

Module Handbook

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

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KIT DEPARTMENT OF CIVIL ENGINEERING, GEO- AND ENVIRONMENTAL SCIENCES

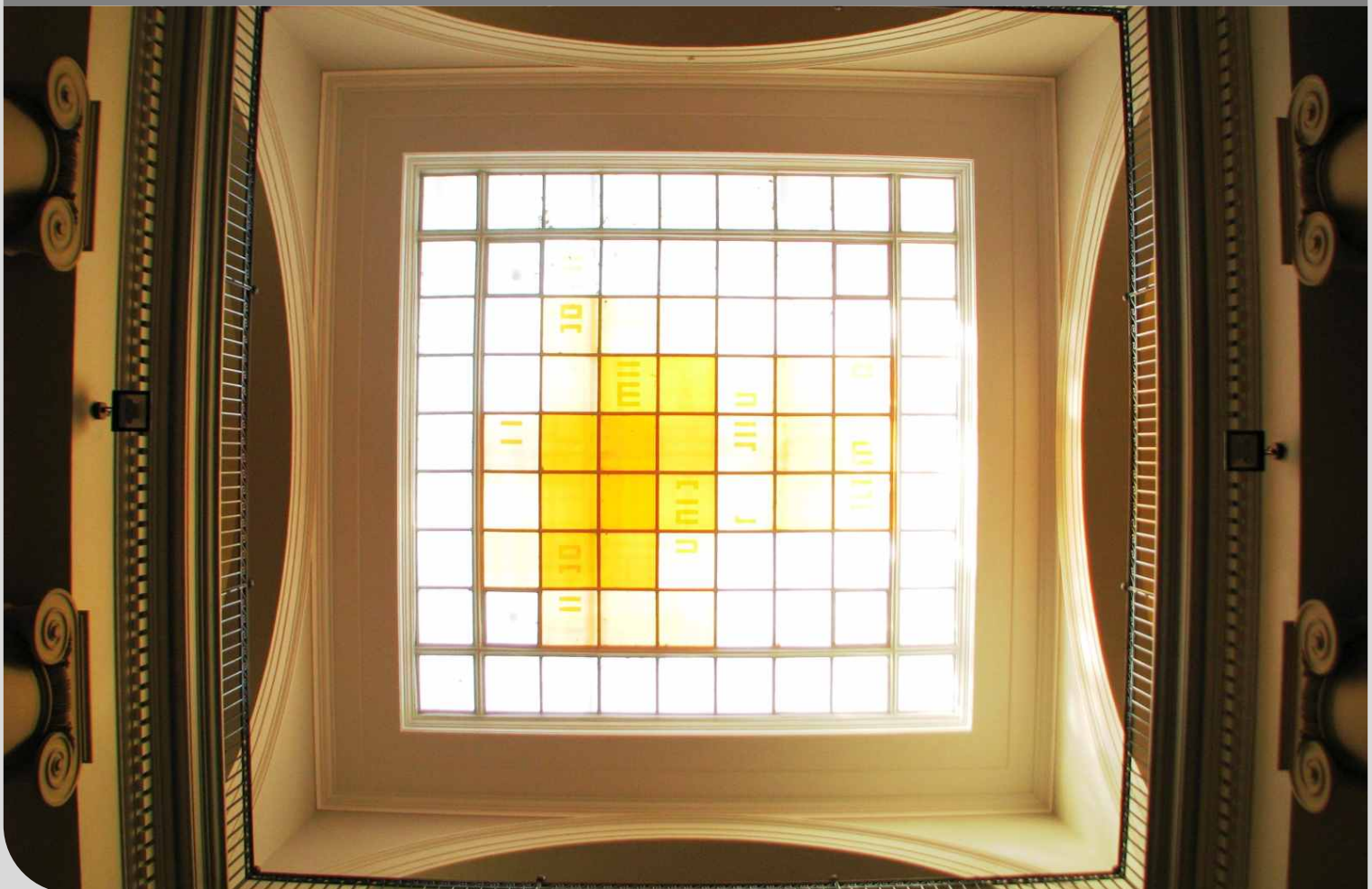


Table Of Contents

1. Preface	8
2. Curriculum	9
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)	19
2.2.4. Study Focus 'Technology and Management in Construction' (SF 4)	22
2.2.5. Study Focus 'Geotechnical Engineering' (SF 5)	25
2.3. Mentoring, module selection, individual curriculum	28
2.4. Beginning and completion of a module	28
2.5. Registration, deregistration, repetition of examinations	28
2.6. Students with disability or chronic disease	29
2.7. Crediting and recognition of already obtained accomplishments	29
2.8. Admission, preparation and completion of the master's thesis	29
2.9. Additional accomplishments	30
3. Further information	31
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	32
4. Current changes	33
5. Modules	34
5.1. Design and Construction of Components in Reinforced Concrete [bauim1P1-BEMISTB] - M-BGU-100033	34
5.2. Steel and Composite Structures [bauim1P2-STAHLBAU] - 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. Anchorage in Concrete [bauim1S05-BEFTECH] - M-BGU-100001	45
5.9. Material Science, Welding and Fatigue [bauim1S06-SCHWEISSEN] - M-BGU-100039	46
5.10. Construction of Steel and Composite Bridges [bauim1S07-STAHLBRÜ] - M-BGU-100040	48
5.11. Hollow Section Structures [bauim1S08-HOHLPROFIL] - M-BGU-100004	50
