managementhandbuch – Agile Methoden und Lean Management im Bauwesen. Springer, Berlin, Heidelberg.
- Girmscheid, G. (2016): Projektabwicklung in der Bauwirtschaft: Wege zur Win-Win-Situation für Auftraggeber und Auftragnehmer. Wege zur Win-Win-Situation für Auftraggeber und Auftragnehmer. 5. Aufl. VDI-Buch. Springer, Berlin, Heidelberg. ISBN: 978-3-662-49329-8.
- Heidemann, A. (2011): Kooperative Projektabwicklung im Bauwesen unter der Berücksichtigung von Lean-Prinzipien - Entwicklung eines Lean- Projektabwicklungssystems. Internationale Untersuchungen im Hinblick auf die Umsetzung und Anwendbarkeit in Deutschland". Karlsruhe: Universität Karlsruhe. ISBN: 978-3-86644-583-3.
- Kochendörfer, B.; Liebchen, J. H.; Viering, M. G. (2018): Bau-Projekt-Management. Grundlagen und Vorgehensweisen. 5. Aufl. Leitfaden des Baubetriebs und der Bauwirtschaft. Wiesbaden, Springer Vieweg. ISBN: 978-3-8348-1823-2. DOI: 10.1007/978-3-8348-2245-1. URL: <http://dx.doi.org/10.1007/978-3-8348-2245-1>.
- Mafakheri, F.; Dai, L.; Slezak, D.; Nasiri, F. (2007): Project Delivery System Selection under Uncertainty. In: Journal of Management in Engineering 23 (4), S. 200-206.
- Schlabach, C. (2013): Untersuchungen zum Transfer der australischen Projektabwicklungsform Project Alliancing auf den deutschen Hochbaumarkt. Dissertation, Kassel, Universität Kassel. ISBN: 9783862194902.
- Sommer, H. (2016): Projektmanagement im Hochbau mit BIM und Lean Management. Springer Vieweg.
- Walker, D. H. T.; Rowlinson, S. (Hrsg) (2020): Routledge handbook of integrated project delivery. 1. Aufl. Routledge handbooks. London, Routledge. ISBN: 9781138736689.
- Zuber, S. Z. S.; Nawi, M. N. M.; Nifa, F. A. A.; Bahaudin, A. Y. (2018): An Overview of Project Delivery Methods in Construction Industry. In: International Journal of Supply Chain Management 7 (6), S. 177-182.



**M****5.92 Module: Machinery and Process Engineering (bauIM4P6-) [M-BGU-100339]****Responsible:** Prof. Dr.-Ing. Sascha Gentes**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** Study Focus I / Technology and Management in Construction (Compulsory Modules)  
Subject-Specific Supplements  
Study Focus II / Technology and Management in Construction (Compulsory Modules)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-BGU-100623	Machinery and Process Engineering	5 CR	Gentes
T-BGU-108012	Student Research Project 'Excavation Pit Development and Shuttering Planning'	1 CR	Schneider

**Competence Certificate**

- 'Teilleistung' T-BGU-108012 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100623 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can name the basic principles and concepts of machine technology and are able to describe the built and function of construction machinery and equipment. They can appropriately name the equipment and select the suitable machines depending on their building tasks. They understand the BGL system (list of construction equipment) and are able to rank and classify machines and equipment as needed. They will realize optimization potentials using suitable process technology and equipment alternatives. Finally, they will be able to plan and size various construction machines and transport devices with respect to static and dynamic effects and impacts.

**Content**

This module provides machine technology basics to better understand a broad variety of construction equipment and machinery. Further, static and dynamic effects and impacts of construction equipment application will be discussed, various construction machines introduced, their respective applications compared, and basics for their dimensioning provided. Different construction machines and their variations will be presented with the help of the BGL system. In addition, the functions, variations, effectiveness, and applications for diverse construction and productions procedures used in processing technology, earthworks, underground engineering, and hydraulic engineering will be presented and discussed. The curriculum also includes the necessary technical basics for drive systems, power transmission components (mechanic and hydraulic), undercarriages, as well as steering controls, and safety facilities.

In addition to a building site visit for practical insight, a practical course on the institute's own test site will be offered to try out construction machinery. Finally, students need to develop two exercises within the scope of their seminar paper as part of this module.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Construction Equipment lecture: 30 h
- Process Engineering lecture: 30 h

independent study:

- preparation and follow-up lectures Construction Equipment: 20 h
- preparation and follow-up lectures Process Engineering: 20 h
- preparation of student research project: 30 h
- examination preparation: 50 h

total: 180 h

**Recommendation**

none

**Literature**

- 1) Baugeräteliste, aktuelle Fassung
- 2) Hüster, Felix, Leistungsberechnung der Baumaschinen, Shaker, 5. Aufl., Aachen, 2005.
- 3) Girmscheid, Gerhard: Leistungsermittlungshandbuch für Baumaschinen und Bauprozesse, Springer Berlin Heidelberg, 2010.
- 4) Drees, Gerhard; Krauß, Siri: Baumaschinen und Bauverfahren - Einsatzgebiete und Einsatzplanung, expert-Verlag, 3., völlig neu bearb. Aufl., Renningen, 2002.

**M****5.93 Module: Production Planning and Control in Construction (bauIM4P7-) [M-BGU-105918]****Responsible:** Prof. Dr.-Ing. Shervin Haghsheno**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Modules\)](#) (Usage from 4/1/2022)[Subject-Specific Supplements](#) (Usage from 4/1/2022)[Study Focus II / Technology and Management in Construction \(Compulsory Modules\)](#) (Usage from 4/1/2022)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-111901	<a href="#">Production Planning and Control in Construction</a>	5 CR	Haghsheno
T-BGU-108010	<a href="#">Student Research Project 'Cost Estimation in Structural Engineering and Earthworks'</a>	1 CR	Schneider

**Competence Certificate**

- 'Teilleistung' T-BGU-108010 with not graded accomplishment according to § 4 Par. 3

- 'Teilleistung' T-BGU-111901 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

The module must not be taken together with the module Economics and Management in Construction [bauIM4P3-] not offered anymore.

**Competence Goal**

The students can describe the essential technical, business, and organizational tasks of construction management from the order to acceptance and can analyze and evaluate the individual work steps. They can describe the fundamental processes of construction site planning and handling and assign suitable methods and tasks. Besides, they can design production systems for selected products from the construction industry and apply various techniques and methods for resource and logistics planning. Furthermore, the students can name the essential accident prevention regulations and can describe the active and passive protection measures as well as the organization of the labor protection. In addition, the students can develop approaches to solutions in the area of occupational safety on the basis of problem situations.

The students can explain the different methods of calculation and the structure of a calculation. They have the knowledge to create tenders and unit prices independently. Furthermore, students can apply current software for the calculation. Furthermore, the course clarifies, how to create, justify and calculate claims based on the VOB/B by using practical examples.

Students can explain the construction contract laws as well as the difference between BGB and VOB. Furthermore, students can explain the different types of procurement. The students are familiar with legal thinking regarding contract and employment law and can apply the basics to construction projects. Thereby, they can assess and evaluate the contents of a construction contract.

**Content**

The course site management presents the work of foreman, site manager, and project manager and contains significant aspects of management processes of the construction site. In addition to performance reporting, work costing and site management, the technical, legal and economic tasks of the site manager as well as communication and correspondence on the construction site will be highlighted. In addition, accident prevention regulations, active and passive protection measures as well as the organization of the labor protection during operation and on site are discussed.

The area of construction site planning and handling deals in more detail with various production systems and factors from the construction industry. Based on this, resource planning for the management of a construction site is dealt with in more detail. In addition to the resources of financial resources, machines and employees, logistics planning is also dealt with in more detail. In the context of resource planning, in-depth insights into costing are given and the topic of claim management, which deals with the handling of supplements, is also dealt with in particular. In the area of construction law, topics relating to the construction contract are dealt with. In addition, the areas of obstructions, liability and limitation periods are also addressed.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

This module will be offered newly as from summer term 2022.

**Workload**

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

- Site Management lecture: 15 h
- Site Planning and Handling lecture/exercise: 45 h

independent study:

- preparation and follow-up lectures Site Management: 15 h
- preparation and follow-up lecture/exercises Site Planning and Handling: 30 h
- preparation of student research project: 30 h
- examination preparation: 45 h

total: 180 h

**Recommendation**

none

**Literature**

Elwert, Ulrich, Flassak, Alexander: Nachtragsmanagement in der Baupraxis - Grundlagen, Beispiele, Anwendung, Vieweg, 2., erw. und aktualisierte Aufl., Wiesbaden, 2008.

Berner, Fritz; Kochendörfer, Bernd; Schach, Rainer: Grundlagen der Baubetriebslehre 2 Baubetriebsplanung, Imprint: Springer Vieweg, Wiesbaden, 2013

Hofstadler, Christian: Bauablaufplanung und Logistik im Baubetrieb, Springer, Berlin, 2007

Schach, Rainer; Otto, Jens: Baustelleneinrichtung Grundlagen – Planung – Praxishinweise – Vorschriften und Regeln, Springer Fachmedien Wiesbaden GmbH, Wiesbaden, 2017

Drees, Gerhard; Paul, Wolfgang: Kalkulation von Baupreisen, Beuth Verlag GmbH, Berlin, 2015

Hauptverband d. Deutschen Bauindustrie/Zentralverband d. Deutschen Baugewerbes: Kosten-, Leistungs- und Ergebnisrechnung der Bauunternehmen, Rudolf Müller GmbH & Co. KG, Köln, 2016

**M****5.94 Module: Environmentally-friendly Recycling and Disassembly of Buildings (bauIM4S06-) [M-BGU-100110]**

**Responsible:** Prof. Dr.-Ing. Sascha Gentes  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100146	<a href="#">Environmentally-Friendly Recycling and Disassembly of Buildings</a>	6 CR	Gentes

**Competence Certificate**

- 'Teilleistung' T-BGU-100146 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can independently plan demolition, dismantling and disposal work for structural and technical systems, apply for them and implement them on site. They recognize the need and the sense of qualified demolition and the associated recycling related to the entire construction operation. They can explain various methods and procedures for implementation and realization. The students can assess demolition objects and demolition waste according to the current legal situation, implement safety requirements for demolition work and write risk assessments. They are able to evaluate recycling and disposal options and thus independently plan the necessary resources for demolition work (personnel, machines, processes) and create corresponding calculations.

**Content**

Information about the state of research and technology with respect to machined disassembly, transport, conditioning, dumping, and disposal of demolition waste, as well as the latest developments in machine technology is imparted. The entire approval process from the demolition license application to machine deployment plans will be discussed in addition to technical aspects. This also involves occupational safety, immission control, as well as handling pollutants in buildings to be demolished. Specific tasks, e.g. the partial demolition of existing buildings, will be explained and calculated using existing examples. VDI (The Association of German Engineers) guidelines pertaining to demolition projects will be introduced and an excursion to a recycling facility will provide the opportunity to discuss landfill directives.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Project Studies lecture, exercise: 30 h
- Disassembly Process Engineering lecture, exercise: 30 h

independent study:

- preparation and follow-up lectures, exercises Project Studies: 30 h
- preparation and follow-up lectures, exercises Disassembly Process Engineering: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**Literature**

- 1) Seemann, Axel: Entwicklung integrierter Rückbau- und Recyclingkonzepte für Gebäude - ein Ansatz zur Kopplung von Demontage, Sortierung und Aufbereitung, Shaker, Aachen, 2003.
- 2) RAL, Deutsches Institut für Gütesicherung und Kennzeichnung e.V.: Ausbau und Entsorgung von Gefahrstoffen in Bauwerken - Gütesicherung, Beuth, Ausg. Juni 2004, Berlin, 2004.
- 3) Schröder, Marcel [Red.]: Abbrucharbeiten - Grundlagen, Vorbereitung, Durchführung, Müller, 3., aktualisierte und erw. Aufl., Köln, 2015.
- 4) VDI 6202 "Schadstoffsanierung"
- 5) VDI 6210 "Abbruch"

**M****5.95 Module: Upgrading of Existing Buildings and Energetic Refurbishment (bauIM4S07-) [M-BGU-100108]****Responsible:** Prof. Dr.-Ing. Kunibert Lennerts**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#)[Subject-Specific Supplements](#)[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	3

Mandatory			
T-BGU-100621	<a href="#">Term Paper Upgrading of Existing Buildings and Energetic Refurbishment</a>	1,5 CR	Lennerts
T-BGU-108001	<a href="#">Upgrading of Existing Buildings and Energetic Refurbishment</a>	4,5 CR	Lennerts

**Competence Certificate**

- 'Teilleistung' T-BGU-100621 with examination of other type according to § 4 Par. 2 No. 3

- 'Teilleistung' T-BGU-108001 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students understand the economic, ecological and cultural significance of the building stock and to describe the specific tasks for a civil engineer in this field of activity. You can explain the advantages and disadvantages of different maintenance strategies and maintenance budgets can be calculated for real estate stocks. You know the basics of a technical due diligence and the basics of building information modeling. In addition, students may constitute the legal framework for energy rehabilitation measures and can use the methods of the energy performance of buildings apply.

**Content**

- durability and wear of components
- determination of component lifetimes
- budgeting of maintenance costs
- condition assessment & action planning
- monument and Historic Monuments
- building Information Modeling (BIM)
- policy development and historical development of the energy savings
- forms of energy and calculation of energy use
- energy efficiency of buildings by Energy Saving Ordinance
- renewables

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Upgrading of Existing Buildings lecture, exercise: 45 h
- Energetic Refurbishment lecture: 15 h

independent study:

- preparation and follow-up lectures/exercises Upgrading of Existing Buildings: 30 h
- preparation and follow-up lectures Energetic Refurbishment: 15 h
- preparation of term paper (partial examination): 25 h
- examination preparation (partial examination): 50 h

total: 180 h

**Recommendation**

none



**M****5.96 Module: Real Estate Management (bauiM4S08-) [M-BGU-100346]**

**Responsible:** Prof. Dr.-Ing. Kunibert Lennerts  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100629	<a href="#">Real Estate Management</a>	6 CR	Lennerts

**Competence Certificate**

- 'Teilleistung' T-BGU-100629 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students can distinguish between the prevailing real estate investment alternatives and apply the common controlling instruments in real estate management. They can evaluate real estate by means of different valuation methods and to prepare expert opinions. Furthermore, they can explain the basic features and specifics of real estate management in the public sector and the management of corporate real estate. Furthermore, they have knowledge of the decision-making bases and the implementation of public-private partnership projects and can clarify the benefits and limits of this procurement alternative. Furthermore, the students gain insight into the project development of real estate based on theoretical principles and case studies from practice and are put in a position to solve problems in project development.

**Content**

- controlling in real estate management
- valuation of real estate with the preparation of expert opinions
- special features in the management of corporate real estate
- special features in the real estate management of the public sector
- contract models and financing structures in PPP projects
- theoretical transfer and case studies from practice in the field of project development of real estate
- Onsite Lecture

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Real Estate Management Controlling lecture: 15 h
- Property Valuation Basics lecture: 15 h
- Corporate and Public Real Estate Management lecture: 15 h
- Project Development with Case Study lecture: 15 h

independent study:

- preparation and follow-up lectures Real Estate Management Controlling: 15 h
- preparation and follow-up lectures Property Valuation Basics: 15 h
- preparation and follow-up lectures Corporate and Public Real Estate Management: 15 h
- preparation and follow-up lectures Project Development with Case Study: 15 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**M****5.97 Module: Lean Construction (bauiM4S09-) [M-BGU-100104]**

**Responsible:** Prof. Dr.-Ing. Shervin Haghsheeno  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	3

Mandatory			
T-BGU-101007	<a href="#">Project Paper Lean Construction</a>	1,5 CR	Haghsheeno
T-BGU-108000	<a href="#">Lean Construction</a>	4,5 CR	Haghsheeno

**Competence Certificate**

- 'Teilleistung' T-BGU-101007 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-108000 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students are able to explain the theoretical basics of Lean Construction. They are able to choose the right process management approach for a project and to adapt and improve it during the project. Furthermore, students will be able to identify and analyze problems in construction projects from a process perspective. The students are able to explain the different tools of Lean Construction and select, combine and apply them according to the problem.

**Content**

In this module, the theoretical basics of Lean Construction are presented at the beginning and deepened through learning simulations and exercises. Subsequently, the Last Planner System™, value stream mapping and cooperative contract forms, among others, are examined in depth. Aspects such as construction site logistics, cost and quality management and planning management from a lean perspective. In the exercise, students work in small groups on selected topics based on provided literature and analyze them in the context of the knowledge from the lecture. The results of the small group work are compiled in a written paper and presented at the end of the lecture. To consolidate and reflect on the learning objective, a joint follow-up of the small group work will take place, in which the individual works will be placed in an overall context.

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 30 h
- preparation of project with report (partial exam): 30 h
- examination preparation (partial exam): 60 h

total: 180 h

**Recommendation**

none

**Literature**

Gehbauer, F. (2013) *Lean Management Im Bauwesen*. Skript des Instituts für Technologie und Management im Baubetrieb, Karlsruher Institut für Technologie (KIT).

Liker, J. & Meier, D. (2007) *Praxisbuch, der Toyota Weg: für jedes Unternehmen*. Finanzbuch Verlag.

Rother, M., Shook, J., & Wiegand, B. (2006). *Sehen lernen: mit Wertstromdesign die Wertschöpfung erhöhen und Verschwendung beseitigen*. Lean Management Institut.

**M****5.98 Module: Advanced Studies in Construction Engineering (bauM4S10-) [M-BGU-100344]****Responsible:** Prof. Dr.-Ing. Shervin Haghsheno**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-BGU-108003	<a href="#">Advanced Studies in Construction Engineering</a>	6 CR	Haghsheno

**Competence Certificate**

- 'Teilleistung' T-BGU-108003 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students are able to identify terms and modes of operations of specific construction equipment, combination of devices and special procedural systems in the subject areas earthwork and special underground engineering. They are able to understand and evaluate complex combinations of methods and processes with civil engineering works. Adding to this, they can identify the influence of outside influences to the selected devices and output-tool efficiency. Moreover, the students can amplify fundamental construction methods and construction designs of tunnels and galleries including the corresponding machines and devices as much as basic knowledge in blasting engineering.

**Content**

Earthwork and Underground Construction:

special equipment features and options of devices, mode of operation of the single devices and systems; process engineering of earthworks while mining, transportation, placing and compacting; influences on efficiency; soil improvement; quality control; transport and controls of devices and equipment; methods of underground construction, including special temporary pit supporting systems and foundations; underground improvements; injections; underpinning; tunneling; caisson construction; freezing of soil; quay walls; harbor constructions; statics of floating systems; support devices.

Tunnels and Blasting Engineering:

geological, rock mechanical and geotechnical parameters for underground constructions (tunnels and galleries, caves, etc.); project-related, process-related, and environmental influences; Machines and devices; special methods and advancements; selection criteria for proper tunnel methods; blasting engineering; explosive substances and blasting techniques; basic legal knowledge for blasting; study trip relating to blasting engineering.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Tunnel Construction and Blasting Engineering lecture: 30 h
- Operation Methods for Foundation and Marine Construction lecture: 15 h
- Operation Methods for Earthmoving lecture: 15 h

independent study:

- preparation and follow-up lectures Tunnel Construction and Blasting Engineering: 30 h
- preparation and follow-up lectures Operation Methods for Foundation and Marine Construction: 15 h
- preparation and follow-up lectures Operation Methods for Earthmoving: 15 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**M****5.99 Module: Decommissioning of Nuclear Facilities (bauM4S12-) [M-BGU-100345]**

**Responsible:** Prof. Dr.-Ing. Sascha Gentes  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100627	<a href="#">Decommissioning of Nuclear Facilities</a>	6 CR	Gentes

**Competence Certificate**

- 'Teilleistung' T-BGU-100627 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can name the processes, equipments and machinery for decommissioning nuclear facilities. They can explain analytical methods for the procedure, the required techniques and processes for decommissioning and can develop decommissioning concepts. They are able to analyse self-reliantly decommissioning projects of nuclear facilities and to work in teams. They can prepare proposal for approval considering the respective laws.

**Content**

This course provides an overview about the state of research and technology in mechanical process engineering for the decommissioning of nuclear facilities. This involves decontamination procedures, remote-handled procedures, and procedures for the separation of reinforced concrete, etc.

The required approvals and licenses and the involved authorities will be introduced and discussed using examples and legal sources, e.g. the German Atomic Energy Act (Atomgesetz). The basics of radiation protection together with the pertaining measurement technology will be explained in step with actual practice. Furthermore, a suitable system to successfully manage decommissioning projects will be presented as well as the numerous stakeholders involved.

A visit to a nuclear facility currently under decommissioning is part of the course. The new findings will be further discussed in conjunction with existing decommissioning projects which will also be presented by the involved industry partners.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Removal and Decontamination of Nuclear Facilities lecture, exercise: 30 h
- New Development and Optimization of Decommissioning Machine Technology lecture, exercise: 30 h

independent study:

- preparation and follow-up lectures, exercises Removal and Decontamination of Nuclear Facilities: 30 h
- preparation and follow-up lectures, exercises New Development and Optimization of Decommissioning Machine Technology: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**Literature**

- 1) Kohli, Rajiv [Hrsg.]: Developments in surface contamination and cleaning - fundamentals and applied aspects, Knovel library, USA, 2008.
- 2) Rahman, A.: Decommissioning and radioactive waste management, Whittles, Dunbeath, 2008.
- 3) Thierfeldt, S.; Schartmann, F.: Stilllegung und Rückbau kerntechnischer Anlagen - Erfahrungen und Perspektiven, 4. Neu bearbeitete Auflage, Brenk Systemplanung Aachen, 2012.
- 4) Zeiher, Marco: Ein Entscheidungsunterstützungsmodell für den Rückbau massiver Betonstrukturen in kerntechnischen Anlagen, Karlsruhe, Univ., Diss., 2009.
- 5) Fortschrittsbericht über den Stand der BMBF – Stilllegungsprojekte und der vom BMBF geförderten FuE-Arbeiten zu 'Stilllegung / Rückbau kerntechnischer Anlagen'



**M****5.100 Module: Facility Management in Hospitals and Hospital Management (bauIM4S13-) [M-BGU-100347]****Responsible:** Prof. Dr.-Ing. Kunibert Lennerts**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-BGU-109291	<a href="#">Facility Management in Hospitals and Hospital Management</a>	6 CR	Lennerts

**Competence Certificate**

- 'Teilleistung' T-BGU-109291 with examination of other type according to § 4 Par. 2 No. 3  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students are able to describe and understand the principle of funding hospitals the basics of the German health care system. You know the cost structures in a hospital and are able to understand the basis of the hospital accounting. Students are able to distinguish primary and secondary processes in a hospital each other.

For selected facility management processes (secondary) processes, students can carry out strategic planning. Students understand the basic principles of hospital planning with a focus on master planning, space and function program and layout planning. Furthermore, students can give an overview over a wide range of hospital management.

**Content**

- hospital financing
- cost structures of a hospital
- facility management processes in hospitals
- strategic planning of selected facility management services
- sustainable hospitals
- master planning, space and function program and layout planning of hospitals
- introduction to hospital management
- internal organizational structures, working conditions and working environment in the hospital

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Facility Management in Hospitals lecture/exercise: 45 h
- Hospital Management lecture: 15 h

independent study:

- preparation and follow-up lecture/exercises Facility Management in Hospitals: 30 h
- preparation and follow-up lectures Hospital Management: 15 h
- preparation of term paper Facility Management in Hospitals and Hospital Management: 75 h

total: 180 h

**Recommendation**

course Facility and Real Estate Management (6200414)

**M****5.101 Module: Building Information Modeling (BIM) (bauIM4S16-) [M-BGU-103916]****Responsible:** Prof. Dr.-Ing. Shervin Haghsheno**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-108007	<a href="#">Building Information Modeling (BIM)</a>	6 CR	Haghsheno

**Competence Certificate**

- 'Teilleistung' T-BGU-108007 with examination of other type according to § 4 Par. 2 No. 3  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can describe the BIM method and the theoretical foundations of different perspectives of building digitalisation. Furthermore, they can apply CAD in practice in the construction industry and carry out modelling steps and link the modelled components with further information themselves. The students can present the different interests of the project participants within the framework of BIM and assess the perspectives of different project participants in a construction project. Thus, they are able to work in a team on planning and construction processes with different project participants.

**Content**

"Building Information Modelling (BIM) is a collaborative working methodology that uses digital models of a building to consistently capture and manage the information and data relevant to its life cycle and to exchange them in transparent communication between the parties involved or to transfer them for further processing" [2]. The module deals with the historical development of the method and provides the theoretical foundations necessary for understanding and applying BIM. Further application possibilities such as linking the building model with production planning and ERP systems or in the area of virtual building simulation are demonstrated. In addition, a project is modelled throughout several process phases in the context of group work, taking into account the goals of various participants. Since the creation of a three-dimensional building model is an essential prerequisite for the application of BIM, an introduction to CAD is provided as part of this module. In addition, CAD exercises are offered for practical application.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

For participation, it is necessary to have access to a notebook with a Windows operating system (64bit). The required software will be provided as student versions during the course.

**registration procedure:**

The number of participants is limited to 50 persons (civil engineering students). Registration details will be published in advance on the institute's homepage. If necessary, a selection will be made taking into account the student's progress. Confirmation of participation will be issued by the end of the first week of lectures.

**Workload**

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises, tutorials: 60 h
- project work, preparation of report and presentation (exam): 60 h

total: 180 h

**Recommendation**

course Computer Aided Design (CAD) (6200520)

topic 'Cost Estimation' in the course Economics in Construction Operation (6200412) from the module Technology and Management in Construction [bauIBFP6-TMB]

course Site Planning and Handling (6241803) from the module Production Planning and Control in Construction [bauIM4P7-]

**Literature**

[1] Borrmann, André; Köni, Markus; Koch, Christian; Beetz, Jakob; König, Markus (Hg.) (2015): Building information modeling // Building Information Modeling. Technologische Grundlagen und industrielle Praxis. Wiesbaden: Springer Vieweg (VDI-Buch).

[2] Bundesministerium für Verkehr und digitale Infrastruktur (Hg.) (2015): Stufenplan Digitales Planen und Bauen. Einführung moderner, IT-gestützter Prozesse und Technologien bei Planung, Bau und Betrieb von Bauwerken.

[3] Hausknecht, Kerstin; Liebich, Thomas (2016): BIM-Kompodium. Building Information Modeling als neue Planungsmethode. Stuttgart: Fraunhofer IRB Verlag.

**M****5.102 Module: Research Seminar Construction Management (bauIM4S17-) [M-BGU-103917]****Responsible:** Prof. Dr.-Ing. Shervin Haghsheno**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each term	2 terms	German	4	1

Mandatory			
T-BGU-108008	<a href="#">Research Seminar Construction Management</a>	6 CR	Haghsheno

**Competence Certificate**

- 'Teilleistung' T-BGU-108008 with examination of other type according to § 4 Par. 2 No. 3  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can name the principles of the theory of science and different research methods and can apply them self-reliantly to scientific problems in the context of construction management. They are able to prepare self-reliantly scientific papers.

**Content**

- theory of science
- research methods in context of research questions in construction management
- basics for scientific working
- structure, form and style of scientific papers
- application at example of specific and current research questions in the field of construction management
- intermediate and final presentations of current research with discussion
- semester accompanying seminar paper

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

The module can be started with in the summer and in the winter semester as well. The courses of the module do not depend on each other and can be taken in arbitrary order.

**Workload**

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

- Research Seminar Construction Management I: 30 h
- Research Seminar Construction Management II: 30 h

independent study:

- preparation and follow-up Research Seminar Construction Management I: 30 h
- preparation and follow-up Research Seminar Construction Management II: 30 h
- project work, preparation of report and colloquium (exam): 60 h

total: 180 h

**Recommendation**

none

**M****5.103 Module: Equipment and Special Construction Techniques in Building Practice (bauIM4S18-) [M-BGU-103918]****Responsible:** Prof. Dr.-Ing. Sascha Gentes**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each term	2 terms	German	4	1

Mandatory			
T-BGU-108009	<a href="#">Equipment and Special Construction Techniques in Building Practice</a>	6 CR	Gentes

**Competence Certificate**

- 'Teilleistung' T-BGU-108009 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can name the basic concepts of the presented construction equipment and special construction processes and are able to describe the structure and function of the devices and the procedures. Furthermore, they are able to assess the respective use of devices and processes and they know the current status of Technology of the treated areas.

**Content**

In this module, construction management basics of practical topics for work preparation and construction are taught. Various devices and special processes from different areas of construction, from formwork to construction and test methods, are presented and explained, especially with regard to innovative new features.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Equipment and specific Methods in Construction I lecture: 30 h
- Equipment and specific Methods in Construction II lecture: 30 h

independent study:

- preparation and follow-up lectures Equipment and specific Methods in Construction I: 30 h
- preparation and follow-up lectures Equipment and specific Methods in Construction II: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**M****5.104 Module: Digitalization in Facility and Real Estate Management (bauIM4S19-) [M-BGU-104348]****Responsible:** Prof. Dr.-Ing. Kunibert Lennerts**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	English	4	1

Mandatory			
T-BGU-108941	<a href="#">Digitalization in Facility and Real Estate Management</a>	6 CR	Lennerts

**Competence Certificate**

- 'Teilleistung' T-BGU-108941 with examination of other type according to § 4 Par. 2 No. 3  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students will acquire basic knowledge of sensor networks, building automation and the application of the 'Internet of Things' (IoT) in facility and real estate management. They will be able to take a critical look of the technologies of digitization (including network structures, cloud storage, sensor distribution, information privacy, augmented reality) and evaluate them according to the requirements of facility and real estate management. In addition, students will be able to implement simple sensor networks and the basics of 'augmented reality' by using a HoloLens.

**Content**

- Basic information of concepts of digitalization
- Execute Internet of Things in building automation
- Integration of sensor signals in FM processes
- Visualize of maintenance and inspection work through 'augmented reality' (HoloLens)
- Producing project work during the semester colloquium

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Digitalization in Facility and Real Estate Management lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises Digitalization in Facility and Real Estate Management: 40 h
- preparation of project Digitalization in Facility and Real Estate Management, incl. report and presentation (examination): 80 h

total: 180 h

**Recommendation**

none

**M****5.105 Module: Digital Technologies in Field Information Modeling (bauIM4S20-) [M-BGU-105638]****Responsible:** Jun.-Prof. Dr. Reza Maalek**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2021)  
[Subject-Specific Supplements](#) (Usage from 4/1/2021)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2021)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	English	4	1

Mandatory			
T-BGU-111276	<a href="#">Digital Technologies in Field Information Modeling</a>	6 CR	Maalek

**Competence Certificate**

- 'Teilleistung' T-BGU-111276 with examination of other type according to § 4 Par. 2 No. 3  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

This course discusses the practical methods to digitally document, model, store, and share required spatial and temporal information throughout the construction project's lifecycle. Students will get familiarized with the different state-of-the-art remote sensing technologies applicable to automating the collection of field construction information. The students will be able to use technologies, such as laser scanners, to automate construction engineering and management processes, including, progress monitoring, quality control, structural integrity assessment, and safety management. Students will be provided with the practical strategies and tools necessary to analyze the acquired field information to promote the seamless transfer of information between the real and digital worlds. These technologies and methodologies will allow the students to apply the domain of field information modeling (FIM) in practical settings.

**Content**

Construction project information modeling frameworks, such as building information modeling (BIM), heritage building information modeling (H-BIM), or bridge information modeling (BrIM), involve modeling and integrating intelligent and semantic information within multi-dimensional (n-D) computer-aided design (CAD) models. During the design stages, the 3-dimensional (3D) digital model of a construction project can be created, whereby each element is classified based on attributes such as functional type (e.g. structural wall), elemental relationships (e.g. structural wall and floor slab connectivity and interaction), and geometric properties (e.g. shape and size). Further modeling can be carried out so as to integrate project planning and control information, such as work sequences and duration (e.g. 4D BIM), as well as cost (e.g. 5D BIM), enabling the project management team to directly evaluate the impact of design changes on the project's schedule and cost. During construction, the designed n-D model serves as a detailed baseline to aid field construction work. Relevant field data must then be collected and compared to the designed model to ensure compliance. Particularly within the lean project delivery, recording fast, frequent, and reliable field data is desired to foster continual improvement. In the context of schedule and cost control for instance, daily measurement of percent planned complete, recommended as a part of the Last Planner® system, combined with frequent earned value analysis, require up-to-date knowledge of the progress of activities. Hence, Field Information Modeling (FIM) is essential to model and transform collected field data into intelligent, tangible and semantic digital models as a means of promoting the seamless flow of information between the field and the digital worlds. This course is designed to provide the learners with the tools necessary to understand the concept of FIM, the cutting-edge technologies that can be used to foster the FIM process, and methods to fully automate the FIM process along with the challenges, limitations and future progressions.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises, tutorials: 60 h
- project work, preparation of report and presentation (examination): 60 h

total: 180 h

**Recommendation**

module Digital Engineering and Construction [bauiM4S21]



**M****5.106 Module: Digital Engineering and Construction (bauIM4S21-) [M-BGU-105830]****Responsible:** Jun.-Prof. Dr. Reza Maalek**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 10/1/2021)  
[Subject-Specific Supplements](#) (Usage from 10/1/2021)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 10/1/2021)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	English	4	1

Mandatory			
T-BGU-111695	<a href="#">Digital Engineering and Construction</a>	6 CR	Maalek

**Competence Certificate**

- 'Teilleistung' T-BGU-111604 with examination of other type according to § 4 Par. 2 No. 3  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students will be able to describe the main digital technologies for the engineering design process throughout the lifecycle of construction projects. They can explain the role of the practical applications of these technologies within the engineering design process of a real project. They are also able to apply some selected basic principles of these technologies in practical settings in the context of lab assignments.

**Content**

Recent advancements in digital and remote sensing technologies in construction engineering and management is paving the path to the conception of industry 4.0 in construction (construction 4.0). A full digitization and automation of the construction industry is projected to produce annual cost savings of around € 1.3 trillion globally compared to current practices according to the most reliable sources (e.g., World Economic forum). The full digitization and automation must start from the early design stages of the project and continue throughout the construction, facility management and operations, and dismantling phases. The advancements in digital technologies now enables large scale 3D visualization, 4D and 5D simulation, design enhancements and optimizations, which were amiss in traditional design practices. The growth in information technologies has enabled the addition of intelligence through information modeling concepts onto a single model, which can then be utilized for further engineering analysis (e.g., solar, wind, structural), design optimization, and clash detection, particularly in larger projects. With the introduction of virtual reality tools, project stakeholders can now virtually walk through the project (e.g., a building) before it is built, which can reduce the possibility of change orders due to misunderstanding of design requirements. To further enhance communication between the construction labourers and the digital design, augmented and mix reality has been showing potential. This can further mitigate the risk of incorrect construction, saving time and cost of rework due to miscommunication of expectations. Another possibility is robotics and additive manufacturing, which can further help mitigate the risk of information loss between the digital and real worlds. Finally, to ensure the built complies with the design in terms of design standards and requirements, field information, such as 3D point clouds using laser scanners or smartphones, and non-destructive testing (NDT) methods can be performed so as to determine the discrepancies early on and prevent costly rework when the degree of influence on the project becomes less. This course is designed to provide the learners with the tools necessary to understand the digital engineering and construction framework, and the cutting-edge technologies used to foster construction automation, along with the challenges, limitations and future progressions.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

newly offered as from winter tem 2021/22

**Workload**

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

- lecture/lab assignment: 60 h

independent study:

- preparation and follow-up lecture/lab assignments: 60 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

modules Building Information Modeling (BIM) [bauiM4S16-], Digital Planning and Building Information Modeling [bauiM1S42-DIGIPLAN]

course Computer Aided Design (CAD) (6200520)

**M****5.107 Module: Leadership and Communication (bauIM4S22-) [M-BGU-105917]****Responsible:** Prof. Dr.-Ing. Shervin Haghsheno**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)  
[Subject-Specific Supplements](#) (Usage from 4/1/2022)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-111900	<a href="#">Leadership and Communication</a>	6 CR	Haghsheno

**Competence Certificate**

- 'Teilleistung' T-BGU-111900 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

The module must not be taken together with the module Business and Human Resource Management [bauIM4S01-] not offered anymore.

**Competence Goal**

Students are taught how to explain the basics of leadership. They are able to classify leadership in the business management functions. They will also be able to list, describe and differentiate between various organizational and legal forms of companies. In the area of strategic planning, they can recognize types of strategy in construction companies and analyze their implementation. In the context of labor law, students will be able to define the concept of employee and distinguish it from self-employment. They are aware of the essential elements of a legally compliant admonition, warning and termination and are able to draft these writings.

The students are furthermore able to describe different communication models and to apply different communication techniques. They can explain the important basics from the topic area of public participation and know the associated concepts and methods. Furthermore, they are able to describe the components of conflict management systems and know about the role of communication in the context of conflict prevention as well as conflict resolution and are sensitized to the stages of conflict escalation. They also know methods of conflict resolution and can explain the concept of mediation in particular.

**Content**

In the area of management, generic strategies for construction companies and their implementation in the context of organizational structures and legal forms are taught. The procedures and processes for developing a corporate strategy and its implementation are explained. Furthermore, leadership principles as well as tasks and tools in the context of leadership are taught. The fundamentals and methods of personnel management, including determining personnel requirements, development, recruitment and motivation, are dealt with and illustrated by means of an example. In addition, the basics of labor law are taught with a focus on personnel management and personnel responsibility.

In the area of communication, communication models and communication techniques are presented and their application is tested with the help of a group exercise. As an example of communication in the context of construction projects, the topic of public participation is dealt with. In addition to the theoretical basics, a practical example will be presented. Furthermore, the topic of communication in conflict situations will be discussed with the aspects of conflict prevention, escalation and resolution. Furthermore, methods of conflict resolution are presented with a focus on the concept of mediation.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

This module will be offered newly as from summer term 2022.

**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

**Recommendation**

keine

**M****5.108 Module: Real Estate and Facility Management - on Site Lectures (bauIM4S23-) [M-BGU-105924]****Responsible:** Prof. Dr.-Ing. Kunibert Lennerts**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)  
[Subject-Specific Supplements](#) (Usage from 4/1/2022)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-111909	<a href="#">Real Estate und Facility Management - on Site Lectures</a>	6 CR	Lennerts

**Competence Certificate**

- 'Teilleistung' T-BGU-111909 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can work independently on questions from real estate-related practice (research or application-oriented) using scientific methods and structure a given problem and present the results orally. They can select and apply methods and instruments appropriate to the problem in a well-founded manner. The students can work out the 'state-of-the-art' of a problem and a procedure for the solutions of the practical cases, to critically question and, if necessary, to adapt as well as to discard the previously worked out solution results accordingly and to derive new ones.

**Content**

- systematic evaluation, practice and application of scientific methods in the context of real estate-related practice
- specifying research objectives and conducting literature research
- drafting and elaboration of a research design
- derivation of scientifically based decisions for real estate-related practice
- presentation of the results

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

This module will be offered newly as from winter term 2022/23.

**Workload**

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 40 h
- work on student project incl. report and presentation/colloquium: 80 h

total: 180 h

**Recommendation**

modules Real Estate Management [bauIM4S08], Facility Management [bauIM4S24]

**M****5.109 Module: Facility Management (bauIM4S24-) [M-BGU-105922]****Responsible:** Prof. Dr.-Ing. Kunibert Lennerts**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)  
[Subject-Specific Supplements](#) (Usage from 4/1/2022)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-111908	Facility Management	6 CR	Lennerts

**Competence Certificate**

- 'Teilleistung' T-BGU-111908 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can name the term as well as the goals and tasks of FM and explain and differentiate the structures and work areas of commercial, infrastructural, and technical FM.

The students can classify and communicate risks for owners and operators of facilities and assign the operator responsibility to different actors. They can recognise, assess, and communicate potential legal consequences.

Furthermore, the students can name the basics of the concepts in maintenance management in general as well as in the areas of construction and maintenance.

The students can also apply the central standards, guidelines and laws of space management, measure and evaluate space utilisation costs and assess potentials for space optimisation in companies.

**Content**

- introduction to commercial, infrastructural, and technical FM
- maintenance management
- space management
- resources management
- operator responsibility

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

This module will be offered newly as from winter term 2022/23.

**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

**Recommendation**

none

**M****5.110 Module: Technology and Production Methods in Turnkey Construction and Civil Engineering Works (bauIM4S25-) [M-BGU-105913]****Responsible:** Prof. Dr.-Ing. Shervin Haghsheno**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)  
[Subject-Specific Supplements](#) (Usage from 4/1/2022)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-111899	<a href="#">Technology and Production Methods in Turnkey Construction and Civil Engineering Works</a>	6 CR	Haghsheno

**Competence Certificate**

- 'Teilleistung' T-BGU-111899 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

The module must not be taken together with the module Turnkey Construction [bauIM4S15-] not offered anymore.

**Competence Goal**

The students are able to describe and apply fundamental process and production methods, especially regarding to technical building services. Moreover, they are able to amplify fundamental processes in the subject area of turnkey construction and to analyze correspondent contexts and workflows.

Adding to this, the students are able to amplify essential elements of selected civil engineering structures and, regarding to this, comprehend typical production methods. Furthermore, the students are able to choose, amplify and analyze appropriate production methods for civil engineering structures.

**Content**

In the subject area of turnkey construction besides the detailed design of shell construction, technical support and technical building services, there is also an explanation of the related basic knowledge in engineering. Also, basics of the technical support belong to the curriculum, e.g., heating installations, ventilation systems, A/C, electric installations. Most of all, there is a focus on regenerative energies. Furthermore, the explanation of the processes in turnkey construction, from design and construction permit to final acceptance of work, is part of the lecture.

In the subject area of civil engineering structures and regenerative energies, besides basic knowledge in construction, there is also a focus on production methods for the construction and maintenance of the selected civil engineering structures. Adding to conventional construction methods there are topics like additive manufacturing in solid construction. This also includes the view on hydraulic constructions (e.g. water locks), waste disposal (e.g. waste disposal sites) and infrastructure constructions (e.g. steel composite bridge). Also, there is a focus on regenerative energies (e.g. wind power stations).

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

This module will be offered newly as from summer term 2022.

**Workload**

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

- Turnkey Construction lecture/exercise: 30 h
- Civil Engineering Structures and Regenerative Energies lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Turnkey Construction: 30 h
- preparation and follow-up lecture/exercises Civil Engineering Structures and Regenerative Energies: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**Literature**

Bundesamt für Justiz (Hg.) (2020): Verordnung über die Honorare für Architekten- und Ingenieurleistungen (Honorarordnung für Architekten und Ingenieure - HOAI), Anlage 12

Patt, H; Speerli, J.; Gonsowski, P. (2021): Wasserbau. Grundlagen, Gestaltung von wasserbaulichen Bauwerken und Anlagen. Wiesbaden: Springer Fachmedien.

Bilitewski, B.; Härdtle, G. (2013): Abfallwirtschaft. Handbuch für Praxis und Lehre. Berlin/Heidelberg: Springer-Verlag.

Petzek, E.; Bancila, R. (2015): Economical Bridge Solutions based on innovative composite dowels and integrated abutments. Wiesbaden: Springer Fachmedien.

Hau, W. (2014): Windkraftanlagen. Grundlagen – Technik – Einsatz – Wirtschaftlichkeit. Berlin/Heidelberg: Springer-Verlag.



**M****5.111 Module: Lean Integrated Project Delivery (Lean IPD) (bauiM4S26-) [M-BGU-105925]****Responsible:** Prof. Dr.-Ing. Shervin Haghsheno**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)  
[Subject-Specific Supplements](#) (Usage from 4/1/2022)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-111911	<a href="#">Project Lean Integrated Project Delivery</a>	3 CR	Haghsheno
T-BGU-111910	<a href="#">Lean Integrated Project Delivery</a>	3 CR	Haghsheno

**Competence Certificate**

- 'Teilleistung' T-BGU-111911 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-111910 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

Students will be able to describe the basic approaches of Integrated Project Delivery (IPD) and its international models (IPD, Alliancing, Project Partnering) and to explain the associated functionalities and elements (values, culture, organization, economics, methods, and legal characteristics of a multi-party contract). In particular, they are able to analyze the interrelationships between IPD and lean management approaches and to present them from different perspectives. In addition, students will be able to apply appropriate Lean methods using practical examples for the development, planning and execution phases of construction projects, which are essential for the success of IPD projects (including Conditions of Satisfaction, Target Value Design, Set based Design, Choosing by Advantages).

**Content**

The following content will be covered in this module:

- challenges of traditional project delivery models in the construction industry
- basics of Integrated Project Delivery as an innovative approach, incl. the development in the international context
- development of IPD in Germany
- characteristics and model elements of IPD
- phase model of Integrated Project Delivery
- specifics of multi-party contracts and the selection process of project partners
- IPD from the perspective of lean management philosophy
- selected Lean methods with special relevance for IPD projects (Conditions of Satisfaction, Target Value Design, Set based Design, Choosing by Advantages)

In the context of a case study, the contents of an IPD project are worked on by teams. The results of the case study are documented in the form of a report and presented by the students at the end of the module.

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

This module will be offered newly as from summer term 2023.

The module set-up follows the 'flipped classroom' approach. This means that after a short common introduction the case study is to be prepared by team work. At selected dates events (meetings, interim presentations etc.) in the plenum are arranged.

**Workload**

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

- lecture/exercise: 45 h

independent study:

- preparation and follow-up lecture/exercises: 45 h
- case study as team work, preparation of report and presentation (partial examination): 45 h
- examination preparation (partial examination): 45 h

total: 180 h

**Recommendation**

module Lean Construction [bauIM4S08-]

**Literature**

AIA California Council (2014): Integrated Project Delivery: an Updated. American Institute of Architects.

Allison, M.; Ashcraft, H.; Cheng, R.; Klawens, S.; Pease, J. (2018): Integrated Project Delivery - An Action Guide for Leaders.

Ashcraft, H. (2011): IPD Teams: Creation, Organization and Management.

Breyer, W. (2017): Partnering Modelle - ein internationaler Vergleich. In: Planen, Errichten und Betreiben. Digitalisierung im Bau. 4. Internationaler BBB-Kongress. Hrsg. von Fritz Berner. BBB Professoren. Stuttgart: Institut für Baubetriebslehre, Universität Stuttgart, S. 163–177.

Fiedler, M. (2018): Lean Construction – Das Managementhandbuch – Agile Methoden und Lean Management im Bauwesen. Springer, Berlin, Heidelberg.

Fischer, M.; Khanzode, A.; Reed, D.; Ashcraft, H. W. (2017): Integrated Project Delivery. John Wiley & Sons, Somerset.