5.12. Glass, Plastic and Cable Structures [bauim1S09-GlaKunSe] - M-BGU-100041	51
5.13. Building Preservation of Steel and Timber Structures [bauim1S11-BAUING-BSH] - M-BGU-100043	53
5.14. Timber Structures [bauim1S12-BAUING-HB] - M-BGU-100044	55
5.15. Timber and Wood-Based Materials [bauim1S13-BAUING-HHW] - M-BGU-100045	56
5.16. Non-linear Analysis of Beam Structures [bauim1S14-NILI-STAB] - M-BGU-100046	58
5.17. Computational Analysis of Structures [bauim1S15-CTWM] - M-BGU-100047	59
5.18. FE-Applications in Practical Engineering [bauim1S16-FE-PRAXIS] - M-BGU-100048	61
5.19. Shell Structures and Stability of Structures [bauim1S17-STABISHELL] - M-BGU-100049	62
5.20. Numerical Methods in Structural Analysis [bauim1S18-FEM-BS] - M-BGU-100050	64
5.21. Non-linear Analysis of Surface Structures [bauim1S19-NILI-FTW] - M-BGU-100051	65
5.22. Basics of Finite Elements [bauim1S20-GRUNDFE] - M-BGU-100052	66
5.23. Fracture and Damage Mechanics [bauim1S21-BRUCHMECH] - M-BGU-100053	68
5.24. Material Models in Solid Mechanics [bauim1S22-MATTHEO] - M-BGU-100054	70
5.25. Concrete Construction Technology [bauim1S24-BETONTECH] - M-BGU-100056	72
5.26. Durability and Service Life Design [bauim1S25-DAUERLEB] - M-BGU-100057	73
5.27. Building Preservation of Concrete and Masonry Constructions [bauim1S26-BBM] - M-BGU-100058	74
5.28. Building Physics I [bauim1S27-BAUPH-I] - M-BGU-103950	76
5.29. Building Physics II [bauim1S28-BAUPH-II] - M-BGU-100060	77