Haghsheno, S.; Baier, C.; Schilling Miguel, A.; Talmon, P.; Budau, M. (2020): Integrated Project Delivery (IPD) – Ein neues Projektabwicklungsmodell für komplexe Bauvorhaben. In: Bauwirtschaft, 5 (2), 80–93

Heidemann, A. (2011): Kooperative Projektabwicklung im Bauwesen unter der Berücksichtigung von Lean-Prinzipien - Entwicklung eines Lean- Projektabwicklungssystems. Internationale Untersuchungen im Hinblick auf die Umsetzung und Anwendbarkeit in Deutschland". Karlsruhe: Universität Karlsruhe. ISBN: 978-3-86644-583-3.

Lahdenperä, P. (2012): Making sense of the multi-party contractual arrangements of project partnering, project alliancing and integrated project delivery. In: Construction Management and Economics 30, S. 57–79.

Schlabach, C. (2013): Untersuchungen zum Transfer der australischen Projektabwicklungsform Project Alliancing auf den deutschen Hochbaumarkt. Dissertation, Kassel, Universität Kassel. ISBN: 9783862194902.

Thomsen, C.; Darrington, J.; Dunne, D.; Lichtig, W. (2009): Managing Integrated Project Delivery. Construction Management Association of America.

Walker, D. H. T.; Rowlinson, S. (Hrsg) (2020): Routledge handbook of integrated project delivery. 1. Aufl. Routledge handbooks. London, Routledge. ISBN: 9781138736689.

**M****5.112 Module: Agile Project Management in Facility and Real Estate Management (bauIM4S27-) [M-BGU-105920]****Responsible:** Prof. Dr.-Ing. Kunibert Lennerts**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)  
[Subject-Specific Supplements](#) (Usage from 4/1/2022)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	English	4	1

Mandatory			
T-BGU-111906	<a href="#">Agile Project Management in Facility and Real Estate Management</a>	6 CR	Lennerts

**Competence Certificate**

- 'Teilleistung' T-BGU-111906 with examination of other type according to § 4 Par. 2 No. 3

details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students get familiar with the basics of agile PM and can name and explain the different roles and their tasks in relevant project teams. In addition, the tasks of the different roles in project teams are taught from an agile perspective as well as agile principles and the Scrum method. They can describe, compare and differentiate between different agile PM methods. Through the semester-long project work, the students can apply learned team management principles and innovative techniques such as prototyping, design thinking, etc., to a practical application in the field of real estate and facility management. Thereby, the students recognize the most important roles and processes in the context of a small and less complex project and subsequently acquire broad knowledge of agile project management and the practical application for planning and controlling projects.

**Content**

- agile project management: terminology and principles
- scrum method: roles, artifacts & in-class method simulation
- team dynamics: development phases & conflict management
- overview on prototyping & visualization tools & techniques
- design thinking & innovation

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

This module will be offered newly as from summer term 2023.

**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 project Agile Project Management in Facility and Real Estate Management, incl. report and presentation (examination): 80 h

total: 180 h

**Recommendation**

none

**M****5.113 Module: Seminar Construction Machinery (bauM4S28-) [M-BGU-105921]****Responsible:** Prof. Dr.-Ing. Shervin Haghsheno**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences

**Part of:** [Study Focus I / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)  
[Subject-Specific Supplements](#) (Usage from 4/1/2022)  
[Study Focus II / Technology and Management in Construction \(Compulsory Elective Modules\)](#) (Usage from 4/1/2022)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-111907	<a href="#">Seminar Construction Machinery</a>	6 CR	Haghsheno

**Competence Certificate**

- 'Teilleistung' T-BGU-111907 with examination of other type according to § 4 Par. 2 No. 3  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can describe the functions and the use of different machine components. Furthermore, they can identify the different components of a construction machine on a real object of study. In addition, they are able to explain and plan the usage of specific components for concrete machine functions. The students can identify different malfunctions. They can evaluate maintenance repair work activities. In specific cases they manage some maintenance activities by themselves.

The students are capable of describing how selected construction machine sensors work. Furthermore, they can choose which sensors are appropriate for scientific test setups to examine machine and process optimization.

Also, the students learned to develop solutions for construction machine specific tasks by themselves. These solutions should be in accordance with the rules of good scientific practice.

**Content**

The teaching content is orientated on specific construction machines. The focus in each semester will be on one or several various machines. This is the reason why the specific content can vary from semester to semester.

The following content is part of the seminar:

- function, design and areas of application for specific construction machines
- function of specific machine components (for example hydraulic systems, motors, sensors and other machine components)

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

This module will be offered newly as from summer term 2022.

The content of the seminar will be created together between the lecturers and the students. Beside theoretical parts there will be practical exercises on our testing field in Linkenheim-Hochstetten. For the successful participation of the seminar a regular presence will be necessary.

**IMPORTANT:** The number of participants is limited to 10 students. Further information for the application procedure will be announced on the homepage of the institute. When necessary, the academic progress of the student is going to decide which student will be chosen to attend on the course. The latest point of the confirmation is the end of the first week in the semester.

**Workload**

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

- seminar/field exercise: 60 h

independent study:

- preparation and follow-up seminar/field exercises: 60 h
- portfolio, incl. report and presentation (examination): 60 h

total: 180 h

**Recommendation**

none

**Literature**

König, H.: Maschinen im Baubetrieb, Grundlagen und Anwendung. Springer Vieweg, Wiesbaden, 2014.

Grote, K.-H. und Feldhusen, J.: Dubbel Taschenbuch für den Maschinenbau. Springer, Berlin/Heidelberg/New York, 2007.

**M****5.114 Module: Theoretical Soil Mechanics (bauIM5P1-THEOBM) [M-BGU-100067]**

**Responsible:** apl. Prof. Dr. Andrzej Niemunis  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Geotechnical Engineering \(Compulsory Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Geotechnical Engineering \(Compulsory Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100067	<a href="#">Theoretical Soil Mechanics</a>	6 CR	Niemunis

**Competence Certificate**

- 'Teilleistung' T-BGU-100067 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students obtained a scientific based understanding of the essential behavior of soil under monotonic and cyclic load with and without effects of time regarding large and small deformations. They are able to describe relations in soil mechanics mathematically and physically correctly. They can understand the tensorial terminology of modern geotechnical literature and can apply computing programs to comprehend element tests. They recognize self-reliantly relevant mechanisms of boundary value problems and can specify the limitations of simple engineering models.

**Content**

advanced theoretical basics of soil behavior:

- geotechnical invariants of stress and strain
- failure criteria according to Coulomb, Matsuoka-Nakai etc.
- contractancy and dilatancy
- critical density
- failure criteria according to Krey-Tiedemann
- soil behavior under partial saturation
- collapse theorems and their application (Kinematic Element Analysis)
- elasticity in soil mechanics (isotropic and anisotropic)
- elastoplasticity with volumetric hardening using the example of the Cam-Clay-Model
- soil behavior under cyclic loading
- one-dimensional viscoplasticity

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 30 h
- working with available software: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

fundamentals in soil mechanics and continuum mechanics, module Basics of Numerical Modelling [bauIM5P4-NUMGRUND]

**Literature**

Niemunis (2009): Über die Anwendung der Kontinuumstheorie auf bodenmechanische Probleme (download)

**M****5.115 Module: Earthworks and Foundation Engineering (bauIM5P2-ERDGB) [M-BGU-100068]**

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Geotechnical Engineering \(Compulsory Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Geotechnical Engineering \(Compulsory Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-BGU-100068	<a href="#">Earthworks and Foundation Engineering</a>	4 CR	Stutz
T-BGU-100178	<a href="#">Student Research Project 'Earthworks and Foundation Engineering'</a>	2 CR	Stutz

**Competence Certificate**

- 'Teilleistung' T-BGU-100178 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100068 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**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

**Annotation**

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: 60 h
- examination preparation: 40 h

total: 180 h

**Recommendation**

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. Smolczyk, 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****5.116 Module: Rock Mechanics and Tunneling (bauiM5P3-FMTUB) [M-BGU-100069]**

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Geotechnical Engineering \(Compulsory Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Geotechnical Engineering \(Compulsory Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-100069	<a href="#">Rock Mechanics and Tunneling</a>	5 CR	Stutz
T-BGU-100179	<a href="#">Student Research Project 'Rock Mechanics and Tunneling'</a>	1 CR	Stutz

**Competence Certificate**

- 'Teilleistung' T-BGU-100179 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100069 with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students understand the essential strength and deformation properties of rock and master the basic analytical methods to solve boundary value problems of surface and underground rock excavation. They can select basic construction methods and constructions in underground tunnel construction and apply self-reliantly the methods of rock mechanics and static calculation and safety assessments. With regard to the assessment of variants, costs, construction operation and safety aspects they gained geotechnical competence in solving problems for all kind of constructions in and with solid rocks.

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Basics in Rock Mechanics lecture/exercise: 30 h
- Basics in Tunnel Construction lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Basics in Rock Mechanics: 20 h
- preparation and follow-up lecture/exercises Basics in Tunnel Construction: 20 h
- preparation of student research project: 20 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

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

basic knowledge of Engineering Geology;

**Literature**

- [1] Brady, B. H. G. and Brown, E. T., (2004): Rock Mechanics for Underground Mining, 3rd. Edition, Kluwer Academic Publishers.
- [2] Kolymbas, D. (1998), Geotechnik - Tunnelbau und Tunnelmechanik, Springer.
- [3] Goodman, R.E., (1989): Introduction to Rock Mechanics, John Wiley & Sons.
- [4] Hoek, E., 2007: Practical Rock Engineering, kostenloser Download unter: <http://www.rocscience.com/hoek/PracticalRockEngineering.asp>.
- [5] Jäger, J.C., Cook, N.G.W. and Zimmerman, R.W., 2007: Fundamentals of Rock Mechanics, Blackwell Publishing.
- [6] Wittke, W., 1982: Felsmechanik, Springer-Verlag.
- [7] Maidl, B. 1997: Tunnelbau im Sprengvortrieb
- [8] Müller, L. 1978: Der Felsbau, Bd. 3 Tunnelbau
- [9] Wittke, W.: Rock Mechanics Based on an Anisotropic Jointed Rock Model (AJRM), Ernst & Sohn, 2014

**M****5.117 Module: Basics of Numeric Modeling (bauIM5P4-NUMGRUND) [M-BGU-100070]**

**Responsible:** apl. Prof. Dr. Andrzej Niemunis  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Geotechnical Engineering \(Compulsory Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Geotechnical Engineering \(Compulsory Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-BGU-106196	<a href="#">Continuum Mechanics</a>	3 CR	Franke
T-BGU-106197	<a href="#">Numerics in Geotechnics</a>	3 CR	Niemunis

**Competence Certificate**

- 'Teilleistung' T-BGU-106196 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-106197 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

This module must not be selected together with the module Continuum Mechanics of Heterogeneous Solids [bauIM1S32-KONTIMECH].

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The module [M-BGU-100064 - Continuum Mechanics of Heterogeneous Solids](#) must not have been started.

**Competence Goal**

The students are familiar with the general concepts of continuum mechanics and their application to engineering, specifically geotechnical, problems. They know operational methods for the discretization of the typical differential equations. They are able to comprehend the modelling of geomechanical boundary value problems using Finite Difference and Finite Element Methods and to work independently on standard problems. They can assess the failure potential of numerical calculations, select commercial FE-codes reasonably and test and evaluate FE results critically.

**Content**

see German version

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Continuum Mechanics lecture: 30 h
- Numerics in Geotechnics lecture: 30 h

independent study:

- preparation and follow-up lectures Continuum Mechanics: 15 h
- examination preparation Continuum Mechanics (partial exam): 30 h
- preparation and follow-up lectures Numerics in Geotechnics: 15 h
- exercises with available software: 30 h
- examination preparation Numerics in Geotechnics (partial exam): 30 h

total: 180 h

**Recommendation**

course 'Introduction to Continuum Mechanics' (6200607) or similar basic knowledge

**Literature**

- [1] E. Becker, W. Bürger: Kontinuumsmechanik. Teubner, 1975
- [2] J. Bonet, R.D., Wood: Nonlinear continuum mechanics for finite element analysis. Cambridge, 1997
- [3] R. Greve: Kontinuumsmechanik. Springer, 2003
- [4] L. Malvern: Introduction to the Mechanics of a Continuous Medium. Prentice Hall, 1969
- [5] Th. Seelig: Kontinuumsmechanik. Skript zur Vorlesung
- [6] Press, W., e.a. (1992), Numerical Recipes, Cambridge Univ. Press
- [7] Hughes, T.J.R. (2000): The FEM, Linear Static and Dynamic FE Analysis. Dover
- [8] Bathe, K.-J. (200): Finite-Elemente-Methoden. Springer
- [9] Smith, I.M.; Griffith, D.V. (2004): Programming the Finite Element Method. JWS
- [10] Potts, D.M. Zdravkovic, L. (1999): Finite element analysis in geotechnical engineering. Thomas Telford Ltd
- [11] Zienkiewicz O.C. et.al. (2005): The Finite Element Method, Vol. 1, Wiley
- [12] Hartmann, F. (1987): Methode der Randelemente, Springer
- [13] Strang, G. (2007): Wissenschaftliches Rechnen, Springer

**M****5.118 Module: Special Issues of Soil Mechanics (bauIM5S01-SPEZBM) [M-BGU-100005]**

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Subject-Specific Supplements](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100071	<a href="#">Special Issues of Soil Mechanics</a>	6 CR	Stutz

**Competence Certificate**

- 'Teilleistung' T-BGU-100071 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students master a wide range of mechanical, hydraulic and numerical tools for the processing of specific soil mechanical problems. They can comprehend the cross-linking of hydraulic, mechanical and chemical processes under partial saturation. They can use the dynamic and cyclic laboratory techniques and apply material laws operationally for the calculation and calibration of experiments. They can describe and evaluate constructionally vibrations and waves in elastic continua and real soils in the range of strains from small shakes up to earthquakes.

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exams

**Annotation**

none

**Workload**

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

- Unsaturated, Viscous and Cyclic Soil Behaviour - Theory and Element Tests lecture/exercise: 30 h
- Soil Dynamics lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Unsaturated, Viscous and Cyclic Soil Behaviour - Theory and Element Tests: 15 h
- preparation and follow-up lecture/exercises Soil Dynamics: 15 h
- exercises with available software: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

module Theoretical Soil Mechanics [bauIM5P1-THEOBM]

**M****5.119 Module: Ground Investigation (bauIM5S02-BERKUND) [M-BGU-100071]**

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Geotechnical Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Geotechnical Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100072	<a href="#">Ground Investigation</a>	6 CR	Stutz

**Competence Certificate**

- 'Teilleistung' T-BGU-100072 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can conduct the standard experiments common in soil mechanics by themselves, define appropriate experimental conditions, analyse and control the experiments purposefully and derive constructionally conclusions. They are familiar with the common field experiments in unconsolidated rocks, they can plan, control, analyse and interpret these. They conducted experiments exemplarily by themselves.

**Content**

The module covers standard tests in soil mechanics, starting with indexing experiments, determination of shear parameters and water permeability through to different triaxial tests. The different types of explorations, measurement of density and stiffness as well as determination of interface structures in rocks are demonstrated in field experiments. It is discussed which requirements the types of experiments define for exploratory drilling and sample quality, which laboratory and field experiment or experimental conditions respectively are required for the evaluation of the ground and foundation and how drillings can be converted to monitoring wells.

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Soil Mechanical Laboratory Exercises: 30 h
- Geomechanical Field Exercise: 30 h
- preparation and follow-up of experiments in the laboratory, own repeating experiments: 30 h

independent study:

- preparation and follow-up Soil Mechanical Laboratory Exercises: 15 h
- preparation and follow-up Geomechanical Field Exercise: 15 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

none

**M****5.120 Module: Applied Geotechnics (bauIM5S03-ANGEOTEC) [M-BGU-100072]**

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Study Focus I / Geotechnical Engineering \(Compulsory Elective Modules\)](#)  
[Subject-Specific Supplements](#)  
[Study Focus II / Geotechnical Engineering \(Compulsory Elective Modules\)](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-100073	<a href="#">Applied Geotechnics</a>	6 CR	Stutz

**Competence Certificate**

- 'Teilleistung' T-BGU-100073 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students make a self-dependent reasonable design decisions for pile foundations and excavations with regard to geological engineering, site managing and economical boundary conditions. They can assess the interaction of building, foundation and subsoil and can establish simple mechanical models by themselves and use numerical tools customary in practice as well. They can describe and use relevant guidelines and can link constructional experience, dimensioning rules and standardization to theoretical knowledge about soil mechanical laws.

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Foundations and Retaining Structures lecture/exercise: 30 h
- Special Foundation Engineering and Design lecture/exercise: 30 h
- field trips: 10 h

independent study:

- preparation and follow-up lecture/exercises Foundations and Retaining Structures: 25 h
- preparation and follow-up lecture/exercises Special Foundation Engineering and Design: 25 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

module Earthworks and Foundation Engineering [bauIM5P2-ERDGB]

**Literature**

- [1] Seitz, J. & Schmidt, H.-G. (2000), Bohrpfähle Ernst & S.
- [2] Triantafyllidis, Th. (1990), Planung und Bauausführung im Spezialtiefbau, Teil 1, Ernst & S.
- [3] Weißenbach, A. (2001), Baugruben, Teil 1-3, Wiley
- [4] EA Pfähle (2007), Dt. Ges. f. Geotechnik, Ernst & S.
- [5] EAB (2006), Deutsche Ges. f. Geotechnik, 4. Aufl., Ernst & S.
- [6] EAU (2004), HTG und Deutsche Ges. f. Geotechnik, 10. Aufl., Ernst & S.
- [7] EBGeo (2010), Deutsche Ges. f. Geotechnik, Ernst & S.
- [8] Witt, J. Grundbau-Taschenbuch Teil 1-3, 7. Aufl. (2009), Ernst & S.



**M****5.121 Module: Ground Water and Earth Dams (bauIM5S04-GWDAMM) [M-BGU-100073]**

**Responsible:** Dr.-Ing. Andreas Bieberstein  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Subject-Specific Supplements](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100091	<a href="#">Ground Water and Earth Dams</a>	6 CR	Bieberstein

**Competence Certificate**

- 'Teilleistung' T-BGU-100091 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**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

**Annotation**

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

**Recommendation**

module Earthworks and Foundation Engineering [bauIM5P2-ERDGB]

**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****5.122 Module: Rock Engineering and Underground Construction (bauIM5S05-FELSHOHL) [M-BGU-100074]**

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Subject-Specific Supplements](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100074	<a href="#">Rock Engineering and Underground Construction</a>	6 CR	Stutz

**Competence Certificate**

- 'Teilleistung' T-BGU-100074 with written examination according to § 4 Par. 2 No. 1  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students are familiar with planning, construction and design of safety systems for embankments and hillsides in bedrock. They can identify critical failure mechanisms, conduct respective stability analyses and design anchoring. They know setup and function of tunnel boring machines and tunneling techniques by own perception and can select appropriate tunnel boring technologies. They can transfer deepened knowledge about strength and deformation properties of bedrock and the precursory and accompanied exploration to the rehabilitation of existing tunnels.

**Content**

see German version

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Aboveground Rock Engineering lecture/exercise: 30 h
- Tunnel Construction in Soils and in Existence lecture/exercise: 30 h
- field trips: 10 h

independent study:

- preparation and follow-up lecture/exercises Aboveground Rock Engineering: 25 h
- preparation and follow-up lecture/exercises Tunnel Construction in Soils and in Existence: 25 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

module Rock Engineering and Tunneling [bauIM5P3-FMTUB]

**Literature**

- [1] Brady, B. H. G. and Brown, E. T., (2004): Rock Mechanics for Underground Mining, 3rd. Edition, Kluwer Academic Publishers.  
 [2] Maidl B., Herrenknecht M., Maidl U., Wehrmeyer G. Maschinelles Tunnelbau im Schildvortrieb, 2. Auflage 2011, Ernst & Sohn  
 [3] Kolymbas, D. (1998), Geotechnik - Tunnelbau und Tunnelmechanik, Springer.

**M****5.123 Module: Numerical Modelling in Geotechnics (bauIM5S06-NUMMOD) [M-BGU-100075]**

**Responsible:** apl. Prof. Dr. Andrzej Niemunis  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Subject-Specific Supplements](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-100107	<a href="#">Numerical Modelling in Geotechnics</a>	6 CR	Niemunis

**Competence Certificate**

- 'Teilleistung' T-BGU-100107 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can develop numerical solutions for typical geotechnical boundary value problems by themselves and implement them by programming with FORTRAN95. They got to know FE applications in several fields of geotechnics (foundation, rock and tunnel construction, dam construction), got practical experience with the FE code ABAQUS (TM) and applied this for the modeling of example problems. They are able to interpret and evaluate critically results of numerical simulations.

**Content**

- beam on elastic half-space
- slope stability with layer procedure according to Bishop
- 2D and 3D pile rafts with lateral bedding
- FE-modeling of spatially correlated fluctuations of soil parameters
- FE settlement prediction with nonlinearity for small strains
- introduction to the FE-program ABAQUS: definition of joints and elements, assignment of material laws, definition of initial and boundary conditions
- examples of FE-applications in tunnel engineering
- numerical FE-modeling of a deep pit excavation under consideration of the construction sequence
- numerical FE-modeling of seepage through a zoned dam with partial saturation (different load cases)
- linear dynamics using ABAQUS

**Module grade calculation**

grade of the module is grade of the exam

**Annotation**

none

**Workload**

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

- Exercises in Numerical Modelling: 30 h
- FEM Applications in Geotechnical Modelling lecture: 30 h

independent study:

- preparation and follow-up Exercises in Numerical Modelling: 15 h
- preparation and follow-up lectures FEM Applications in Geotechnical Modelling: 15 h
- exercises with available software: 30 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

module Basics of Numeric Modelling [bauIM5P4-NUMGRUND]

**Literature**

- [1] Smith, I.M.; Griffith, D.V. (2004): Programming the Finite Element Method. JWS
- [2] Hibbit, Karlsson, Sorensen: ABAQUS for geotechnical problems
- [3] Helwany, S. (2007) Applied Soil Mechanics with ABAQUS Applications, Wiley
- [4] Hibbit, Karlsson, Sorensen (1997): Contact in ABAQUS/Standard
- [5] FORTRAN 95 HP Manual

**M****5.124 Module: Geotechnical Testing and Measuring Technology (bauIM5S07-VERSMESS) [M-BGU-100076]**

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Subject-Specific Supplements](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100075	<a href="#">Geotechnical Testing and Measuring Technology</a>	6 CR	Stutz

**Competence Certificate**

- 'Teilleistung' T-BGU-100075 with oral examination according to § 4 Par. 2 No. 2  
 details about the learning control see at the 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can classify the procedures and methods for subsoil exploration and testing techniques even those surpassing standard procedures. They are able to select reasonably appropriate combinations of techniques based on the specific application conditions and prerequisites. They can explain basic knowledge in geophysics, measurement technologies and the functioning principles of sensors and data acquisition. As a result of this they can select equipment reasonably with respect to resolution, accuracy, long term stability and interpretation. They have own experiences with the handling of sensor application, wiring, data acquisition, control elements, measuring and analysis procedures.

**Content**

The module deepens aspects of geotechnical experiments. Specific experiments from rock mechanics and dam and embankment construction as well as the test of rheologic properties are presented. The students obtain also insight into geophysical exploratory methods. Further, basics with respect to the selection of appropriate sensors measuring physical, dynamic and electrical quantities, optical methods, correlation measurement techniques, influences of errors, data transfer, data acquisition as well as controlling concepts. The setup and test of a measurement chain for field measurements is practiced.

**Module grade calculation**

none

**Annotation**

none

**Workload**

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

- Rock Testing lecture: 15 h
- Testing in Dam and Wastefill Engineering lecture: 15 h
- Geotechnical Measuring Technology lecture/exercise: 30 h
- preparation and follow-up of experiments in the laboratory, own repeating experiments: 25 h

independent study:

- preparation and follow-up lecture Rock Testing: 10 h
- preparation and follow-up lecture Testing in Dam and Wastefill Engineering: 10 h
- preparation and follow-up lecture/exercise Geotechnical Measuring Technology: 15 h
- examination preparation: 60 h

total: 180 h

**Recommendation**

module Ground Investigation (bauIM5S02-BERKUND)

**M****5.125 Module: Special Underground Engineering (bauIM5S08-SPEZTIEF) [M-BGU-100078]**

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Subject-Specific Supplements](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100080	<a href="#">Ground Improvement, Grouting and Soil Freezing</a>	3 CR	Riegger
T-BGU-100079	<a href="#">Anchoring, Piling and Slurry Wall Technology</a>	3 CR	Stutz

**Competence Certificate**

- 'Teilleistung' T-BGU-100080 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-100079 with oral examination according to § 4 Par. 2 No. 2

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can name performance, ranges of application, necessary preliminary investigations and accompanying controls (monitoring) for special underground engineering technologies. They can select self-reliantly appropriate technologies for certain construction problems, describe and dimensioning the steps of the procedure, motivate required preinvestigations, specify parameters for the realization and define the type of controls of execution. They can describe the principles of the observation method and the construction measurement technology and the controls for quality assurance.

**Content**

The module goes into specific construction techniques of special underground engineering and discusses questions of application limitation, of designing and proofs of safety, requirements for equipment, execution controls and advices for avoiding errors and minimizing risks:

- soil freezing techniques
- injection techniques
- soil improvement techniques
- implementation of slurry and seal walls
- drilling and anchor techniques for grouted anchors
- execution of piles

**Module grade calculation**

grade of the module is CP weighted average of grades of the partial exams

**Annotation**

none

**Workload**

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

- Ground Improvement, Grouting and Soil Freezing lecture/exercise: 30 h
- Anchoring, Piling and Slurry Wall Technology lecture/exercise: 30 h
- field trips: 10 h

independent study:

- preparation and follow-up lecture/exercises Ground Improvement, Grouting and Soil Freezing: 25 h
- examination preparation Ground Improvement, Grouting and Soil Freezing (partial exam): 30 h
- preparation and follow-up lecture/exercises Anchoring, Piling and Slurry Wall Technology: 25 h
- examination preparation Anchoring, Piling and Slurry Wall Technology (partial exam): 30 h

total: 180 h

**Recommendation**

none

**Literature**

- [1] Triantafyllidis, Th. (1990), Planung und Bauausführung im Spezialtiefbau, Teil 1, Ernst & S.
- [2] Seitz, J. & Schmidt, H.-G. (2000), Bohrpfähle Ernst & S.
- [3] Witt, J. (Hrsg.), Grundbau-Taschenbuch Teil 1-3, 7. Aufl. (2009), Ernst & Sohn
- [4] Kutzner, Ch. (1991), Injektionen im Baugrund, F.Enke

**M****5.126 Module: Environmental Geotechnics (bauIM5S09-UMGEOTEC) [M-BGU-100079]**

**Responsible:** Dr.-Ing. Andreas Bieberstein  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Subject-Specific Supplements](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100084	<a href="#">Landfills</a>	3 CR	Bieberstein
T-BGU-100089	<a href="#">Brownfield Sites - Investigation, Evaluation, Rehabilitation</a>	3 CR	Bieberstein

**Competence Certificate**

- 'Teilleistung' T-BGU-100084 with oral examination according to § 4 Par. 2 No. 2
- 'Teilleistung' T-BGU-100089 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

**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 brownfields. 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 discussed. 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

**Annotation**

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

total: 180 h

**Recommendation**

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****5.127 Module: Coupled Geomechanic Processes (bauIM5S10-GEKOPPRO) [M-BGU-100077]**

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Subject-Specific Supplements](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	2 terms	German/English	4	3

**Election notes**

one of the courses in the field of Geothermics has to be selected

Mandatory			
T-BGU-111058	<a href="#">Special Issues in Rock Mechanics</a>	3 CR	Stutz
Electives (Election: 1 item)			
T-BGU-111924	<a href="#">Wildcard Transport of Heat and Fluids</a>	3 CR	N.N.
T-BGU-108017	<a href="#">Applied Geothermics</a>	4 CR	Kohl

**Competence Certificate**

- 'Teilleistung' T-BGU-111058 (compulsory) with examination of other type according to § 4 Par. 2 No. 3 according to the selected course:

- 'Teilleistung' T-BGU-111924 (compulsory elective 1) with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-108017 (compulsory elective 2) with written examination according to § 4 Par. 2 No. 1

details about the learning controls see at the respective 'Teilleistung'

**Prerequisites**

none

**Competence Goal**

The students can explain supplementary knowledge about strength and deformation properties of rocks as well as of rock testing in-situ and in laboratory. They recognize and evaluate the basic physical and chemical alteration parameters of geomaterials. They are able to describe the involved hydromechanical and thermomechanical processes and to express mathematically their interdependence with mechanical properties.

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

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

**Content****Special Issues in Rock Mechanics:**

The module takes into account unconsolidated and hard rock as multiphase systems, in which mechanical processes take place coupled with hydraulic, chemical, biological and thermal processes and their material behavior being therefore typically time-dependent. Phenomena of swelling, shrinking, creeping, fracture hydraulics and rock dynamics are considered.

**Transport of Heat and Fluids:**

- heat budget of the Earth (influence of the sun, humans, stored heat, heat production)
- heat transport in rocks (phonons, photons, electrons, 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/nonstationary heat conduction, heat transport 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

**Geothermische Nutzung:**

- 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**

grade of the module is average grade of the compulsory partial exam and the selected compulsory elective partial exam.

**Annotation**

As from summer term 2022 the possible selections in Geothermics are updated.

**Workload**

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

- Special Issues in Rock Mechanics lecture/exercise: 30 h
- Transport of Heat and Fluids lecture (compulsory elective 1): 30 h
- Application and Industrial Use / Geothermics 2 lecture/exercise (compulsory elective 2): 30 h

**independent study:**

- preparation and follow-up lecture/exercises Special Issues in Rock Mechanics: 30 h
- preparation of presentation and written report about Special Issues in Rock Mechanics (partial examination, compulsory): 30 h
- preparation and follow-up lectures Transport of Heat and Fluids: 30 h
- examination preparation Transport of Heat and Fluids (partial examination, compulsory elective 1): 30 h
- preparation and follow-up lecture/exercises Application and Industrial Use / Geothermics 2: 30 h
- examination preparation Application and Industrial Use / Geothermics 2 (partial examination, compulsory elective 2): 30 h

total: 180 h

**Recommendation**

module Rock Engineering and Tunneling [bauIM5P3-FMTUB]

**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 (free download from [http://www.rocscience.com/education/hoek\\_corner](http://www.rocscience.com/education/hoek_corner))

**M****5.128 Module: Module Master Thesis (bauMSC-THESIS) [M-BGU-104996]**

**Responsible:** Prof. Dr.-Ing. Peter Vortisch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [Master Thesis](#) (Usage from 7/1/2019)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
30	Grade to a tenth	Each term	1 term	German/English	5	1

Mandatory			
T-BGU-110135	<a href="#">Master Thesis</a>	30 CR	Vortisch

**Competence Certificate**

thesis and final presentation according to § 14 ER/SPO

**Prerequisites**

Modules in extent of minimum 42 CP has to be passed in order to be admitted to the Master Thesis according to ER/SPO § 14 Par. 1. Results obtained in the module Interdisciplinary Qualifications [bauIMW0-UEQUAL] cannot be counted for this purpose.

**Competence Goal**

The student is able to investigate independently a complex problem within a particular research field of his choice in limited time, following scientific methods. He can search autonomously for literature, can find own approaches, can evaluate his results and can classify them according to the state of the art. He is further able to present clearly the essential matter and results in his master thesis and in a comprehensive presentation.

**Content**

The Master Thesis is an independent written report and comprises the theoretical or experimental work on a complex problem within a particular field of civil engineering with scientific methods. The topic of the master thesis derives from the students choice of a particular field. The student and can make proposals for the topic.

**Module grade calculation**

The grade of the module results from the evaluation of the Master Thesis and the final presentation.

**Annotation**

Information about the procedure regarding admission and registration of the Master Thesis see chap. 2.9.

**Workload**

- working on thesis project: 720 h
- thesis writing: 150 h.
- preparation of presentation: 30 h

total: 900 h

**Recommendation**

All technical skills and soft skills required for working on the selected topic and the preparation of the thesis should be attained.

**M****5.129 Module: Interdisciplinary Qualifications (bauimw0-UEQUAL) [M-BGU-103927]**

**Responsible:** Prof. Dr.-Ing. Peter Vortisch  
**Organisation:** University  
**Part of:** [Interdisciplinary Qualifications](#)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	pass/fail	Each term	2 terms	German	4	2

**Election notes**

Courses accepted generally by the Examination Committee are available directly as selection option in the module.

For self assignment of taken interdisciplinary qualifications of HoC, ZAK or SpZ the 'Teilleistungen' with the title "Self Assignment HoC-ZAK-SpZ ..." have to be selected according to the grading scale, not graded or graded.

Interdisciplinary Qualifications (Election: at least 6 credits)			
T-BGU-106765	<a href="#">Introduction to Matlab</a>	3 CR	Ehret
T-BGU-111596	<a href="#">Self Assignment HoC-ZAK-SpZ 1 not graded</a>	2 CR	
T-BGU-111597	<a href="#">Self Assignment HoC-ZAK-SpZ 2 not graded</a>	2 CR	
T-BGU-111598	<a href="#">Self Assignment HoC-ZAK-SpZ 3 not graded</a>	2 CR	
T-BGU-111599	<a href="#">Self Assignment HoC-ZAK-SpZ 4 graded</a>	2 CR	
T-BGU-111600	<a href="#">Self Assignment HoC-ZAK-SpZ 5 graded</a>	2 CR	
T-BGU-111601	<a href="#">Self Assignment HoC-ZAK-SpZ 6 graded</a>	2 CR	

**Competence Certificate**

according to taken courses

**Prerequisites**

none

**Competence Goal**

Learning outcomes can be divided into three main complementary categories: 1. Contextual Knowledge

- Students are aware of the cultural context of their position and are in a position to consider the views and interests of others (beyond the boundaries of subject, culture, and language).
- They have enhanced their ability to participate properly and appropriately in academic or public discussions.

## 2. Practical Focus

- Students have gained an insight into the routines of professional life.
- They have further developed their capability to learn.
- They have improved their scope of action by extending their knowledge of foreign languages.
- They are able to relate their field of experience to basic aspects of business administration and law.

## 3. Basic Competences

- The students autonomously acquire new knowledge in a planned, specific, and methodologically founded manner and use it for solving tasks and problems.
- They can evaluate own work.
- They possess efficient work techniques, can set priorities, take decisions, and assume responsibility.

**Content**

With the key competences, the House of Competence (HoC) and the Centre for Cultural and General Studies (ZAK) offer a wide range of courses, which are bundled thematically for better orientation. The contents are explained in detail in the descriptions of the courses on the internet pages of HoC (<https://studium.hoc.kit.edu/index.php/lehrangebot-gesamtuebersicht/>; in German) and ZAK ([https://www.zak.kit.edu/english/general\\_studies.php](https://www.zak.kit.edu/english/general_studies.php)). Further, courses of the General Studies of ZAK or language courses of the 'Sprachenzentrums' (<https://www.spz.kit.edu/index.php>; in German) can be taken as Interdisciplinary Qualifications.

**Module grade calculation**

not graded

**Annotation**

In exceptional cases the Examination Committee can accept or recognize further suitable courses as Interdisciplinary Qualifications which are not listed in the mentioned offers of HoC, ZAK and 'Sprachenzentrum' or already included in the module. Further information about the Interdisciplinary Qualifications (selection, registration, etc.) see Sect. 2.4.

In agreement with the examiner the passing of the respective course can be marked. This mark is not considered for the grade of the module as the module is not graded.

For self assignment of the taken exams of HoC, ZAK and SpZ the respective 'Teilleistung' has to be selected. Title and CP of the taken exam are taken over by the assignment.

**Workload**

according to taken courses; see course description of HoC, lecture descriptions of ZAK, descriptions of language courses

**Recommendation**

none

**M****5.130 Module: Further Examinations (bauimZL) [M-BGU-103951]****Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Additional Examinations](#)**Credits**  
30**Grading scale**  
pass/fail**Recurrence**  
Each term**Duration**  
2 terms**Language**  
German**Level**  
4**Version**  
1**Additional Examinations (Election: at most 30 credits)**

T-BGU-111044	<a href="#">Practical Exercises Dynamics of Structures</a>	2 CR	Betsch
--------------	--	------	--------

## 6 Courses

T

### 6.1 Course: Advanced Fluid Mechanics [T-BGU-106612]

**Responsible:** Prof. Dr. Olivier Eiff

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

**Part of:** [M-BGU-103359 - Advanced Fluid Mechanics](#)


**Type**  
Written examination




**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6221701	<a href="#">Advanced Fluid Mechanics</a>	4 SWS	Lecture / Practice ( /  )	Eiff

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

#### Competence Certificate

written exam, 90 min.

#### Prerequisites

none

#### Recommendation

none

#### Annotation

none

## T

## 6.2 Course: Advanced Studies in Construction Engineering [T-BGU-108003]

**Responsible:** Prof. Dr.-Ing. Shervin Haghsheno  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100344 - Advanced Studies in Construction Engineering](#)



**Type**  
Written examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6241903	<a href="#">Tunnelbau und Sprengtechnik</a>	2 SWS	Lecture / 	Haghsheno, Scheuble, Matz
WT 21/22	6241904	<a href="#">Tiefbau</a>	1 SWS	Lecture	Haghsheno, Schneider
WT 21/22	6241905	<a href="#">Erdbau</a>	1 SWS	Lecture / 	Haghsheno, Schwarzweller

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**





none



**T****6.3 Course: Agile Project Management in Facility and Real Estate Management [T-BGU-111906]****Responsible:** Prof. Dr.-Ing. Kunibert Lennerts**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-105920 - Agile Project Management in Facility and Real Estate Management](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2022	6242805	<a href="#">Agile Project Management in Facility and Real Estate Management</a>	4 SWS	Lecture / Practice ( /  )	Lennerts

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

project:

report, appr. 10 pages, and  
presentation, appr. 10 min.**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

## 6.4 Course: Analysis and Evolution of Mobility [T-BGU-101004]

**Responsible:** PD Dr.-Ing. Martin Kagerbauer

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

**Part of:** [M-BGU-100583 - Analysis and Evolution of Mobility](#)



**Type**  
Oral examination




**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6232901	<a href="#">Empirische Daten im Verkehrswesen</a>	2 SWS	Lecture / Practice ( /  )	Kagerbauer
ST 2022	6232811	<a href="#">Mobilitätsservices und neue Formen der Mobilität</a>	2 SWS	Lecture / Practice ( /  )	Kagerbauer

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

### Competence Certificate

oral exam, appr. 30 min.

### Prerequisites

none

### Recommendation

none

### Annotation

none

## T

**6.5 Course: Anchoring, Piling and Slurry Wall Technology [T-BGU-100079]**

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100078 - Special Underground Engineering](#)


**Type**  
Oral examination




**Credits**  
3

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6251822	<a href="#">Anchoring, Piling and Slurry Wall Technology</a>	2 SWS	Lecture / Practice ( /  )	Kudella

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none


**Recommendation**





none

**Annotation**

none

**T****6.6 Course: Applied Building Physics [T-BGU-100039]****Responsible:** Dr.-Ing. Engin Kotan**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103950 - Building Physics I](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
3**Events**

WT 21/22	6211909	<a href="#">Angewandte Bauphysik</a>	2 SWS	Lecture / 	Kotan, Vogel, Dehn
----------	---------	--------------------------------------	-------	---	--------------------

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

## 6.7 Course: Applied Dynamics of Structures [T-BGU-100021]

**Responsible:** Prof. Dr.-Ing. Alexander Stark  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100038 - Applied Dynamics of Structures](#)



**Type**  
Written examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
2

Events					
ST 2022	6211805	<a href="#">Praktische Baudynamik</a>	1 SWS	Lecture / 	Stark, Kohm
ST 2022	6211806	<a href="#">Übungen zu Praktische Baudynamik</a>	1 SWS	Practice / 	Kohm

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T


**6.8 Course: Applied Ecology and Water Quality [T-BGU-109956]**





**Responsible:** PD Dr.-Ing. Stephan Fuchs  
Dr.-Ing. Stephan Hilgert

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

**Part of:** [M-BGU-104922 - Freshwater Ecology](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each summer term	1

Events					
ST 2022	6223813	<a href="#">Applied Ecology and Water Quality</a>	2 SWS	Seminar / 	Hilgert, Fuchs

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

term paper, appr. 8-15 pages, and  
presentation, appr. 15 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

The number of participants in the course is limited to 12 persons. The registration is to be made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoecology* and further study programs. The attendance at the first meeting is mandatory. In case of absence the place will be assigned to a person on the waiting list.

## T

## 6.9 Course: Applied Geotechnics [T-BGU-100073]

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100072 - Applied Geotechnics](#)



**Type**  
Written examination




**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6251810	<a href="#">Foundations and Retaining Structures</a>	2 SWS	Lecture / Practice ( /  )	Stutz
ST 2022	6251812	<a href="#">Special Foundation Engineering and Design</a>	2 SWS	Lecture / Practice ( /  )	Stutz

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**


none

## T

## 6.10 Course: Applied Geothermics [T-BGU-108017]

**Responsible:** Prof. Dr. Thomas Kohl  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100077 - Coupled Geomechanic Processes](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each summer term	1

Events					
ST 2022	6310425	<a href="#">Application and Industrial Use / Geothermics 2</a>	2 SWS	Lecture / Practice ( /  )	Kohl

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

The assessment consists of a written exam (45min) according to §4 (2) of the examination regulations.

**Prerequisites**

none



## T

## 6.11 Course: Basics of Finite Elements [T-BGU-100047]

**Responsible:** Prof. Dr.-Ing. Peter Betsch

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

**Part of:** [M-BGU-100052 - Basics of Finite Elements](#)


**Type**  
Oral examination





**Credits**  
5

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
2

Events					
WT 21/22	6215901	<a href="#">Grundlagen Finite Elemente</a>	2 SWS	Lecture / 	Betsch
WT 21/22	6215902	<a href="#">Übungen zu Grundlagen Finite Elemente</a>	2 SWS	Practice / 	Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

oral exam, appr. 30 min.

### Prerequisites

none

### Recommendation

none

### Annotation

none

## T

## 6.12 Course: Basics of Prestressed Concrete [T-BGU-100019]

**Responsible:** Prof. Dr.-Ing. Alexander Stark  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100036 - Basics of Prestressed Concrete](#)



**Type**  
Written examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6211803	<a href="#">Grundlagen des Spannbetons</a>	2 SWS	Lecture / 	Stark
ST 2022	6211804	<a href="#">Übungen zu Grundlagen des Spannbetons</a>	2 SWS	Practice / 	Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

## 6.13 Course: Bracing and Stability in Reinforced Concrete [T-BGU-100018]

**Responsible:** Prof. Dr.-Ing. Alexander Stark  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100003 - Bracing and Stability in Reinforced Concrete](#)



**Type**  
Written examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6211801	<a href="#">Aussteifung und Stabilität im Stahlbetonbau</a>	2 SWS	Lecture / 	Stark
ST 2022	6211802	<a href="#">Übungen zu Aussteifung und Stabilität im Stahlbetonbau</a>	2 SWS	Practice / 	Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.14 Course: Brownfield Sites - Investigation, Evaluation, Rehabilitation [T-BGU-100089]**

**Responsible:** Dr.-Ing. Andreas Bieberstein  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100079 - Environmental Geotechnics](#)


**Type**  
Oral examination





**Credits**  
3

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 21/22	6251915	<a href="#">Brownfield Sites - Investigation, Evaluation, Rehabilitation</a>	2 SWS	Lecture / 	Bieberstein, Eiche, Würdemann, Mohrlok

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

**6.15 Course: Building and Environmental Aerodynamics [T-BGU-111060]****Responsible:** Dr.-Ing. Christof-Bernhard Gromke**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-105503 - Interaction Flow - Building Structure](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	3	Grade to a third	Each term	1 terms	1

Events					
WT 21/22	6221905	<a href="#">Building and Environmental Aerodynamics</a>	2 SWS	Lecture / Practice ( / )	Gromke

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**


none





**Annotation**

none

**T****6.16 Course: Building Information Modeling (BIM) [T-BGU-108007]****Responsible:** Prof. Dr.-Ing. Shervin Haghsheno**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103916 - Building Information Modeling \(BIM\)](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	6	Grade to a third	Each summer term	1

Events					
ST 2022	6241812	<a href="#">Building Information Modeling</a>	4 SWS	Lecture / Practice ( /  )	Haghsheno

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

project report appr. 10 pages and presentation appr. 10 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

**6.17 Course: Building Preservation in Steel Structures [T-BGU-110856]****Responsible:** Prof. Dr.-Ing. Thomas Ummenhofer**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100043 - Building Preservation of Steel and Timber Structures](#)[M-BGU-105373 - Building Preservation and Innovations in Metal and Lightweight Structures](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	1

Events					
WT 21/22	6212909	<a href="#">Bauwerkserhaltung im Stahlbau</a>	2 SWS	Lecture	Ummenhofer

**Competence Certificate**

written exam, 60 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**


none




## T

## 6.18 Course: Building Preservation in Timber Structures [T-BGU-110857]

**Responsible:** Dr.-Ing. Matthias Frese**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100043 - Building Preservation of Steel and Timber Structures](#)  
[M-BGU-105374 - Building Preservation and Innovations in Timber Structures](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	1

Events					
WT 21/22	6213903	<a href="#">Bauwerkserhaltung im Holzbau</a>	2 SWS	Lecture / Practice ( /  )	Frese, Mitarbeiter/ innen

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

written exam, 60 min.

**Prerequisites**

none

**Recommendation**




none





**Annotation**

none



**T****6.19 Course: Building Preservation of Concrete and Masonry Constructions [T-BGU-100038]****Responsible:** Dr.-Ing. Engin Kotan**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100058 - Building Preservation of Concrete and Masonry Constructions](#)**Type**  
Oral examination**Credits**  
5**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
ST 2022	6211811	<a href="#">Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions</a>	2 SWS	Lecture / 	Kotan
ST 2022	6211812	<a href="#">Exercises to Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions</a>	1 SWS	Practice / 	Kotan
ST 2022	6211813	<a href="#">Building Analysis</a>	1 SWS	Lecture / 	Kotan, Vogel

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**


none





**Annotation**

none

T

**6.20 Course: Building Technology [T-BGU-100040]****Responsible:** PD Dr.-Ing. Stephan Wirth**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103950 - Building Physics I](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
WT 21/22	6211910	<a href="#">Gebäudetechnik</a>	2 SWS	Lecture / 	Wirth

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**


none





**Annotation**

none

## T

**6.21 Course: City Transport Facilities [T-BGU-100083]****Responsible:** Prof. Dr.-Ing. Ralf Roos**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100026 - City Transport Facilities](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
WT 21/22	6233909	<a href="#">Innerstädtische Verkehrsanlagen</a>	4 SWS	Lecture / Practice ( /  )	Roos, Zimmermann

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 45 min.

**Prerequisites**

Exercises and student research project City Transport Facilities has to be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-109912 - Exercises and Student Research Project City Transport Facilities](#) must have been passed.