5.30. Materials Testing and Measuring Techniques [bauIM1S29-MATPRÜF] - M-BGU-100061	78
5.31. Continuum Mechanics of Heterogeneous Solids [bauIM1S32-KONTIMECH] - M-BGU-100064	79
5.32. Finite Elements in Solid Mechanics [bauIM1S37-FEFKM] - M-BGU-100578	81
5.33. Numerical Structural Dynamics [bauIM1S38-NUMSTRDYN] - M-BGU-100579	82
5.34. Tank Construction [bauIM1S39-BEHBAU] - M-BGU-100580	83
5.35. Modeling in Solid Mechanics [bauIM1S40-MODFEST] - M-BGU-101673	85
5.36. Contact Mechanics [bauIM1S41-KONTMECH] - M-BGU-104916	87
5.37. Digital Planning and Building Information Modeling [bauIM1S42-DIGIPLAN] - M-BGU-105135	88
5.38. Design and Construction in Metal and Lightweight Structures [bauIM1S43-ENTW-MLB] - M-BGU-105370	89
5.39. Timber Structures: Materials and Appropriate Design [bauIM1S44-BST-HB] - M-BGU-105371	90
5.40. Innovations and Developments in Steel and Timber Structures [bauIM1S45-INNO-MHB] - M-BGU-105372	91
5.41. Building Preservation and Innovations in Metal and Lightweight Structures [bauIM1S46-BWE-INNO-MLB] - M-BGU-105373	92
5.42. Building Preservation and Innovations in Timber Structures [bauIM1S47-BWE-INNO-HB] - M-BGU-105374	93
5.43. Urban Water Infrastructure and Management [bauIM2P10-URBIM] - M-BGU-103358	94
5.44. Numerical Fluid Mechanics [bauIM2P5-NUMFLMECH] - M-BGU-103375	96
5.45. Hydraulic Engineering [bauIM2P6-ADVHYENG] - M-BGU-103376	97
5.46. Water and Energy Cycles [bauIM2P8-WATENCYC] - M-BGU-103360	98
5.47. Advanced Fluid Mechanics [bauIM2P9-ADVFM] - M-BGU-103359	100
5.48. Management of Water Resources and River Basins [bauIM2S01-HY1] - M-BGU-103364	102
5.49. Subsurface Flow and Contaminant Transport [bauIM2S03-HY3] - M-BGU-103872	103
5.50. Analysis of Spatial Data [bauIM2S04-HY4] - M-BGU-103762	105
5.51. Hydrological Measurements in Environmental Systems [bauIM2S05-HY5] - M-BGU-103763	107
5.52. Environmental Communication [bauIM2S07-HY7] - M-BGU-101108	108
5.53. Groundwater Management [bauIM2S08-HY8] - M-BGU-100340	109
5.54. Hydro Power Engineering [bauIM2S11-WB3] - M-BGU-100103	111
5.55. Waterway Engineering [bauIM2S12-WB4] - M-BGU-103392	112
5.56. Interaction Flow - Building Structure [bauIM2S16-SM2] - M-BGU-103897	113
5.57. Technical Hydraulics [bauIM2S17-SM3] - M-BGU-103385	115
5.58. Environmental Fluid Mechanics [bauIM2S19-SM5] - M-BGU-103383	116
5.59. Advanced Computational Fluid Dynamics [bauIM2S21-NS2] - M-BGU-103384	117
5.60. Industrial Water Management [bauIM2S29-SW6] - M-BGU-104073	119
5.61. Project Studies in Water Resources Management [bauIM2S33-WB6] - M-BGU-103394	120
5.62. Numerical Flow Modeling in Hydraulic Engineering [bauIM2S34-WB7] - M-BGU-103390	121
5.63. Flow and Sediment Dynamics in Rivers [bauIM2S35-WB8] - M-BGU-104083	122
5.64. Hydraulic Structures [bauIM2S36-WB9] - M-BGU-103389	124
5.65. Experimental Hydraulics and Measuring Techniques [bauIM2S37-WB10] - M-BGU-103388	126
5.66. Water Distribution Systems [bauIM2S38-WB11] - M-BGU-104100	128
5.67. Experiments in Fluid Mechanics [bauIM2S39-SM6] - M-BGU-103377	130
5.68. Wastewater and Storm Water Treatment Facilities [bauIM2S40-SW7] - M-BGU-104898	132
5.69. Freshwater Ecology [bauIM2S41-SW8] - M-BGU-104922	134
5.70. River Basin Modeling [bauIM2S42-SW9] - M-BGU-103373	136
5.71. Wastewater Treatment Technologies [bauIM2S43-SW10] - M-BGU-104917	137
5.72. Introduction to Environmental Data Analysis and Statistical Learning [bauIM2S44-ENV DAT] - M-BGU-104880	139
5.73. Fluid Mechanics of Turbulent Flows [bauIM2S45-NS4] - M-BGU-105361	141
5.74. Modeling of Turbulent Flows - RANS and LES [bauIM2S46-NS5] - M-BGU-105362	142
5.75. Urban and Regional Planning [bauIM3P1-PLSTAREG] - M-BGU-100007	143
5.76. Models and Methods in Traffic Engineering and Transportation Planning [bauIM3P2-VERMODELL] - M-BGU-100008	144
5.77. Infrastructure Management [bauIM3P3-STRINFRA] - M-BGU-100009	146
5.78. Track Guided Transport Systems - Technical Design and Components [bauIM3P4-EBTECHNIK] - M-BGU-100010	147
5.79. Laws and Proceedings Concerning Traffic and Roads [bauIM3P5-VERFRECHT] - M-BGU-100011	148
5.80. Urban Renewal [bauIM3S01-PLSTUMB] - M-BGU-100013	149