**Recommendation**

none

**Annotation**

none

## T

## 6.22 Course: Computational Analysis of Structures [T-BGU-100031]

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100047 - Computational Analysis of Structures](#)



**Type**  
Oral examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
3

Events					
ST 2022	6214801	<a href="#">Computational Analysis of Structures</a>	2 SWS	Lecture / 	Wagner
ST 2022	6214802	<a href="#">Exercises to Computational Analysis of Structures</a>	2 SWS	Practice / 	Geiger

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

Student research project "Computational Analysis of Structures" has to be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-100174 - Student Research Project 'Computational Analysis of Structures'](#) must have been passed.

**Recommendation**

none

**Annotation**

none

## T

## 6.23 Course: Computational Structural Dynamics [T-BGU-100999]

**Responsible:** Prof. Dr.-Ing. Peter Betsch**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100579 - Numerical Structural Dynamics](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
ST 2022	6215810	<a href="#">Numerische Strukturdynamik</a>	4 SWS	Lecture / Practice ( /  )	Betsch

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

## 6.24 Course: Concrete Construction Technology [T-BGU-100036]

**Responsible:** Prof. Dr.-Ing. Frank Dehn

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

**Part of:** [M-BGU-100056 - Concrete Construction Technology](#)



**Type**  
Oral examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6211914	<a href="#">Betontechnologie</a>	3 SWS	Lecture / Practice ( /  )	Dehn, Kvitsel
WT 21/22	6211915	<a href="#">Verformungs- und Bruchprozesse</a>	1 SWS	Lecture / 	Kotan, Dehn

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

oral exam, appr. 30 min.

### Prerequisites

none

### Recommendation

none



### Annotation





none

## T

## 6.25 Course: Construction of Steel and Composite Bridges [T-BGU-100024]

**Responsible:** Prof. Dr.-Ing. Thomas Ummenhofer**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100040 - Construction of Steel and Composite Bridges](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
ST 2022	6212805	<a href="#">Stahl- und Verbundbrückenbau</a>	2 SWS	Lecture / 	Ummenhofer
ST 2022	6212806	<a href="#">Übungen zu Stahl- und Verbundbrückenbau</a>	2 SWS	Practice / 	Ummenhofer, Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, 60 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

**6.26 Course: Contact Mechanics [T-BGU-109947]****Responsible:** Dr.-Ing. Marlon Franke**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-104916 - Contact Mechanics](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 21/22	6215909	<a href="#">Contact Mechanics</a>	2 SWS	Lecture	Konyukhov, Franke
WT 21/22	6215910	<a href="#">Exercises Contact Mechanic</a>	2 SWS	Practice	Konyukhov, Franke

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none


**Annotation**





none



T

**6.27 Course: Continuum Mechanics [T-BGU-106196]****Responsible:** Dr.-Ing. Marlon Franke**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100064 - Continuum Mechanics of Heterogeneous Solids](#)  
[M-BGU-100070 - Basics of Numeric Modeling](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 21/22	6215702	<a href="#">Kontinuumsmechanik</a>	2 SWS	Lecture / 	Franke

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

## 6.28 Course: Decommissioning of Nuclear Facilities [T-BGU-100627]

**Responsible:** Prof. Dr.-Ing. Sascha Gentes  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100345 - Decommissioning of Nuclear Facilities](#)



**Type**  
Oral examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6243901	<a href="#">Demontage und Dekontamination von kerntechnischen Anlagen</a>	2 SWS	Lecture / Practice ( /  )	Gentes, Mitarbeiter/innen
WT 21/22	6243903	<a href="#">Neuentwicklungen und Optimierungen in der Maschinentechnik der Demontage und des Rückbaus</a>	2 SWS	Lecture / Practice ( /  )	Gentes, Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

keine

**Recommendation**

none

**Annotation**

none

**T****6.29 Course: Design and Construction in Metal and Lightweight Structures [T-BGU-110852]****Responsible:** Prof. Dr.-Ing. Thomas Ummenhofer**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-105370 - Design and Construction in Metal and Lightweight Structures](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each term	1 terms	1

Events					
WT 21/22	6212913	<a href="#">Entwerfen und Konstruieren im Metall- und Leichtbau</a>	4 SWS	Lecture / Practice (	Ummenhofer

**Competence Certificate**

structure and construction proposal, report appr. 20 pages, colloquium appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.30 Course: Design and Construction of Components in Reinforced Concrete [T-BGU-100015]****Responsible:** Prof. Dr.-Ing. Alexander Stark**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100033 - Design and Construction of Components in Reinforced Concrete](#)**Type**  
Written examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
WT 21/22	6211701	<a href="#">Bemessung und Konstruktion von Bauteilen im Stahlbeton</a>	2 SWS	Lecture	Müller
WT 21/22	6211702	<a href="#">Übungen zu Bemessung und Konstruktion von Bauteilen im Stahlbeton</a>	2 SWS	Practice	Müller

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none


**Annotation**




none

**T****6.31 Course: Design Exercise Hydraulic Structures [T-BGU-111929]**

**Responsible:** Prof. Dr. Mario Jorge Rodrigues Pereira da Franca  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-103376 - Hydraulic Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	1

Events					
ST 2022	6222703	<a href="#">Design of Hydraulic Structures</a>	2 SWS	Lecture / Practice ( /  )	Seidel

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

1 design exercise, report about 10 pages

**Prerequisites**

none

**Recommendation**

none


**Annotation**

none

## T

**6.32 Course: Design Exercise River Engineering [T-BGU-111928]****Responsible:** Prof. Dr. Mario Jorge Rodrigues Pereira da Franca**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103376 - Hydraulic Engineering](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	1

Events					
ST 2022	6222701	<a href="#">River Engineering</a>	2 SWS	Lecture / Practice ( /  )	Rodrigues Pereira da Franca

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

1 design exercise, report about 10 pages

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

**6.33 Course: Digital Engineering and Construction [T-BGU-111695]****Responsible:** Jun.-Prof. Dr. Reza Maalek**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-105830 - Digital Engineering and Construction](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each winter term	1 terms	1

Events					
WT 21/22	6244901	<a href="#">Digital Engineering and Construction</a>	4 SWS	Lecture / Practice (	Maalek

**Competence Certificate**

4 weekly assignments, term paper approx. 10 pages, presentation approx. 15-20 min.

**Prerequisites**

none

**Recommendation**


none





**Annotation**

none

**T****6.34 Course: Digital Planning and Building Information Modeling [T-BGU-110382]****Responsible:** Tim Zinke**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-105135 - Digital Planning and Building Information Modeling](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each winter term	1 terms	1

Events					
WT 21/22	6212912	<a href="#">Digital Planning and Building Information Modeling</a>	4 SWS	Lecture / Practice ( /  )	Zinke

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

preparation of BIM flat pattern plan and report, approx. 20 pages, with presentation, approx. 10 min.

**Prerequisites**

none

**Recommendation**

none





**Annotation**

none



**T****6.35 Course: Digital Technologies in Field Information Modeling [T-BGU-111276]****Responsible:** Jun.-Prof. Dr. Reza Maalek**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-105638 - Digital Technologies in Field Information Modeling](#)**Type**  
Examination of another type**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Expansion**  
1 terms**Version**  
2

Events					
ST 2022	6244801	<a href="#">Digital Technologies in Field Information Modeling</a>	4 SWS	Lecture / Practice ( /  )	Maalek

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

4 weekly assignments, term paper approx. 10 pages, presentation approx. 15 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.36 Course: Digitalization in Facility and Real Estate Management [T-BGU-108941]**

**Responsible:** Prof. Dr.-Ing. Kunibert Lennerts  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-104348 - Digitalization in Facility and Real Estate Management](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	6	Grade to a third	Each term	1

Events					
WT 21/22	6242907	<a href="#">Digitization in Facility- and Real Estate Management</a>	4 SWS	Lecture / Practice (	Lennerts, Mitarbeiter/ innen

**Competence Certificate**

project work incl. report, appr. 15 pages, and presentation/colloquium, appr. 15 min

**Prerequisites**

none



**Recommendation**





none

**Annotation**

none

**T****6.37 Course: Durability and Service Life Design [T-BGU-100037]****Responsible:** Dr.-Ing. Michael Vogel**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100057 - Durability and Service Life Design](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 21/22	6211907	<a href="#">Korrosive Prozesse und Lebensdauer</a>	3 SWS	Lecture / Practice ( /  )	Vogel, Dehn
WT 21/22	6211908	<a href="#">Analytische Verfahren</a>	1 SWS	Lecture / 	Vogel

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none


**Recommendation**





none

**Annotation**

none

**T****6.38 Course: Dynamics of Structures [T-BGU-100077]****Responsible:** Prof. Dr.-Ing. Peter Betsch**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100035 - Surface Structures and Dynamics of Structures](#)**Type**  
Written examination**Credits**  
2**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2**Events**

WT 21/22	6215701	<a href="#">Baudynamik</a>	2 SWS	Lecture / 	Betsch
----------	---------	----------------------------	-------	---	--------

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam, 60 min.

**Prerequisites**

none

**Recommendation**

none



**Annotation**





none

## T

## 6.39 Course: Earthworks and Foundation Engineering [T-BGU-100068]

**Responsible:** 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**  
Written examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
WT 21/22	6251701	<a href="#">Foundation Types</a>	2 SWS	Lecture / Practice ( /  )	Knittel
WT 21/22	6251703	<a href="#">Basics in Earthworks and Embankment Dams</a>	2 SWS	Lecture / Practice ( /  )	Bieberstein

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

preparation of the student research project for examination preparation


**Annotation**





none

## T

**6.40 Course: Environmental Communication [T-BGU-101676]****Responsible:** Dr. Charlotte Kämpf**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-101108 - Environmental Communication](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	6	Grade to a third	Each term	2

Events					
WT 21/22	6224905	<a href="#">Umweltkommunikation / Environmental Communication</a>	2 SWS	Seminar	Kämpf
ST 2022	6224905	<a href="#">Environmental Communication</a>	2 SWS	Seminar / 	Kämpf

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

presentation, appr. 15 min.,  
manuscript, appr. 6000 words, and  
Poster DIN-A3

**Prerequisites**

The accomplishment 'Examination Prerequisite Environmental Communication' (T-BGU-106620) has to be passend.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-106620 - Examination Prerequisite Environmental Communication](#) must have been passed.

**Recommendation**

none

**Annotation**

none

**T****6.41 Course: Environmental Fluid Mechanics [T-BGU-106767]**

**Responsible:** Prof. Dr. Olivier Eiff  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-103383 - Environmental Fluid Mechanics](#)

**Type**  
Written examination

**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 21/22	6221909	<a href="#">Environmental Fluid Mechanics</a>	4 SWS	Lecture / Practice ( / )	Eiff

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**



none





**Annotation**

none

## T

**6.42 Course: Environmentally-Friendly Recycling and Disassembly of Buildings [T-BGU-100146]****Responsible:** Prof. Dr.-Ing. Sascha Gentes**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100110 - Environmentally-friendly Recycling and Disassembly of Buildings](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1**Events**

ST 2022	6243801	<a href="#">Projektstudien</a>	2 SWS	Lecture / Practice ( /  )	Hauptenthal, Gentes
ST 2022	6243803	<a href="#">Verfahrenstechniken der Demontage</a>	2 SWS	Lecture / Practice ( /  )	Gentes

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none



**Annotation**





none



## T

**6.43 Course: Equipment and Special Construction Techniques in Building Practice [T-BGU-108009]****Responsible:** Prof. Dr.-Ing. Sascha Gentes**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103918 - Equipment and Special Construction Techniques in Building Practice](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1**Events**

WT 21/22	6243905	<a href="#">Geräte und spezielle Verfahren in der Baupraxis II</a>	2 SWS	Lecture / 	Gentes, Schneider
ST 2022	6241815	<a href="#">Geräte und spezielle Verfahren in der Baupraxis I</a>	2 SWS	Lecture / 	Gentes, Schneider

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 45 min.

**Prerequisites**

none

**Recommendation**


none





**Annotation**

none

**T****6.44 Course: Examination Prerequisite Environmental Communication [T-BGU-106620]****Responsible:** Dr. Charlotte Kämpf**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-101108 - Environmental Communication](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	0	pass/fail	Each summer term	1

Events					
WT 21/22	6224905	<a href="#">Umweltkommunikation / Environmental Communication</a>	2 SWS	Seminar	Kämpf
ST 2022	6224905	<a href="#">Environmental Communication</a>	2 SWS	Seminar / 	Kämpf

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

2 literature annotations, appr. 150 words each, and short presentation, appr. 10 min.

**Prerequisites**

none

**Recommendation**





none

**Annotation**

none

**T****6.45 Course: Exercises and Student Research Project City Transport Facilities [T-BGU-109912]****Responsible:** Prof. Dr.-Ing. Ralf Roos**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100026 - City Transport Facilities](#)**Type**  
Completed coursework**Credits**  
2**Grading scale**  
pass/fail**Recurrence**  
Each winter term**Expansion**  
1 terms**Version**  
1**Events**

WT 21/22	6233909	<a href="#">Innerstädtische Verkehrsanlagen</a>	4 SWS	Lecture / Practice ( /  )	Roos, Zimmermann
----------	---------	---	-------	---	------------------

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

1 report approx. 5 pages and 3 planning documents

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T




## 6.46 Course: Exercises Space and Infrastructure [T-BGU-111278]





**Responsible:** PD Dr.-Ing. Martin Kagerbauer  
Dr. Sina Keller

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

**Part of:** [M-BGU-100014 - Space and Infrastructure](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	1	pass/fail	Each summer term	1 terms	1

Events					
ST 2022	6072201	<a href="#">Grundlagen Geographischer Informationssysteme für die Modellierung und Planung</a>	2 SWS	Lecture / 	Keller
ST 2022	6072202	<a href="#">Grundlagen Geographischer Informationssysteme für die Modellierung und Planung, Übung</a>	2 SWS	Practice / 	Keller
ST 2022	6231805	<a href="#">Erschließung, Ver- und Entsorgungsplanung</a>	2 SWS	Lecture / Practice ( /  )	Kagerbauer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

#### Competence Certificate

9 of 10 exercises about GIS;

1 plan submission with 1-2 pages written explanation

#### Prerequisites

none

#### Recommendation

none

#### Annotation

new as from summer term 2021

## T

**6.47 Course: Experimental Hydraulics II [T-BGU-106773]****Responsible:** Dr.-Ing. Frank Seidel**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103388 - Experimental Hydraulics and Measuring Techniques](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each winter term	1

Events					
WT 21/22	6222907	<a href="#">Experimental Hydraulics II</a>	2 SWS	Lecture / Practice (	Seidel

**Competence Certificate**

term paper, appr. 10 pages

**Prerequisites**

none

**Recommendation**


none





**Annotation**

none

**T****6.48 Course: Experiments in Fluid Mechanics [T-BGU-106760]****Responsible:** Prof. Dr. Olivier Eiff**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103377 - Experiments in Fluid Mechanics](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	6	Grade to a third	Each summer term	2

Events					
ST 2022	6221802	<a href="#">Experiments in Fluid Mechanics</a>	4 SWS	Lecture / Practice ( /  )	Eiff, Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

laboratory reports with analyses of the experiments in small teams, each appr. 10 pages including figures and tables, and oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

**6.49 Course: Facility Management [T-BGU-111908]**

**Responsible:** Prof. Dr.-Ing. Kunibert Lennerts  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-105922 - Facility Management](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

**Competence Certificate**

oral exam, appr. 40 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.50 Course: Facility Management in Hospitals and Hospital Management [T-BGU-109291]****Responsible:** Prof. Dr.-Ing. Kunibert Lennerts**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100347 - Facility Management in Hospitals and Hospital Management](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each winter term	1 terms	1

Events					
WT 21/22	6242905	<a href="#">Facility Management in Hospitals</a>	3 SWS	Lecture / Practice (	Lennerts, Mitarbeiter/ innen
WT 21/22	6242906	<a href="#">Facility Management in Hospitals</a>	1 SWS	Lecture	Lennerts, Mitarbeiter/ innen

**Competence Certificate**

term paper appr. 10 pages, with final presentation appr. 10 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none



## T

**6.51 Course: FE-Applications in Practical Engineering [T-BGU-100032]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100048 - FE-Applications in Practical Engineering](#)



**Type**  
Oral examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6214803	<a href="#">FE-Applications in Practical Engineering</a>	2 SWS	Lecture / 	Freitag, Panther
ST 2022	6214804	<a href="#">Übungen zu FE-Anwendung in der Baupraxis</a>	2 SWS	Practice / 	Panther

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T


**6.52 Course: Field Training Water Quality [T-BGU-109957]**





**Responsible:** PD Dr.-Ing. Stephan Fuchs  
Dr.-Ing. Stephan Hilgert

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

**Part of:** [M-BGU-104922 - Freshwater Ecology](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each summer term	1

Events					
ST 2022	6223814	<a href="#">Field Training Water Quality</a>	2 SWS	Practice / 	Hilgert, Fuchs

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

report on field training, appr. 8-15 pages

**Prerequisites**

The 'Teilleistung' Applied Ecology and Water Quality (T-BGU-109956, seminar paper with presentation) has to be begun, i.e. at least the registration has to be made.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-109956 - Applied Ecology and Water Quality](#) must have been started.



**Recommendation**





none

**Annotation**

The number of participants in the course is limited to 12 persons. The registration is to be made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoeology* and further study programs. The attendance at the first meeting is mandatory. In case of absence the place will be assigned to a person on the waiting list.

**T****6.53 Course: Finite Elements in Solid Mechanics [T-BGU-100998]****Responsible:** Prof. Dr.-Ing. Peter Betsch**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100578 - Finite Elements in Solid Mechanics](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
ST 2022	6215808	<a href="#">Finite Elemente in der Festkörpermechanik</a>	2 SWS	Lecture / 	Betsch
ST 2022	6215809	<a href="#">Übungen zu Finite Elemente in der Festkörpermechanik</a>	2 SWS	Practice / 	Wasmer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none




**Annotation**

none

**T****6.54 Course: Flow Measurement Techniques [T-BGU-110411]****Responsible:** Dr.-Ing. Christof-Bernhard Gromke**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103388 - Experimental Hydraulics and Measuring Techniques](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	3	Grade to a third	Each term	1 terms	1

Events					
WT 21/22	6221907	<a href="#">Flow Measurement Techniques</a>	2 SWS	Lecture / Practice ( /  )	Gromke

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

T

**6.55 Course: Fluid Mechanics of Turbulent Flows [T-BGU-110841]**

**Responsible:** Prof. Dr.-Ing. Markus Uhlmann  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-105361 - Fluid Mechanics of Turbulent Flows](#)


**Type**  
Oral examination




**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6221806	<a href="#">Fluid Mechanics of Turbulent Flows</a>	4 SWS	Lecture / Practice ( /  )	Uhlmann

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

oral exam, appr. 45 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

T

**6.56 Course: Fracture and Damage Mechanics [T-BGU-100087]**

**Responsible:** Prof. Dr.-Ing. Thomas Seelig  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100053 - Fracture and Damage Mechanics](#)


**Type**  
Oral examination




**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6215903	<a href="#">Bruch- und Schädigungsmechanik</a>	2 SWS	Lecture / Practice ( /  )	Seelig

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

oral exam, appr. 45 min.

**Prerequisites**

none


**Recommendation**





none

**Annotation**

none

**T****6.57 Course: Freight Transport [T-BGU-106611]****Responsible:** Bastian Chlond**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100020 - Intermodality in Freight, Long-Distance and Air Transport](#)**Type**  
Written examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
ST 2022	6232809	<a href="#">Güterverkehr</a>	2 SWS	Lecture / Practice ( /  )	Chlond

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam, 60 min.

**Prerequisites**

none


**Recommendation**

none

**Annotation**

none

**T****6.58 Course: Geostatistics [T-BGU-106605]****Responsible:** Prof. Dr.-Ing. Erwin Zehe**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103762 - Analysis of Spatial Data](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
ST 2022	6224805	<a href="#">Geostatistics</a>	4 SWS	Lecture / Practice ( /  )	Zehe, Mälicke, Wienhöfer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none



## T

**6.59 Course: Geotechnical Testing and Measuring Technology [T-BGU-100075]**

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100076 - Geotechnical Testing and Measuring Technology](#)




**Type**  
Oral examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6251909	<a href="#">Rock Testing</a>	1 SWS	Lecture / 	Schneider
WT 21/22	6251910	<a href="#">Testing in Dam and Wastefill Engineering</a>	1 SWS	Lecture / 	Bieberstein
WT 21/22	6251911	<a href="#">Geotechnical Measuring Technology</a>	2 SWS	Lecture / Practice ( /  )	Huber

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 40 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

**6.60 Course: Glass, Plastic and Cable Structures [T-BGU-100025]****Responsible:** Dr.-Ing. Daniel Ruff**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100041 - Glass, Plastic and Cable Structures](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 21/22	6212905	<a href="#">Glas-, Kunststoff- und Seiltragwerke</a>	3 SWS	Lecture	Ruff
WT 21/22	6212906	<a href="#">Übungen zu Glas-, Kunststoff- und Seiltragwerke</a>	1 SWS	Practice	Ruff

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none


**Recommendation**




none

**Annotation**

none

**T****6.61 Course: Ground Improvement, Grouting and Soil Freezing [T-BGU-100080]****Responsible:** Tobias Riegger**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100078 - Special Underground Engineering](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
ST 2022	6251820	<a href="#">Ground Improvement, Grouting and Soil Freezing</a>	2 SWS	Lecture / Practice ( /  )	Riegger

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**



none





## T

## 6.62 Course: Ground Investigation [T-BGU-100072]

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100071 - Ground Investigation](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each summer term	1

Events					
ST 2022	6251808	<a href="#">Soil Mechanical Laboratory Exercises</a>	2 SWS	Practice / 	Knittel, Reith
ST 2022	6251809	<a href="#">Geomechanical Field Exercise</a>	2 SWS	Practice / 	Knittel, Reith

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 40 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.63 Course: Ground Water and Earth Dams [T-BGU-100091]**

**Responsible:** 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**  
Oral examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6251814	<a href="#">Geotechnical Ground Water Problems</a>	2 SWS	Lecture / Practice ( /  )	Bieberstein
ST 2022	6251816	<a href="#">Embankment Dams (Advanced)</a>	2 SWS	Lecture / Practice ( /  )	Bieberstein

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 40 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.64 Course: Groundwater Flow around Structures [T-BGU-106774]****Responsible:** Ph.D. Luca Trevisan**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103389 - Hydraulic Structures](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none


**Recommendation**





none

**Annotation**

none

**T****6.65 Course: Groundwater Hydraulics [T-BGU-100624]****Responsible:** Dr. Ulf Mohrlök**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100340 - Groundwater Management](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
ST 2022	6221801	<a href="#">Groundwater Hydraulics</a>	2 SWS	Lecture / Practice ( /  )	Mohrlök

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none


**Recommendation**

none

**Annotation**

none

**T****6.66 Course: Group Exercise Project Integrated Planning [T-BGU-109916]****Responsible:** Prof. Dr.-Ing. Ralf Roos**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100018 - Project Integrated Planning](#)**Type**  
Completed coursework**Credits**  
5**Grading scale**  
pass/fail**Recurrence**  
Each winter term**Expansion**  
1 terms**Version**  
1

Events					
WT 21/22	6230901	<a href="#">Projekt Integriertes Planen</a>	4 SWS	Project (P /  )	Roos, Zimmermann, Chlond

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

integrated term paper of the whole group and 2 presentations of the result

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none



## T

**6.67 Course: Highway Design [T-BGU-100057]**




**Responsible:** Prof. Dr.-Ing. Ralf Roos  
Dr.-Ing. Matthias Zimmermann

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

**Part of:** [M-BGU-100017 - Highway Design](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	4	Grade to a third	Each term	2

Events					
WT 21/22	6233901	<a href="#">DV-gestützter Straßenentwurf</a>	2 SWS	Lecture / Practice ( /  )	Zimmermann
WT 21/22	6233903	<a href="#">Projektstudie Außerortsstraße</a>	2 SWS	Lecture / Practice ( /  )	Zimmermann, Roos

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

Study project Design of a Rural Road hat to be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-109917 - Study Project Design of a Rural Road](#) must have been passed.

**Recommendation**

none





**Annotation**

none

T

**6.68 Course: History of Urban Planning [T-BGU-108441]****Responsible:** Prof. Dr. Joachim Vogt**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100013 - Urban Renewal](#)**Type**  
Written examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2**Events**

ST 2022	6328016	<a href="#">Städtebau I: Städtebaugeschichte</a>	2 SWS	Lecture / 	Vogt, Ross
---------	---------	--	-------	---	------------

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.69 Course: Hollow Section Structures [T-BGU-100086]****Responsible:** Dr.-Ing. Stefan Herion**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100004 - Hollow Section Structures](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 21/22	6212903	<a href="#">Hohlprofilkonstruktionen</a>	2 SWS	Lecture	Herion
WT 21/22	6212904	<a href="#">Übungen zu Hohlprofilkonstruktionen</a>	2 SWS	Practice	Herion

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none



**Annotation**


none

**T****6.70 Course: Homework 'Basics of Finite Elements' [T-BGU-109908]**

**Responsible:** Prof. Dr.-Ing. Peter Betsch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100052 - Basics of Finite Elements](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each winter term	1

Events					
WT 21/22	6215901	<a href="#">Grundlagen Finite Elemente</a>	2 SWS	Lecture / 	Betsch
WT 21/22	6215902	<a href="#">Übungen zu Grundlagen Finite Elemente</a>	2 SWS	Practice / 	Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

processing of two exercise sheets

**Prerequisites**

none

**Recommendation**


none





**Annotation**

none

**T****6.71 Course: Homework 'Introduction to Environmental Data Analysis and Statistical Learning' [T-BGU-109950]****Responsible:** Dr.-Ing. Uwe Ehret**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-104880 - Introduction to Environmental Data Analysis and Statistical Learning](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each winter term	1

Events					
WT 21/22	6224908	<a href="#">Introduction to Environmental Data Analysis and Statistical Learning</a>	4 SWS	Lecture / Practice ( /  )	Ehret

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

course associated assignments, short reports appr. 1 page each

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

**6.72 Course: Hydraulic Engineering [T-BGU-106759]**

**Responsible:** Prof. Dr. Mario Jorge Rodrigues Pereira da Franca  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-103376 - Hydraulic Engineering](#)



**Type**  
Written examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
2

Events					
ST 2022	6222701	<a href="#">River Engineering</a>	2 SWS	Lecture / Practice ( /  )	Rodrigues Pereira da Franca
ST 2022	6222703	<a href="#">Design of Hydraulic Structures</a>	2 SWS	Lecture / Practice ( /  )	Seidel

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 75 min.

**Prerequisites**

The not graded accomplishments 'Design Exercise River Engineering', T-BGU-111928, and 'Design Exercise Hydraulic Structures', T-BGU-111929, have to be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-111928 - Design Exercise River Engineering](#) must have been passed.
2. The course [T-BGU-111929 - Design Exercise Hydraulic Structures](#) must have been passed.


**Recommendation**





none

**Annotation**

none

**T****6.73 Course: Hydro Power Engineering [T-BGU-100139]****Responsible:** Dr.-Ing. Peter Oberle**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100103 - Hydro Power Engineering](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
ST 2022	6222801	<a href="#">Hydro Power Engineering</a>	4 SWS	Lecture / Practice ( /  )	Oberle

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.74 Course: Hydrological Measurements in Environmental Systems [T-BGU-106599]****Responsible:** Dr. Jan Wienhöfer**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103763 - Hydrological Measurements in Environmental Systems](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	6	Grade to a third	Each summer term	1

Events					
ST 2022	6224807	<a href="#">Hydrological Measurements in Environmental Systems</a>	4 SWS	/ ●	Wienhöfer, Mitarbeiter/ innen

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

The examination consists of four parts:

1. active participation in the seminar (presentation ~ 20 mins)
2. active participation in field and lab work
3. documentation of the field experiments (report ~ 10 pages)
4. analysis of field data (presentation ~ 20 mins and report ~10 pages)

Each part is graded with points, and the overall grade is determined by the number of points obtained.

Passing the exam requires at least 1 point in each of the four parts, and in total the minimum number of points.

**Prerequisites**

none

**Recommendation**

none


**Annotation**





The course requires a minimum number of 6 and a maximum number of 30 participants. Please register online for the course (not exam!), 6224807, via the Campus portal (in exceptional cases via e-mail to the responsible lecturer). Participants are selected according to their progress of study considering the following order: students of *Water Science and Engineering*, students of *Civil Engineering*, students of *Geoecology*.



**T****6.75 Course: Information Management for Public Mobility Services [T-BGU-106608]****Responsible:** Prof. Dr.-Ing. Peter Vortisch**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103357 - Special Issues of Public Transport](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each summer term	1

Events					
WT 21/22	6232905	<a href="#">Informationsmanagement für öffentliche Mobilitätsangebote</a>	2 SWS	Block / 	Vortisch

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

lecture accompanying exercises, appr. 5 pieces

**Prerequisites**

none



**Recommendation**





none

**Annotation**

none

**T****6.76 Course: Infrastructure Management [T-BGU-106300]****Responsible:** Prof. Dr.-Ing. Ralf Roos**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100009 - Infrastructure Management](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
ST 2022	6233801	<a href="#">Entwurf und Bau von Straßen</a>	2 SWS	Lecture / 	Roos
ST 2022	6233802	<a href="#">Betrieb und Erhaltung von Straßen</a>	2 SWS	Lecture / 	Roos

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam, 120 min.

**Prerequisites**

none

**Recommendation**


none




**Annotation**

none

**T****6.77 Course: Innovations and Developments in Metal and Lightweight Structures [T-BGU-110854]****Responsible:** Dr.-Ing. Matthias Albiez**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-105372 - Innovations and Developments in Steel and Timber Structures](#)  
[M-BGU-105373 - Building Preservation and Innovations in Metal and Lightweight Structures](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	3	Grade to a third	Each term	1 terms	1

Events					
ST 2022	6212808	<a href="#">Innovationen und Entwicklungen im Metall- und Leichtbau</a>	2 SWS	Lecture / Practice ( /  )	Albiez, Kasper

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none





## T

**6.78 Course: Innovations and Developments in Timber Structures [T-BGU-110855]**

**Responsible:** Prof. Dr.-Ing. Philipp Dietsch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-105372 - Innovations and Developments in Steel and Timber Structures](#)  
[M-BGU-105374 - Building Preservation and Innovations in Timber Structures](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	3	Grade to a third	Each term	1 terms	1

Events					
WT 21/22	6213906	<a href="#">Innovations and Developments in Timber Structures</a>	2 SWS	Lecture / Practice ( /  )	Sandhaas, Frese

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.79 Course: Integrated Design Project in Water Resources Management [T-BGU-111275]**




**Responsible:** Dr.-Ing. Uwe Ehret  
Dr.-Ing. Frank Seidel

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

**Part of:** [M-BGU-105637 - Integrated Design Project in Water Resources Management](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each term	1 terms	1

Events					
ST 2022	6224801	<a href="#">Integrated Design Project in Water Resources Management</a>	4 SWS	Lecture / Practice ( /  )	Ehret, Seidel

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

project work, report approx. 15 pages with presentation approx. 15 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.80 Course: Interaction Flow - Hydraulic Structures [T-BGU-110404]****Responsible:** Dr.-Ing. Michael Gebhardt**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103389 - Hydraulic Structures](#)  
[M-BGU-105503 - Interaction Flow - Building Structure](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	1

Events					
WT 21/22	6221903	<a href="#">Interaction Flow - Hydraulic Structures</a>	2 SWS	Lecture / Practice (	Gebhardt

**Competence Certificate**

written exam, 60 min.

**Prerequisites**

none

**Recommendation**





none

**Annotation**

none

**T****6.81 Course: Introduction to Environmental Data Analysis and Statistical Learning [T-BGU-109949]****Responsible:** Dr.-Ing. Uwe Ehret**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-104880 - Introduction to Environmental Data Analysis and Statistical Learning](#)**Type**  
Written examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1**Events**

WT 21/22	6224908	<a href="#">Introduction to Environmental Data Analysis and Statistical Learning</a>	4 SWS	Lecture / Practice ( / )	Ehret
----------	---------	--	-------	--------------------------	-------

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam, 60 min.

**Prerequisites**

The accomplishment Homework 'Introduction to Environmental Data Analysis and Statistical Learning' (T-BGU-109265) has to be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-109950 - Homework 'Introduction to Environmental Data Analysis and Statistical Learning'](#) must have been passed.

**Recommendation**


none





**Annotation**

none

**T****6.82 Course: Introduction to Matlab [T-BGU-106765]****Responsible:** Dr.-Ing. Uwe Ehret**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103927 - Interdisciplinary Qualifications](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	3	pass/fail	Each winter term	1

Events					
WT 21/22	6224907	<a href="#">Introduction to Matlab</a>	2 SWS	Lecture / Practice ( /  )	Ehret, Wienhöfer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

Implementation of a Matlab code within a class exercise

**Prerequisites**

none

**Recommendation**

none

**Annotation**

The course is limited to 60 participants. Please register via the student portal (Studierendenportal). Only in case that this should not be possible: Please register via e-mail to the responsible lecturer. Participants are selected according to their progress of study considering the following order: students of Water Science and Engineering, then students of Civil Engineering with focus 'Water and Environment', then other students.



## T

## 6.83 Course: Landfills [T-BGU-100084]

**Responsible:** Dr.-Ing. Andreas Bieberstein  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100079 - Environmental Geotechnics](#)


**Type**  
Oral examination

**Credits**  
3

**Grading scale**  
Grade to a third

**Recurrence**  
Each winter term

**Version**  
1

Events					
WT 21/22	6251913	<a href="#">Landfills</a>	2 SWS	Lecture / Practice ( /  )	Bieberstein

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

**6.84 Course: Laws and Proceedings Concerning Traffic and Roads [T-BGU-106297]**

**Responsible:** Hon.-Prof. Dr. Dietmar Hönig  
Prof. Dr.-Ing. Ralf Roos  
Prof. Dr.-Ing. Peter Vortisch

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

**Part of:** [M-BGU-100011 - Laws and Proceedings Concerning Traffic and Roads](#)




**Type**  
Written examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6232801	<a href="#">Bewertungs- und Entscheidungsverfahren</a>	1 SWS	Lecture / 	Chlond
ST 2022	6233803	<a href="#">Verkehrs-, Planungs- und Wegerecht</a>	2 SWS	Lecture / 	Hönig
ST 2022	6233804	<a href="#">Umweltverträglichkeitsstudien im Straßenwesen</a>	1 SWS	Lecture / 	Roos

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 120 min.

**Prerequisites**

none

**Recommendation**

none


**Annotation**

none

**T****6.85 Course: Leadership and Communication [T-BGU-111900]**

**Responsible:** Prof. Dr.-Ing. Shervin Haghsheeno  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-105917 - Leadership and Communication](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2022	6241805	<a href="#">Leadership and Communication</a>	4 SWS	Lecture / Practice ( /  )	Haghsheeno, Eschen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.86 Course: Lean Construction [T-BGU-108000]**

**Responsible:** Prof. Dr.-Ing. Shervin Haghsheno  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100104 - Lean Construction](#)

**Type**  
Written examination

**Credits**  
4,5

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6241901	<a href="#">Lean Construction</a>	4 SWS	Lecture / Practice (	Haghsheno, Mitarbeiter/innen

**Competence Certificate**

written exam, 70 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

T

**6.87 Course: Lean Integrated Project Delivery [T-BGU-111910]**

**Responsible:** Prof. Dr.-Ing. Shervin Haghsheno  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-105925 - Lean Integrated Project Delivery \(Lean IPD\)](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	3	Grade to a third	Each term	1 terms	1

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none


**Recommendation**





none

**Annotation**

none

**T****6.88 Course: Long-Distance and Air Traffic [T-BGU-106301]****Responsible:** Bastian Chlond**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100020 - Intermodality in Freight, Long-Distance and Air Transport](#)**Type**  
Written examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1**Events**

WT 21/22	6232904	<a href="#">Fern- und Luftverkehr</a>	2 SWS	Lecture / 	Chlond, Dozenten
----------	---------	---------------------------------------	-------	---	------------------

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam, 60 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.89 Course: Machinery and Process Engineering [T-BGU-100623]**

**Responsible:** Prof. Dr.-Ing. Sascha Gentes  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100339 - Machinery and Process Engineering](#)



**Type**  
Written examination





**Credits**  
5

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
2

Events					
WT 21/22	6241703	<a href="#">Verfahrenstechnik</a>	2 SWS	Lecture / 	Schneider
WT 21/22	6243701	<a href="#">Maschinentechnik</a>	2 SWS	Lecture / 	Gentes, Dörfler

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none





**Annotation**

none

**T****6.90 Course: Mass Fluxes in River Basins [T-BGU-111061]****Responsible:** PD Dr.-Ing. Stephan Fuchs**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103373 - River Basin Modeling](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	3	pass/fail	Each summer term	1 terms	1

Events					
ST 2022	6223812	<a href="#">Mass Fluxes in River Basins</a>	2 SWS	Lecture / 	Fuchs, Morling

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

working on exercises: report, appr. 5 pages, and presentation , appr. 10 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none



## T

## 6.91 Course: Master Thesis [T-BGU-110135]

**Responsible:** Prof. Dr.-Ing. Peter Vortisch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-104996 - Module Master Thesis](#)

Type	Credits	Grading scale	Recurrence	Version
Final Thesis	30	Grade to a third	Each term	1

**Competence Certificate**

duration appr. 6 months

presentation within one month after submission of the thesis

**Prerequisites**

defined for the module Master Thesis

**Final Thesis**

This course represents a final thesis. The following periods have been supplied:

**Submission deadline** 6 months**Maximum extension period** 3 months**Correction period** 8 weeks

This thesis requires confirmation by the examination office.

**Recommendation**

see module

**Annotation**

Information about the procedure regarding admission and registration of the Master Thesis see chap. 2.9.

**T****6.92 Course: Material Models in Solid Mechanics [T-BGU-100044]**

**Responsible:** Prof. Dr.-Ing. Thomas Seelig  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100054 - Material Models in Solid Mechanics](#)



**Type**  
Oral examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6215801	<a href="#">Anwendungsorientierte Materialtheorien</a>	2 SWS	Lecture / 	Helbig
ST 2022	6215802	<a href="#">Übungen zu Anwendungsorientierte Materialtheorien</a>	2 SWS	Practice / 	Helbig

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 45 min.

**Prerequisites**

none

**Recommendation**





none

**Annotation**

none

**T****6.93 Course: Material Science, Welding and Fatigue [T-BGU-100023]****Responsible:** Dr.-Ing. Philipp Weidner**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100039 - Material Science, Welding and Fatigue](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
ST 2022	6212803	<a href="#">Stahlwerkstoffe, Schweißtechnik und Ermüdung</a>	4 SWS	Lecture / Practice ( /  )	Seyfried, Weidner

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**




none





**Annotation**

none

## T

**6.94 Course: Materials Testing and Measuring Techniques [T-BGU-100043]****Responsible:** Dr.-Ing. Nico Herrmann**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100061 - Materials Testing and Measuring Techniques](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 21/22	6211911	<a href="#">Messverfahren im konstruktiven Ingenieurbau</a>	1 SWS	Lecture / 	Herrmann, Dehn
WT 21/22	6211912	<a href="#">Übungen zu Messverfahren im konstruktiven Ingenieurbau</a>	1 SWS	Practice / 	Herrmann
WT 21/22	6211913	<a href="#">Materialprüfung im Stahlbetonbau</a>	2 SWS	Lecture / 	Herrmann, Dehn

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**





none

**Annotation**

none

**T****6.95 Course: Micromechanics of Heterogeneous Solids [T-BGU-108879]****Responsible:** Dr. Ingo Schmidt**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100064 - Continuum Mechanics of Heterogeneous Solids](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
ST 2022	6215805	<a href="#">Mechanik heterogener Festkörper</a>	2 SWS	Lecture / 	Schmidt

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**




none

**T****6.96 Course: Modeling of Turbulent Flows - RANS and LES [T-BGU-110842]**

**Responsible:** Prof. Dr.-Ing. Markus Uhlmann  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-105362 - Modeling of Turbulent Flows - RANS and LES](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 21/22	6221911	<a href="#">Modelling of Turbulent Flows - RANS and LES</a>	4 SWS	Lecture / Practice ( /  )	Uhlmann

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

oral exam, appr. 45 min.

**Prerequisites**

none


**Recommendation**





none

**Annotation**

none

**T****6.97 Course: Modeling Techniques in Solid Mechanics [T-BGU-103223]****Responsible:** apl. Prof. Dr. Alexander Konyukhov**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-101673 - Modeling in Solid Mechanics](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
ST 2022	6215807	<a href="#">Modellbildung in der Festigkeitslehre</a>	4 SWS	Lecture / Practice ( /  )	N.N.

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**



none





**Annotation**

none

## T

**6.98 Course: Models and Methods in Traffic Engineering and Transportation Planning [T-BGU-100012]****Responsible:** Prof. Dr.-Ing. Peter Vortisch**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100008 - Models and Methods in Traffic Engineering and Transportation Planning](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 21/22	6232701	<a href="#">Berechnungsverfahren und Modelle in der Verkehrsplanung</a>	2 SWS	Lecture / Practice ( /  )	Vortisch, Mitarbeiter/innen
WT 21/22	6232703	<a href="#">Straßenverkehrstechnik</a>	2 SWS	Lecture / Practice ( /  )	Vortisch, Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none



**T****6.99 Course: Non-linear Analysis of Beam Structures [T-BGU-100030]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100046 - Non-linear Analysis of Beam Structures](#)



**Type**  
Written examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6214702	<a href="#">Non-linear Analysis of Beam Structures</a>	2 SWS	Lecture / 	Fina
WT 21/22	6214703	<a href="#">Exercises to Non-linear Analysis of Beam Structures</a>	2 SWS	Practice / 	Panther

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.100 Course: Non-linear Analysis of Surface Structures [T-BGU-100035]**

**Responsible:** Prof. Dr.-Ing. Werner Wagner  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100051 - Non-linear Analysis of Surface Structures](#)



**Type**  
Oral examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6214903	<a href="#">Non-linear Analysis of Surface Structures</a>	2 SWS	Lecture / 	Wagner
WT 21/22	6214904	<a href="#">Übungen zu Nichtlineare Modellierung von Flächentragwerken</a>	2 SWS	Practice / 	Weber

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 3 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.101 Course: Numerical Flow Modeling in Hydraulic Engineering [T-BGU-106776]****Responsible:** Dr.-Ing. Peter Oberle**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103390 - Numerical Flow Modeling in Hydraulic Engineering](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 21/22	6222903	<a href="#">Numerische Strömungsmodellierung im Wasserbau</a>	4 SWS	Lecture / Practice (	Oberle

**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.102 Course: Numerical Fluid Mechanics [T-BGU-106758]**

**Responsible:** Prof. Dr.-Ing. Markus Uhlmann  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-103375 - Numerical Fluid Mechanics](#)


**Type**  
Written examination




**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
2

Events					
WT 21/22	6221702	<a href="#">Numerical Fluid Mechanics I</a>	4 SWS	Lecture / Practice ( /  )	Uhlmann

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

T

**6.103 Course: Numerical Fluid Mechanics II [T-BGU-106768]**

**Responsible:** Prof. Dr.-Ing. Markus Uhlmann  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-103384 - Advanced Computational Fluid Dynamics](#)

**Type**  
Oral examination

**Credits**  
3

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6221809	<a href="#">Numerical Fluid Mechanics II</a>	2 SWS	Lecture / Practice ( / )	Uhlmann

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

module Numerical Fluid Mechanics [bauim2P5-NUMFLMECH] must be completed

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The module [M-BGU-103375 - Numerical Fluid Mechanics](#) must have been passed.

**Recommendation**


none





**Annotation**

none

**T****6.104 Course: Numerical Groundwater Modeling [T-BGU-100625]****Responsible:** Dr. Ulf Mohrlök**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100340 - Groundwater Management](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each winter term	1

Events					
WT 21/22	6221901	<a href="#">Numerical Groundwater Modeling</a>	2 SWS	Project (P /  )	Mohrlök

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

project report, appr. 15 pages

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.105 Course: Numerical Methods in Structural Analysis [T-BGU-100034]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100050 - Numerical Methods in Structural Analysis](#)



**Type**  
Oral examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6214901	<a href="#">Numerische Methoden in der Baustatik</a>	2 SWS	Lecture / 	Fina
WT 21/22	6214902	<a href="#">Übungen zu Numerische Methoden in der Baustatik</a>	2 SWS	Practice / 	Fina

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none



**Recommendation**





none

**Annotation**

none

**T****6.106 Course: Numerical Modelling in Geotechnics [T-BGU-100107]****Responsible:** apl. Prof. Dr. Andrzej Niemunis**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100075 - Numerical Modelling in Geotechnics](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
ST 2022	6251818	<a href="#">Exercises in Numerical Modelling</a>	2 SWS	Practice / 	Niemunis
ST 2022	6251819	<a href="#">FEM Applications in Geotechnical Modelling</a>	2 SWS	Lecture / 	Niemunis

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 30 min.;

on base of a programming project worked at during the semester

**Prerequisites**

none

**Recommendation**


none





**Annotation**

none



**T****6.107 Course: Numerics in Geotechnics [T-BGU-106197]****Responsible:** apl. Prof. Dr. Andrzej Niemunis**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100070 - Basics of Numeric Modeling](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 21/22	6251707	<a href="#">Numerics in Geotechnics</a>	2 SWS	Lecture / 	Niemunis

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

**6.108 Course: Parallel Programming Techniques for Engineering [T-BGU-106769]**

**Responsible:** Prof. Dr.-Ing. Markus Uhlmann  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-103384 - Advanced Computational Fluid Dynamics](#)

**Type**  
Oral examination

**Credits**  
3

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
2

Events					
ST 2022	6221807	<a href="#">Parallel programming techniques for engineering problems</a>	2 SWS	Lecture / Practice ( / )	Uhlmann

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

module Numerical Fluid Mechanics [bauim2P5-NUMFLMECH] must be completed

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The module [M-BGU-103375 - Numerical Fluid Mechanics](#) must have been passed.

**Recommendation**

none

**Annotation**

none

**T****6.109 Course: Planning of Transportation Systems [T-BGU-100013]**

**Responsible:** Prof. Dr.-Ing. Peter Vortisch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100016 - Planning of Transportation Systems](#)



**Type**  
Written examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
2

Events					
ST 2022	6232806	<a href="#">Eigenschaften von Verkehrsmitteln</a>	2 SWS	Lecture / 	Vortisch
ST 2022	6232808	<a href="#">Strategische Verkehrsplanung</a>	2 SWS	Lecture / 	Waßmuth

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 120 min.

**Prerequisites**

none

**Recommendation**



none


**Annotation**

none

## T

**6.110 Course: Practical Exercises Dynamics of Structures [T-BGU-111044]****Responsible:** Prof. Dr.-Ing. Peter Betsch**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103951 - Further Examinations](#)**Type**  
Completed coursework**Credits**  
2**Grading scale**  
pass/fail**Recurrence**  
Each winter term**Expansion**  
1 terms**Version**  
1

Events					
WT 21/22	6215701	<a href="#">Baudynamik</a>	2 SWS	Lecture / 	Betsch
WT 21/22	6215905	<a href="#">Baudynamikpraktikum</a>	2 SWS	Practical course / 	Betsch

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

reports 2-4 pages per experiment

**Prerequisites**

none

**Recommendation**

none

**Annotation**in addition to course Dynamics of Structures, selectable in module Further Examinations ([M-BGU-103951](#))

**T****6.111 Course: Practical Fire Protection [T-BGU-100042]**

**Responsible:** Hon.-Prof. Dr. Hermann Schröder  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100060 - Building Physics II](#)


**Type**  
Oral examination





**Credits**  
3

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6211815	<a href="#">Practical Fire Protection</a>	2 SWS	Lecture / 	Schröder

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none


**Recommendation**





none

**Annotation**

none

**T****6.112 Course: Practical Noise Control [T-BGU-108024]****Responsible:** Christian Zander**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100060 - Building Physics II](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
3

Events					
ST 2022	6211814	<a href="#">Practical Noise Control</a>	2 SWS	Lecture / 	Zander

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**



none




**Annotation**

none

**T****6.113 Course: Production Planning and Control in Construction [T-BGU-111901]****Responsible:** Prof. Dr.-Ing. Shervin Haghsheno**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-105918 - Production Planning and Control in Construction](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	5	Grade to a third	Each term	1 terms	1

Events					
ST 2022	6241801	<a href="#">Site Management</a>	1 SWS	Lecture / Practice ( /  )	N.N.
ST 2022	6241803	<a href="#">Site Planning and Handling</a>	3 SWS	Lecture / Practice ( /  )	Miernik, Kohlhammer, Haghsheno, Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none


**Recommendation**




none

**Annotation**

none

**T****6.114 Course: Project Integrated Planning [T-BGU-100061]****Responsible:** Prof. Dr.-Ing. Ralf Roos**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100018 - Project Integrated Planning](#)**Type**  
Oral examination**Credits**  
1**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
WT 21/22	6230901	<a href="#">Projekt Integriertes Planen</a>	4 SWS	Project (P /  )	Roos, Zimmermann, Chlond

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

Group exercise Project Integrated Planning has to be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-109916 - Group Exercise Project Integrated Planning](#) must have been passed.

**Recommendation**

none

**Annotation**

none



T

**6.115 Course: Project Lean Integrated Project Delivery [T-BGU-111911]**

**Responsible:** Prof. Dr.-Ing. Shervin Haghsheno  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-105925 - Lean Integrated Project Delivery \(Lean IPD\)](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	3	Grade to a third	Each summer term	1 terms	1

**Competence Certificate**

case study report, appr. 15 pages;  
 final presentation and colloquium, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.116 Course: Project Management in Construction and Real Estate Industry [T-BGU-100622]****Responsible:** Prof. Dr.-Ing. Shervin Haghsheno**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100338 - Project Management in Construction and Real Estate Industry](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	5	Grade to a third	Each term	4

Events					
WT 21/22	6241701	<a href="#">Projektmanagement in der Bau- und Immobilienwirtschaft</a>	4 SWS	Lecture / Practice (	Haghsheno, Hirschberger, Sittinger, Münzl

**Competence Certificate**

case study during the semester:

report appr. 15 pages

interim presentations and final presentations 10 min. each

colloquium at the end of the semester appr. 10 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.117 Course: Project Paper Lean Construction [T-BGU-101007]**

**Responsible:** Prof. Dr.-Ing. Shervin Haghsheno  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100104 - Lean Construction](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	1,5	Grade to a third	Each winter term	1

Events					
WT 21/22	6241901	<a href="#">Lean Construction</a>	4 SWS	Lecture / Practice (	Haghsheno, Mitarbeiter/innen

**Competence Certificate**

project:

report, appr. 10 pages, and  
 presentation, appr. 10 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.118 Course: Project Report Water Distribution Systems [T-BGU-108485]****Responsible:** Dr.-Ing. Peter Oberle**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-104100 - Water Distribution Systems](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each winter term	2

Events					
WT 21/22	6222905	<a href="#">Water Distribution Systems</a>	4 SWS	Lecture / Practice (	Oberle

**Competence Certificate**project report, appr. 15 pages, and  
presentation, appr. 15 min.**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.119 Course: Project Studies in Water Resources Management [T-BGU-106783]****Responsible:** Dr.-Ing. Frank Seidel**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103394 - Project Studies in Water Resources Management](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	6	Grade to a third	Each winter term	1

Events					
WT 21/22	6222901	<a href="#">Projektstudium: Wasserwirtschaftliche Planungen</a>	4 SWS	Lecture / Practice (	Seidel

**Competence Certificate**

project work: term paper, appr. 15 pages, with presentation

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

**6.120 Course: Real Estate Management [T-BGU-100629]**

**Responsible:** Prof. Dr.-Ing. Kunibert Lennerts  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100346 - Real Estate Management](#)

**Type**  
Oral examination

**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6242901	<a href="#">Real Estate Management Controlling</a>	1 SWS	Lecture	Lennerts
WT 21/22	6242902	<a href="#">Property Valuation Basics</a>	1 SWS	Lecture	Lennerts
WT 21/22	6242903	<a href="#">Corporate and Public Real Estate Management</a>	1 SWS	Lecture	Lennerts
WT 21/22	6242904	<a href="#">Projectdevelopment with Case Study</a>	1 SWS	Lecture	Lennerts, Mitarbeiter/innen

**Competence Certificate**

oral exam, appr. 40 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.121 Course: Real Estate und Facility Management - on Site Lectures [T-BGU-111909]****Responsible:** Prof. Dr.-Ing. Kunibert Lennerts**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-105924 - Real Estate and Facility Management - on Site Lectures](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each winter term	1 terms	1

**Competence Certificate**

report appr. 15 pages and presentatin/colloquium appr. 15 min.

**Prerequisites**

none

**Recommendation**

none


**Annotation**





none

**T****6.122 Course: Research Seminar Construction Management [T-BGU-108008]**

**Responsible:** Prof. Dr.-Ing. Shervin Haghsheno  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-103917 - Research Seminar Construction Management](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	6	Grade to a third	Each term	1

Events					
WT 21/22	6241906	<a href="#">Baubetriebliches Forschungsseminar II</a>	2 SWS	Seminar	Haghsheno, Mitarbeiter/innen
ST 2022	6241814	<a href="#">Baubetriebliches Forschungsseminar I</a>	2 SWS	Seminar / 	Haghsheno, Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

project report, appr. 25 pages, and colloquium

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none







## T

**6.123 Course: River Basin Modeling [T-BGU-106603]****Responsible:** PD Dr.-Ing. Stephan Fuchs**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103373 - River Basin Modeling](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each winter term	2

Events					
WT 21/22	6223904	<a href="#">Modelling Mass Fluxes in River Basins</a>	2 SWS	Lecture / Practice ( /  )	Fuchs

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**project report, appr. 10 pages, and  
presentation, appr. 15 min.**Prerequisites**

The not graded accomplishment 'Mass Fluxes in River Basins' has to be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-111061 - Mass Fluxes in River Basins](#) must have been passed.

**Recommendation**

none

**Annotation**

none





## T

**6.124 Course: River Processes [T-BGU-111930]**

**Responsible:** Prof. Dr. Mario Jorge Rodrigues Pereira da Franca  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-105927 - River Processes](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2022	6222805	<a href="#">Landscape and River Morphology</a>	2 SWS	Lecture / Practice ( /  )	Rodrigues Pereira da Franca
ST 2022	6222807	<a href="#">Transport Processes in Rivers</a>	2 SWS	Lecture / Practice ( /  )	Rodrigues Pereira da Franca

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

report about student project on Landscape and River Morphology, appr. 10 pages;  
 report about student project on Transport Processes in Rivers, appr. 10 pages;  
 final colloquium, appr. 20 min.

**Prerequisites**

none

**Recommendation**

none



**Annotation**




none

## T

## 6.125 Course: Road Construction [T-BGU-100058]

**Responsible:** Prof. Dr.-Ing. Ralf Roos**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100006 - Road Construction](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 21/22	6233904	<a href="#">Laborpraktikum im Straßenwesen</a>	2 SWS	Lecture / Practice ( /  )	Plachkova-Dzhurova
WT 21/22	6233905	<a href="#">Bemessung von Fahrbahnkonstruktionen und Schadensanalytik</a>	2 SWS	Lecture / 	Plachkova-Dzhurova

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.126 Course: Road Safety [T-BGU-100062]**

**Responsible:** Dr.-Ing. Matthias Zimmermann  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100021 - Road Safety](#)



**Type**  
Written examination





**Credits**  
3

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
3

Events					
WT 21/22	6233906	<a href="#">Sicherheitsmanagement im Straßenwesen</a>	2 SWS	Lecture / Practice ( /  )	Zimmermann
WT 21/22	6233908	<a href="#">Seminar im Straßenwesen</a>	2 SWS	Seminar / 	Zimmermann

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 60 min.

**Prerequisites**

Seminar paper Road Safety has to be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-109915 - Seminar Paper Road Safety](#) must have been passed.

**Recommendation**

none

**Annotation**

none

## T

**6.127 Course: Rock Engineering and Underground Construction [T-BGU-100074]**

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100074 - Rock Engineering and Underground Construction](#)



**Type**  
Written examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6251905	<a href="#">Aboveground Rock Engineering</a>	2 SWS	Lecture / Practice ( /  )	Kudella
WT 21/22	6251907	<a href="#">Tunnel Construction in Soils and in Existence</a>	2 SWS	Lecture / Practice ( /  )	Kudella, Wagner

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none



## 6.128 Course: Rock Mechanics and Tunneling [T-BGU-100069]

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100069 - Rock Mechanics and Tunneling](#)



**Type**  
Written examination





**Credits**  
5

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
2

Events					
ST 2022	6251804	<a href="#">Basics in Rock Mechanics</a>	2 SWS	Lecture / Practice ( /  )	Mutschler
ST 2022	6251806	<a href="#">Basics in Tunnel Construction</a>	2 SWS	Lecture / Practice ( /  )	Wagner

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

written exam, 90 min.

### Prerequisites

none

### Recommendation

preparation of the student research project for examination preparation

### Annotation

none

**T****6.129 Course: Self Assignment HoC-ZAK-SpZ 1 not graded [T-BGU-111596]****Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103927 - Interdisciplinary Qualifications](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each term	1 terms	1

**Competence Certificate**

according to the assignment to be credited

**Prerequisites**

none

**Self service assignment of supplementary studies**

This course can be used for self service assignment of grade acquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Zentrum für Angewandte Kulturwissenschaft und Studium Generale

**Recommendation**

none

**Annotation**

'Not assigned grades' can be assigned by the students themselves; titel and CP of the grades are taken over

**T****6.130 Course: Self Assignment HoC-ZAK-SpZ 2 not graded [T-BGU-111597]****Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103927 - Interdisciplinary Qualifications](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each term	1 terms	1

**Competence Certificate**

according to the assignment to be credited

**Prerequisites**

none

**Self service assignment of supplementary studies**

This course can be used for self service assignment of grade acquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Zentrum für Angewandte Kulturwissenschaft und Studium Generale

**Recommendation**

none

**Annotation**

'Not assigned grades' can be assigned by the students themselves; titel and CP of the grades are taken over



**T****6.131 Course: Self Assignment HoC-ZAK-SpZ 3 not graded [T-BGU-111598]****Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103927 - Interdisciplinary Qualifications](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each term	1 terms	1

**Competence Certificate**

according to the assignment to be credited

**Prerequisites**

none

**Self service assignment of supplementary studies**

This course can be used for self service assignment of grade acquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Zentrum für Angewandte Kulturwissenschaft und Studium Generale

**Recommendation**

none

**Annotation**

'Not assigned grades' can be assigned by the students themselves; titel and CP of the grades are taken over

**T****6.132 Course: Self Assignment HoC-ZAK-SpZ 4 graded [T-BGU-111599]****Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103927 - Interdisciplinary Qualifications](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	2	Grade to a third	Each term	1 terms	1

**Competence Certificate**

according to the assignment to be credited

**Prerequisites**

none

**Self service assignment of supplementary studies**

This course can be used for self service assignment of grade acquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Zentrum für Angewandte Kulturwissenschaft und Studium Generale

**Recommendation**

none

**Annotation**

'Not assigned grades' can be assigned by the students themselves; titel and CP of the grades are taken over

**T****6.133 Course: Self Assignment HoC-ZAK-SpZ 5 graded [T-BGU-111600]****Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103927 - Interdisciplinary Qualifications](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	2	Grade to a third	Each term	1 terms	1

**Competence Certificate**

according to the assignment to be credited

**Prerequisites**

none

**Self service assignment of supplementary studies**

This course can be used for self service assignment of grade acquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Zentrum für Angewandte Kulturwissenschaft und Studium Generale

**Recommendation**

none

**Annotation**

'Not assigned grades' can be assigned by the students themselves; titel and CP of the grades are taken over

**T****6.134 Course: Self Assignment HoC-ZAK-SpZ 6 graded [T-BGU-111601]****Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103927 - Interdisciplinary Qualifications](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	2	Grade to a third	Each term	1 terms	1

**Competence Certificate**

according to the assignment to be credited

**Prerequisites**

none

**Self service assignment of supplementary studies**

This course can be used for self service assignment of grade acquired from the following study providers:

- House of Competence
- Sprachenzentrum
- Zentrum für Angewandte Kulturwissenschaft und Studium Generale

**Recommendation**

none


**Annotation**





'Not assigned grades' can be assigned by the students themselves; titel and CP of the grades are taken over

**T****6.135 Course: Seminar Construction Machinery [T-BGU-111907]**

**Responsible:** Prof. Dr.-Ing. Shervin Haghsheeno  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-105921 - Seminar Construction Machinery](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Examination of another type	6	Grade to a third	Each summer term	1 terms	1

Events					
ST 2022	6241816	<a href="#">Seminar Construction Machinery</a>	4 SWS	Seminar / 	Schneider

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

portfolio:

report appr. 15 pages

presentation 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T



**6.136 Course: Seminar in Transportation [T-BGU-100014]**





**Responsible:** Bastian Chlond  
Prof. Dr.-Ing. Peter Vortisch

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

**Part of:** [M-BGU-103357 - Special Issues of Public Transport](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each term	1

Events					
WT 21/22	6232903	<a href="#">Seminar Verkehrswesen</a>	2 SWS	Seminar / 	Vortisch, KIT
ST 2022	6232903	<a href="#">Seminar Verkehrswesen</a>	2 SWS	Seminar / 	Chlond, Vortisch, Kagerbauer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

seminar paper, appr. 10 pages, and presentation, appr. 10 min.

**Prerequisites**

none

**Recommendation**


none





**Annotation**

none

**T****6.137 Course: Seminar Paper Road Safety [T-BGU-109915]****Responsible:** Dr.-Ing. Matthias Zimmermann**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100021 - Road Safety](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	3	pass/fail	Each winter term	1 terms	1

Events					
WT 21/22	6233908	<a href="#">Seminar im Straßenwesen</a>	2 SWS	Seminar / 	Zimmermann

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

integrated seminar paper of the team, appr. 10 pages/person and plan documents, presentation appr. 10 min.

**Prerequisites**

none


**Recommendation**




none

**Annotation**

none

**T****6.138 Course: Seminar Paper 'Waterway Engineering' [T-BGU-106779]****Responsible:** Dr.-Ing. Andreas Kron**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103392 - Waterway Engineering](#)**Type**  
Completed coursework**Credits**  
1**Grading scale**  
pass/fail**Recurrence**  
Each summer term**Version**  
2

Events					
ST 2022	6222803	<a href="#">Waterway Engineering</a>	4 SWS	Lecture / Practice ( /  )	Kron

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

seminar paper, appr. 15 pages

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none



## T

**6.139 Course: Shell Structures and Stability of Structures [T-BGU-100033]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100049 - Shell Structures and Stability of Structures](#)


**Type**  
Oral examination





**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
3

Events					
ST 2022	6214805	<a href="#">Schalentragwerke</a>	1 SWS	Lecture / 	Fina
ST 2022	6214806	<a href="#">Übungen zu Schalentragwerke</a>	1 SWS	Practice / 	Fina
ST 2022	6214807	<a href="#">Stabilität von Tragwerken</a>	1 SWS	Lecture / 	Fina
ST 2022	6214808	<a href="#">Übungen zu Stabilität von Tragwerken</a>	1 SWS	Practice / 	Lienhard

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 40 min.

**Prerequisites**

Student research project "Shell Structures and Stability of Structures" has to be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-100254 - Student Research Project 'Shell Structures and Stability of Structures'](#) must have been passed.

**Recommendation**

none

**Annotation**

none

**T****6.140 Course: Solid Construction Bridges [T-BGU-100020]**

**Responsible:** Prof. Dr.-Ing. Alexander Stark  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100037 - Solid Construction Bridges](#)

**Type**  
Written examination

**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6211901	<a href="#">Massivbrücken</a>	2 SWS	Lecture	Retzepis
WT 21/22	6211902	<a href="#">Übungen zu Massivbrücken</a>	2 SWS	Practice	Heiland

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

**6.141 Course: Space and Infrastructure [T-BGU-100056]**

**Responsible:** PD Dr.-Ing. Martin Kagerbauer  
Dr. Sina Keller

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

**Part of:** [M-BGU-100014 - Space and Infrastructure](#)




**Type**  
Written examination





**Credits**  
5

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
3

Events					
ST 2022	6072201	<a href="#">Grundlagen Geographischer Informationssysteme für die Modellierung und Planung</a>	2 SWS	Lecture / 	Keller
ST 2022	6072202	<a href="#">Grundlagen Geographischer Informationssysteme für die Modellierung und Planung, Übung</a>	2 SWS	Practice / 	Keller
ST 2022	6231805	<a href="#">Erschließung, Ver- und Entsorgungsplanung</a>	2 SWS	Lecture / Practice ( /  )	Kagerbauer

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

written exam, 90 min.

### Prerequisites

Exercise Space and Infrastructure must be passed.

### Modeled Conditions

The following conditions have to be fulfilled:

1. The course [T-BGU-111278 - Exercises Space and Infrastructure](#) must have been passed.

### Recommendation




none

### Annotation

none

**T****6.142 Course: Special Issues in Rock Mechanics [T-BGU-111058]****Responsible:** Prof. Dr.-Ing. Hans Henning Stutz**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100077 - Coupled Geomechanic Processes](#)**Type**  
Examination of another type**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Expansion**  
1 terms**Version**  
2

Events					
WT 21/22	6251916	<a href="#">Special Issues in Rock Mechanics</a>	2 SWS	Lecture / Practice ( / X	N.N.

Legend:  Online,  Blended (On-Site/Online),  On-Site, X Cancelled**Competence Certificate**

presentation, appr. 10 min., with written report, 5 - 10 pages

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.143 Course: Special Issues of Soil Mechanics [T-BGU-100071]**

**Responsible:** Prof. Dr.-Ing. Hans Henning Stutz  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100005 - Special Issues of Soil Mechanics](#)



**Type**  
Oral examination




**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6251901	<a href="#">Unsaturated, Viscous and Cyclic Soil Behaviour - Theory and Element Tests</a>	2 SWS	Lecture / Practice ( /  )	Niemunis
WT 21/22	6251903	<a href="#">Soil Dynamics</a>	2 SWS	Lecture / Practice ( /  )	Osinov

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

oral exam, appr. 40 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.144 Course: Special Topics in Highway Engineering [T-BGU-106734]**





**Responsible:** Rainer Hess  
Prof. Dr.-Ing. Ralf Roos

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

**Part of:** [M-BGU-100022 - Special Topics in Highway Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each term	1

Events					
ST 2022	6233805	<a href="#">Steuerungsinstrumente für Betrieb und Erhaltung von Straßeninfrastruktur</a>	2 SWS	Lecture / 	Hess
ST 2022	6233806	<a href="#">Simulationen und Analysemethoden im Straßenwesen</a>	1 SWS	Lecture / 	Roos, Mitarbeiter/innen
ST 2022	6233807	<a href="#">Besondere Kapitel im Straßenwesen</a>	1 SWS	Lecture / 	Roos

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.145 Course: Steel and Composite Structures [T-BGU-100016]**

**Responsible:** Prof. Dr.-Ing. Thomas Ummenhofer  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100034 - Steel and Composite Structures](#)



**Type**  
Written examination


**Credits**  
4

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
2

Events					
ST 2022	6212801	<a href="#">Stahl- und Stahlverbundbau</a>	2 SWS	Lecture / 	Ummenhofer
ST 2022	6212802	<a href="#">Übungen zu Stahl- und Stahlverbundbau</a>	2 SWS	Practice / 	Ummenhofer, Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**




none





**Annotation**

none

**T****6.146 Course: Student Research Project 'Building Preservation of Concrete and Masonry Constructions' [T-BGU-100175]****Responsible:** Dr.-Ing. Engin Kotan**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100058 - Building Preservation of Concrete and Masonry Constructions](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each summer term	2

Events					
ST 2022	6211811	<a href="#">Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions</a>	2 SWS	Lecture / 	Kotan
ST 2022	6211812	<a href="#">Exercises to Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions</a>	1 SWS	Practice / 	Kotan
ST 2022	6211813	<a href="#">Building Analysis</a>	1 SWS	Lecture / 	Kotan, Vogel

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

student research paper, 15-20 pages;

definition of a project available from lecturer

**Prerequisites**

none

**Recommendation**

none

**Annotation**



none







**T****6.147 Course: Student Research Project 'Computational Analysis of Structures' [T-BGU-100174]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100047 - Computational Analysis of Structures](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each summer term	2

Events					
ST 2022	6214801	<a href="#">Computational Analysis of Structures</a>	2 SWS	Lecture / 	Wagner
ST 2022	6214802	<a href="#">Exercises to Computational Analysis of Structures</a>	2 SWS	Practice / 	Geiger

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

student research project, appr. 15 pages

definition of a project available from lecturer

**Prerequisites**

none

**Recommendation**

none


**Annotation**





none

**T****6.148 Course: Student Research Project 'Cost Estimation in Structural Engineering and Earthworks' [T-BGU-108010]**

**Responsible:** Dr.-Ing. Harald Schneider  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-105918 - Production Planning and Control in Construction](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each summer term	2

Events					
ST 2022	6241801	<a href="#">Site Management</a>	1 SWS	Lecture / Practice ( /  )	N.N.

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

term paper, appr. 15 pages, with test

**Prerequisites**

none

**Recommendation**

none


**Annotation**




none

T

**6.149 Course: Student Research Project 'Dynamics of Structures' [T-BGU-107819]****Responsible:** Prof. Dr.-Ing. Peter Betsch**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100035 - Surface Structures and Dynamics of Structures](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each winter term	2

Events					
WT 21/22	6215701	<a href="#">Baudynamik</a>	2 SWS	Lecture / 	Betsch

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

term paper;

definition of a project available from lecturer

**Prerequisites**

none

**Recommendation**

none



**Annotation**





none

**T****6.150 Course: Student Research Project 'Earthworks and Foundation Engineering' [T-BGU-100178]**

**Responsible:** 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 scale	Recurrence	Version
Completed coursework	2	pass/fail	Each winter term	2

Events					
WT 21/22	6251701	<a href="#">Foundation Types</a>	2 SWS	Lecture / Practice ( /  )	Knittel
WT 21/22	6251703	<a href="#">Basics in Earthworks and Embankment Dams</a>	2 SWS	Lecture / Practice ( /  )	Bieberstein

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

report appr. 45 pages;

definition of a project available from lecturer

**Prerequisites**

none

**Recommendation**



none





**Annotation**

none

**T****6.151 Course: Student Research Project 'Excavation Pit Development and Shuttering Planning' [T-BGU-108012]****Responsible:** Dr.-Ing. Harald Schneider**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100339 - Machinery and Process Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each winter term	2

Events					
WT 21/22	6241703	<a href="#">Verfahrenstechnik</a>	2 SWS	Lecture / 	Schneider
WT 21/22	6243701	<a href="#">Maschinentechnik</a>	2 SWS	Lecture / 	Gentes, Dörfler

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

term paper, appr. 15 pages, with test

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.152 Course: Student Research Project 'Reinforced Concrete' [T-BGU-100170]****Responsible:** Prof. Dr.-Ing. Alexander Stark**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100033 - Design and Construction of Components in Reinforced Concrete](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each winter term	2

Events					
WT 21/22	6211701	<a href="#">Bemessung und Konstruktion von Bauteilen im Stahlbeton</a>	2 SWS	Lecture	Müller
WT 21/22	6211702	<a href="#">Übungen zu Bemessung und Konstruktion von Bauteilen im Stahlbeton</a>	2 SWS	Practice	Müller

**Competence Certificate**

term paper;

definition of a project available from lecturer

**Prerequisites**

none

**Recommendation**



none




**Annotation**

none

**T****6.153 Course: Student Research Project 'Rock Mechanics and Tunneling' [T-BGU-100179]****Responsible:** Prof. Dr.-Ing. Hans Henning Stutz**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences University**Part of:** [M-BGU-100069 - Rock Mechanics and Tunneling](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each summer term	2

Events					
ST 2022	6251804	<a href="#">Basics in Rock Mechanics</a>	2 SWS	Lecture / Practice ( /  )	Mutschler
ST 2022	6251806	<a href="#">Basics in Tunnel Construction</a>	2 SWS	Lecture / Practice ( /  )	Wagner

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

report appr. 15 pages;

definition of a project available from lecturer

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.154 Course: Student Research Project 'Scheduling and Building Site Facilities' [T-BGU-108011]****Responsible:** Dr.-Ing. Harald Schneider**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100338 - Project Management in Construction and Real Estate Industry](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each winter term	2

Events					
WT 21/22	6241701	<a href="#">Projektmanagement in der Bau- und Immobilienwirtschaft</a>	4 SWS	Lecture / Practice (	Haghsheno, Hirschberger, Sittinger, Münzl

**Competence Certificate**

term paper, appr. 15 pages, with test

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none







**T****6.155 Course: Student Research Project 'Shell Structures and Stability of Structures' [T-BGU-100254]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100049 - Shell Structures and Stability of Structures](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	2	pass/fail	Each summer term	2

Events					
ST 2022	6214805	<a href="#">Schalentragwerke</a>	1 SWS	Lecture / 	Fina
ST 2022	6214806	<a href="#">Übungen zu Schalentragwerke</a>	1 SWS	Practice / 	Fina
ST 2022	6214807	<a href="#">Stabilität von Tragwerken</a>	1 SWS	Lecture / 	Fina
ST 2022	6214808	<a href="#">Übungen zu Stabilität von Tragwerken</a>	1 SWS	Practice / 	Lienhard

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

student research project, appr. 15 pages  
 definition of a project available from lecturer

**Prerequisites**

none

**Recommendation**



none





**Annotation**

none

T

**6.156 Course: Student Research Project 'Steel Structures' [T-BGU-100171]****Responsible:** Prof. Dr.-Ing. Thomas Ummenhofer**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100034 - Steel and Composite Structures](#)**Type**  
Completed coursework**Credits**  
2**Grading scale**  
pass/fail**Recurrence**  
Each summer term**Version**  
2

Events					
ST 2022	6212801	<a href="#">Stahl- und Stahlverbundbau</a>	2 SWS	Lecture / 	Ummenhofer
ST 2022	6212802	<a href="#">Übungen zu Stahl- und Stahlverbundbau</a>	2 SWS	Practice / 	Ummenhofer, Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

term paper;

definition of a project available from lecturer

**Prerequisites**

none

**Recommendation**

none


**Annotation**





none

**T****6.157 Course: Student Research Project 'Surface Structures' [T-BGU-107818]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100035 - Surface Structures and Dynamics of Structures](#)

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each winter term	2

Events					
WT 21/22	6214701	<a href="#">Surface Structures</a>	2 SWS	Lecture / 	Freitag

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

term paper;  
 definition of a project available from lecturer

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none


**T****6.158 Course: Study Project Design of a Rural Road [T-BGU-109917]**





**Responsible:** Prof. Dr.-Ing. Ralf Roos  
Dr.-Ing. Matthias Zimmermann

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

**Part of:** [M-BGU-100017 - Highway Design](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	2	pass/fail	Each winter term	1 terms	1

Events					
WT 21/22	6233903	<a href="#">Projektstudie Außerortsstraße</a>	2 SWS	Lecture / Practice ( /  )	Zimmermann, Roos

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

preparation of 4 planning documents

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

T

**6.159 Course: Surface Structures [T-BGU-100017]**

**Responsible:** Prof. Dr.-Ing. Steffen Freitag  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100035 - Surface Structures and Dynamics of Structures](#)


**Type**  
Written examination





**Credits**  
2

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
2

Events					
WT 21/22	6214701	<a href="#">Surface Structures</a>	2 SWS	Lecture / 	Freitag

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 60 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.160 Course: Sustainability in Mobility Systems [T-BGU-111057]**

**Responsible:** PD Dr.-Ing. Martin Kagerbauer  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-103357 - Special Issues of Public Transport](#)


**Type**  
Written examination

**Credits**  
3

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6232906	<a href="#">Sustainability in Mobility Systems</a>	2 SWS	Lecture / 	Kagerbauer, Plötz, Gnann

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

written exam, 60 min., computer-based

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.161 Course: Sustainability in Real Estate Management [T-BGU-100149]**

**Responsible:** Prof. Dr.-Ing. Kunibert Lennerts  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100112 - Sustainability in Real Estate Management](#)




**Type**  
Written examination




**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6242801	<a href="#">Sustainability in Real Estate Management</a>	2 SWS	Lecture / Practice ( /  )	Lennerts
ST 2022	6242803	<a href="#">Life Cycle Management of Real Estate</a>	1 SWS	Lecture / 	Lennerts
ST 2022	6242804	<a href="#">Facility and Real Estate Management 2</a>	1 SWS	Lecture / 	Lennerts

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.162 Course: Tank Construction [T-BGU-101000]****Responsible:** Dr. Peter Knödel**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100580 - Tank Construction](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
WT 21/22	6212910	<a href="#">Tank Construction</a>	3 SWS	Lecture	Knödel
WT 21/22	6212911	<a href="#">Übungen zu Behälterbau</a>	1 SWS	Practice	Knödel

**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**

none



**Annotation**





none



**T****6.163 Course: Technology and Production Methods in Turnkey Construction and Civil Engineering Works [T-BGU-111899]****Responsible:** Prof. Dr.-Ing. Shervin Haghsheno**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-105913 - Technology and Production Methods in Turnkey Construction and Civil Engineering Works](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Written examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2022	6241808	<a href="#">Turnkey Construction</a>	2 SWS	Lecture / Practice ( /  )	Teizer
ST 2022	6241810	<a href="#">Civil Engineering Structures and Regenerative Energies</a>	2 SWS	Lecture / Practice ( /  )	Haghsheno, Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none


**Recommendation**





none

**Annotation**

none

**T****6.164 Course: Tendering, Planning and Financing in Public Transport [T-BGU-101005]****Responsible:** Prof. Dr.-Ing. Peter Vortisch**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103357 - Special Issues of Public Transport](#)**Type**  
Oral examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1**Events**

ST 2022	6232807	<a href="#">Wettbewerb, Planung und Finanzierung im ÖPNV</a>	2 SWS	Lecture / 	Pischon
---------	---------	--	-------	---	---------

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

**6.165 Course: Term Paper Tank Construction [T-BGU-101001]****Responsible:** Dr. Peter Knödel**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100580 - Tank Construction](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each winter term	2

Events					
WT 21/22	6212910	<a href="#">Tank Construction</a>	3 SWS	Lecture	Knödel
WT 21/22	6212911	<a href="#">Übungen zu Behälterbau</a>	1 SWS	Practice	Knödel

**Competence Certificate**

term paper with presentation, appr. 20 pages

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.166 Course: Term Paper Upgrading of Existing Buildings and Energetic Refurbishment [T-BGU-100621]****Responsible:** Prof. Dr.-Ing. Kunibert Lennerts**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100108 - Upgrading of Existing Buildings and Energetic Refurbishment](#)

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	1,5	Grade to a third	Each winter term	1

Events					
WT 21/22	6240901	<a href="#">Bauen im Bestand</a>	3 SWS	Lecture / Practice (	Lennerts, Schneider
WT 21/22	6240903	<a href="#">Energetische Sanierung</a>	1 SWS	Lecture	Kropp, Schneider, Münzl

**Competence Certificate**term paper, appr. 10 pages, and  
presentation, appr. 10 min.**Prerequisites**

none

**Recommendation**


none





**Annotation**

none

**T****6.167 Course: Term Paper 'Wastewater Treatment Technologies' [T-BGU-111282]****Responsible:** PD Dr.-Ing. Stephan Fuchs**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-104917 - Wastewater Treatment Technologies](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Completed coursework	3	pass/fail	Each summer term	1 terms	2

Events					
ST 2022	6223801	<a href="#">Wastewater Treatment Technologies</a>	4 SWS	Lecture / Practice ( /  )	Azari Najaf Abad, Fuchs

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

presentation, appr. 15 min., term paper, appr. 10 pages

**Prerequisites**

none

**Recommendation**

none

**Annotation**

The number of participants in the course is limited to 30 persons. The registration is to be made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoecology* and further study programs. The topics for the Term Paper are assigned at the beginning of the course.

**T****6.168 Course: Theoretical Soil Mechanics [T-BGU-100067]**

**Responsible:** apl. Prof. Dr. Andrzej Niemunis  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100067 - Theoretical Soil Mechanics](#)


**Type**  
Written examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6251801	<a href="#">Theoretical Soil Mechanics</a>	4 SWS	Lecture / Practice ( /  )	Niemunis

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

## 6.169 Course: Timber Structures [T-BGU-100028]

**Responsible:** Prof. Dr.-Ing. Philipp Dietsch  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100044 - Timber Structures](#)



**Type**  
Written examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6213801	<a href="#">Timber Structures</a>	2 SWS	Lecture / 	Dietsch
ST 2022	6213802	<a href="#">Excercises to Timber Structures</a>	2 SWS	Practice / 	Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none


**T****6.170 Course: Timber Structures: Materials and Appropriate Design [T-BGU-110853]**




**Responsible:** Dr.-Ing. Matthias Frese  
Dr. Carmen Sandhaas

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

**Part of:** [M-BGU-105371 - Timber Structures: Materials and Appropriate Design](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
WT 21/22	6213904	<a href="#">Timber Structures: Materials and Appropriate Design</a>	4 SWS	Lecture / Practice ( /  )	Sandhaas, Frese, Sander

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled

**Competence Certificate**

oral exam, appr. 40 min.

**Prerequisites**

none

**Recommendation**



none





**Annotation**

none



**T****6.171 Course: Track Guided Transport Systems - Operation and Capacity [T-BGU-101002]****Responsible:** Jan Tzschaschel**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100581 - Track Guided Transport Systems - Operation and Capacity](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
ST 2022	6234801	<a href="#">Operation Track Guided Systems</a>	2 SWS	Lecture / 	Tzschaschel
ST 2022	6234804	<a href="#">Operation Systems and Track Guided Infrastructure Capacity</a>	2 SWS	Lecture / 	Tzschaschel

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**



none




**Annotation**

none

## T

**6.172 Course: Track Guided Transport Systems - Technical Design and Components [T-BGU-100052]****Responsible:** Jan Tzschaschel**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100010 - Track Guided Transport Systems - Technical Design and Components](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 21/22	6234701	<a href="#">Track Guided Transport Systems - Technical Design and Components</a>	3 SWS	Lecture / 	Tzschaschel
WT 21/22	6234702	<a href="#">Exercises in Track Guided Transport Systems - Technical Design and Components</a>	1 SWS	Practice / 	Tzschaschel

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

written exam, 90 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

## 6.173 Course: Traffic Management und Simulation Methods [T-BGU-100008]

**Responsible:** Prof. Dr.-Ing. Peter Vortisch

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

**Part of:** [M-BGU-100015 - Traffic Management und Simulation Methods](#)



**Type**  
Oral examination





**Credits**  
6

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
ST 2022	6232802	<a href="#">Verkehrsmanagement und Telematik</a>	2 SWS	Lecture / Practice ( /  )	Vortisch
ST 2022	6232804	<a href="#">Simulation von Verkehr</a>	2 SWS	Lecture / Practice ( /  )	Vortisch, Mitarbeiter/innen

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

### Competence Certificate

oral exam, appr. 20 min.

### Prerequisites

none


### Recommendation




none

### Annotation

none

**T****6.174 Course: Transport and Transformation of Contaminants in Hydrological Systems [T-BGU-106598]****Responsible:** Prof. Dr.-Ing. Erwin Zehe**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103872 - Subsurface Flow and Contaminant Transport](#)**Type**  
Oral examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
ST 2022	6224803	<a href="#">Transport and Transformation of Contaminants in Hydrological Systems</a>	4 SWS	Lecture / Practice ( /  )	Zehe, Wienhöfer

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**




none





**Annotation**

none

**T****6.175 Course: Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis [T-BGU-111932]****Responsible:** Prof. Dr.-Ing. Steffen Freitag**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-105929 - Uncertainty Modeling, Artificial Neural Networks and Optimization in Structural Analysis](#)

Type	Credits	Grading scale	Recurrence	Expansion	Version
Oral examination	6	Grade to a third	Each term	1 terms	1

Events					
ST 2022	6214809	<a href="#">Structural Analysis with Uncertain Data</a>	2 SWS	Lecture / 	Freitag
ST 2022	6214810	<a href="#">Artificial Neural Networks in Structural Analysis</a>	1 SWS	Lecture / 	Freitag
ST 2022	6214811	<a href="#">Structural Optimization</a>	1 SWS	Lecture / 	Freitag

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

oral exam, appr. 40 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

**T****6.176 Course: Upgrading of Existing Buildings and Energetic Refurbishment [T-BGU-108001]****Responsible:** Prof. Dr.-Ing. Kunibert Lennerts**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100108 - Upgrading of Existing Buildings and Energetic Refurbishment](#)**Type**  
Written examination**Credits**  
4,5**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
1

Events					
WT 21/22	6240901	<a href="#">Bauen im Bestand</a>	3 SWS	Lecture / Practice (	Lennerts, Schneider
WT 21/22	6240903	<a href="#">Energetische Sanierung</a>	1 SWS	Lecture	Kropp, Schneider, Münzl

**Competence Certificate**

written exam, 70 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none



**T****6.177 Course: Urban and Regional Planning [T-BGU-100050]**





**Responsible:** Tamer Soylu  
Sebastian Wilske

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

**Part of:** [M-BGU-100007 - Urban and Regional Planning](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each term	1

Events					
WT 21/22	6231701	<a href="#">Stadtplanung</a>	2 SWS	Lecture / Practice ( /  )	Soylu
WT 21/22	6231703	<a href="#">Regional Planning</a>	2 SWS	Lecture / 	Wilske

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

none

**Recommendation**

none

**Annotation**

none

## T

**6.178 Course: Urban Management [T-BGU-108442]**

**Responsible:** Prof. Dr. Anke Karmann-Woessner  
**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences  
**Part of:** [M-BGU-100013 - Urban Renewal](#)



**Type**  
Oral examination





**Credits**  
3

**Grading scale**  
Grade to a third

**Recurrence**  
Each term

**Version**  
1

Events					
WT 21/22	6231801	<a href="#">Stadtmanagement</a>	2 SWS	Lecture / Practice ( /  )	Karmann-Woessner
ST 2022	6231801	<a href="#">Stadtmanagement</a>	2 SWS	Lecture / Practice ( /  )	Karmann-Woessner

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled

**Competence Certificate**

oral exam, appr. 15 min.

**Prerequisites**

none

**Recommendation**


none

**Annotation**

none



**T****6.179 Course: Urban Water Infrastructure and Management [T-BGU-106600]****Responsible:** PD Dr.-Ing. Stephan Fuchs**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103358 - Urban Water Infrastructure and Management](#)**Type**  
Written examination**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
WT 21/22	6223701	<a href="#">Urban Water Infrastructure and Management</a>	4 SWS	Lecture / Practice ( /  )	Fuchs

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam, 60 min.

**Prerequisites**

none

**Recommendation**

none


**Annotation**





none

## T

**6.180 Course: Wastewater Treatment Technologies [T-BGU-109948]****Responsible:** PD Dr.-Ing. Stephan Fuchs**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-104917 - Wastewater Treatment Technologies](#)

Type	Credits	Grading scale	Recurrence	Version
Written examination	3	Grade to a third	Each summer term	3

Events					
ST 2022	6223801	<a href="#">Wastewater Treatment Technologies</a>	4 SWS	Lecture / Practice ( /  )	Azari Najaf Abad, Fuchs

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

written exam, 60 min.

**Prerequisites**

The accomplishment Term Paper 'Wastewater Treatment Technologies' (T-BGU-111282) has to be passend.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-111282 - Term Paper 'Wastewater Treatment Technologies'](#) must have been passed.

**Recommendation**





none

**Annotation**

The number of participants in the course is limited to 30 persons. The registration is to be made via ILIAS. The places are allocated considering the progress in the students' studies, with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoecology* and further study programs. The topics for the Term Paper are assigned at the beginning of the course.

**T****6.181 Course: Water and Energy Cycles [T-BGU-106596]****Responsible:** 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**  
Examination of another type**Credits**  
6**Grading scale**  
Grade to a third**Recurrence**  
Each term**Version**  
2

Events					
WT 21/22	6224702	<a href="#">Water and Energy Cycles in Hydrological Systems: Processes, Predictions and Management</a>	4 SWS	Lecture / Practice ( /  )	Zehe

Legend:  Online,  Blended (On-Site/Online),  On-Site,  Cancelled**Competence Certificate**

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

**Recommendation**

none

**Annotation**

as from summer term 2020 examination of other type

## T

**6.182 Course: Water Distribution Systems [T-BGU-108486]****Responsible:** Dr.-Ing. Peter Oberle**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-104100 - Water Distribution Systems](#)**Type**  
Oral examination**Credits**  
4**Grading scale**  
Grade to a third**Recurrence**  
Each winter term**Version**  
2

Events					
WT 21/22	6222905	<a href="#">Water Distribution Systems</a>	4 SWS	Lecture / Practice (	Oberle

**Competence Certificate**

oral exam, appr. 30 min.

**Prerequisites**

The accomplishment 'Project Report Water Distribution Systems' (T-BGU-108485) has to be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-108485 - Project Report Water Distribution Systems](#) must have been passed.

**Recommendation**

none

**Annotation**

none

**T****6.183 Course: Waterway Engineering [T-BGU-106780]****Responsible:** Dr.-Ing. Andreas Kron**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-103392 - Waterway Engineering](#)

Type	Credits	Grading scale	Recurrence	Version
Oral examination	5	Grade to a third	Each summer term	2

Events					
ST 2022	6222803	<a href="#">Waterway Engineering</a>	4 SWS	Lecture / Practice ( / )	Kron

Legend: Online, Blended (On-Site/Online), On-Site, Cancelled

**Competence Certificate**

oral exam, appr. 20 min.

**Prerequisites**

The accomplishment 'Seminar Paper Waterway Engineering' (T-BGU-106779) has to be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course [T-BGU-106779 - Seminar Paper 'Waterway Engineering'](#) must have been passed.


**Recommendation**




none

**Annotation**

none

**T****6.184 Course: Wildcard Transport of Heat and Fluids [T-BGU-111924]****Responsible:** N.N.**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [M-BGU-100077 - Coupled Geomechanic Processes](#)**Type**  
Written examination**Credits**  
3**Grading scale**  
Grade to a third**Recurrence**  
see Annotations**Expansion**  
1 terms**Version**  
1

Events					
WT 21/22	6339091	<a href="#">Transport of Heat and Fluids</a>	2 SWS	Lecture / Practice ( /  )	Kohl

Legend:  Online,  Blended (On-Site/Online),  On-Site, x Cancelled**Prerequisites**

none

## Appendix: Curriculum by example

The selection of the start of studies, the study focuses and the modules is not at all any recommendation !  
It shall only show that the study can be completed within the standard period of study.

Module (baui)	Module Title	Course	Type	1. Term (WS)			2. Term (SS)			3. Term (WS)			4. Term (SS)		
				HpW	CP	LC	HpW	CP	LC	HpW	CP	LC	HpW	CP	LC
Construction Engineering															
M1P1	Design and Construction of Components in Reinforced Concrete	Design and Construction of Components in Reinforced Concrete	L/E	2/2	6	ngA wE									
M1P2	Steel and Composite Structures	Steel and Composite Structures	L/E				2/2	6	ngA wE						
M1P3	Surface Structures and Dynamics of Structures	Surface Structures	L	2	3	ngA wE									
		Dynamics of Structures	L	2	3	ngA wE									
M1S14	Non-linear Analysis of Beam Structures	Non-linear Analysis of Beam Structures	L/E							2/2	6	oE			
M1S20	Basics of Finite Elements	Basics of Finite Elements	L/E							2/2	6	ngA oE			
Geotechnical Engineering															
M5P1	Theoretical Soil Mechanics	Theoretical Soil Mechanics	L/E				4	6	wE						
M5P2	Earthworks and Foundation Engineering	Foundation Types	L/E	2	6	ngA wE									
		Basics in Earthworks and Embankment Dams	L/E	2											
M5P3	Rock Mechanics and Tunnelling	Basics in Rock Mechanics	L/E				2	6	ngA wE						
		Basics in Tunnel Construction	L/E				2								
M5P4	Basics in Numerical Modelling	Continuum Mechanics	L/E	2	3	oE									
		Numerics in Geotechnics	L/E	2	3	oE									
M5S02	Ground Investigation	Soil Mechanical Laboratory Exercises	E				2	6	oE						
		Geomechanical Field Exercise	E				2								
Subject-Specific Supplements															
M1S03	Solid Construction Bridges	Solid Construction Bridges	L/E							2/2	6	wE			
M1S08	Hollow Section Structures	Hollow Section Structures	L/E							2/2	6	oE			
M1S16	FE-Applications in Practical Engineering	FE-Applications in Practical Engineering	L/E				2/2	6	oE						
M5S04	Ground Water and Earth Dams	Geotechnical Ground Water Problems	L/E							2	6	oE			
		Embankment Dams (Advanced)	L/E							2					
Interdisciplinary Qualifications															
MUEQ	Interdisciplinary Qualifications	'Interdis. Qualifications A'	S	2	3	ngA									
		'Interdis. Qualifications B'	Pj	2	3	ngA									
Master's Thesis															
MMT	Master Thesis														30
Sum per semester				20	30	6E+ 6nA	20	30	5E+ 2nA	20	30	5E+ 1nA		30	

### explanation for the table:

CP = credit point  
LC = learning control  
wE = written exam  
oE = oral exam  
ngA = not graded accomplishment

L = lecture  
L/E = lecture and exercise, separate or integrated  
E = exercise  
S = seminar  
Pj = study project