5.81. Space and Infrastructure [bauim3s02-PLRAUMINF] - M-BGU-100014	151
5.82. Traffic Management und Simulation Methods [bauim3s03-VERMANAGE] - M-BGU-100015	152
5.83. Planning of Transportation Systems [bauim3s04-VERPLAN] - M-BGU-100016	153
5.84. Highway Design [bauim3s05-STRENTW] - M-BGU-100017	155
5.85. Road Construction [bauim3s06-STRBAUT] - M-BGU-100006	157
5.86. Project Integrated Planning [bauim3s09-PROJEKTIP] - M-BGU-100018	158
5.87. Intermodality in Freight, Long-Distance and Air Transport [bauim3s11-VERINTER] - M-BGU-100020	159
5.88. Road Safety [bauim3s12-STRVSICH] - M-BGU-100021	161
5.89. Special Topics in Highway Engineering [bauim3s13-STRSPEZ] - M-BGU-100022	162
5.90. City Transport Facilities [bauim3s17-STRIVA] - M-BGU-100026	163
5.91. Track Guided Transport Systems - Operation and Capacity [bauim3s18-EBBETRKAP] - M-BGU-100581	164
5.92. Analysis and Evolution of Mobility [bauim3s20-VERANAMOB] - M-BGU-100583	166
5.93. Special Issues of Public Transport [bauim3s22-VERSPEZOEUV] - M-BGU-103357	167
5.94. Economics and Management in Construction [bauim4p3-] - M-BGU-100102	168
5.95. Sustainability in Real Estate Management [bauim4p4-] - M-BGU-100112	170
5.96. Project Management in Construction and Real Estate Industry [bauim4p5-] - M-BGU-100338	171
5.97. Machinery and Process Engineering [bauim4p6-] - M-BGU-100339	173
5.98. Business and Human Resource Management [bauim4s01-] - M-BGU-100111	175
5.99. Environmentally-friendly Recycling and Disassembly of Buildings [bauim4s06-] - M-BGU-100110	177
5.100. Upgrading of Existing Buildings and Energetic Refurbishment [bauim4s07-] - M-BGU-100108	179
5.101. Real Estate Management [bauim4s08-] - M-BGU-100346	181
5.102. Lean Construction [bauim4s09-] - M-BGU-100104	182
5.103. Advanced Studies in Construction Engineering [bauim4s10-] - M-BGU-100344	183
5.104. Decommissioning of Nuclear Facilities [bauim4s12-] - M-BGU-100345	184
5.105. Facility Management in Hospitals and Hospital Management [bauim4s13-] - M-BGU-100347	186
5.106. Turnkey Construction [bauim4s15-] - M-BGU-100676	188
5.107. Building Information Modeling (BIM) [bauim4s16-] - M-BGU-103916	190
5.108. Research Seminar Construction Management [bauim4s17-] - M-BGU-103917	191
5.109. Equipment and special Construction Techniques in Building Practice [bauim4s18-] - M-BGU-103918	192
5.110. Digitalization in Facility and Real Estate Management [bauim4s19-] - M-BGU-104348	193
5.111. Theoretical Soil Mechanics [bauim5p1-THEOBM] - M-BGU-100067	194
5.112. Earthworks and Foundation Engineering [bauim5p2-ERDGB] - M-BGU-100068	196
5.113. Rock Mechanics and Tunneling [bauim5p3-FMTUB] - M-BGU-100069	198
5.114. Basics of Numeric Modeling [bauim5p4-NUMGRUND] - M-BGU-100070	200
5.115. Special Issues of Soil Mechanics [bauim5s01-SPEZBM] - M-BGU-100005	202
5.116. Ground Investigation [bauim5s02-BERKUND] - M-BGU-100071	203
5.117. Applied Geotechnics [bauim5s03-ANGEOTEC] - M-BGU-100072	204
5.118. Ground Water and Earth Dams [bauim5s04-GWDAMM] - M-BGU-100073	206
5.119. Rock Engineering and Underground Construction [bauim5s05-FELSHOHL] - M-BGU-100074	207
5.120. Numerical Modelling in Geotechnics [bauim5s06-NUMMOD] - M-BGU-100075	208
5.121. Geotechnical Testing and Measuring Technology [bauim5s07-VERSMESS] - M-BGU-100076	210
5.122. Special Underground Engineering [bauim5s08-SPEZTIEF] - M-BGU-100078	211
5.123. Environmental Geotechnics [bauim5s09-UMGEOTEC] - M-BGU-100079	213
5.124. Coupled Geomechanic Processes [bauim5s10-GEKOPPRO] - M-BGU-100077	215
5.125. Module Master Thesis [bauimsc-THESIS] - M-BGU-104996	217
5.126. Interdisciplinary Qualifications [bauimw0-UEQUAL] - M-BGU-103927	218
6. Courses	220
6.1. Advanced Fluid Mechanics - T-BGU-106612	220
6.2. Advanced Studies in Construction Engineering - T-BGU-108003	221
6.3. Analysis and Evolution of Mobility - T-BGU-101004	222
6.4. Anchorage in Concrete - T-BGU-100022	223
6.5. Anchoring, Piling and Slurry Wall Technology - T-BGU-100079	224
6.6. Applied Building Physics - T-BGU-100039	225
6.7. Applied Dynamics of Structures - T-BGU-100021	226
6.8. Applied Ecology and Water Quality - T-BGU-109956	227

6.9. Applied Geotechnics - T-BGU-100073	228
6.10. Basics of Finite Elements - T-BGU-100047	229
6.11. Basics of Prestressed Concrete - T-BGU-100019	230
6.12. Bracing and Stability in Reinforced Concrete - T-BGU-100018	231
6.13. Brownfield Sites - Investigation, Evaluation, Rehabilitation - T-BGU-100089	232
6.14. Building and Environmental Aerodynamics - T-BGU-103563	233
6.15. Building Information Modeling (BIM) - T-BGU-108007	234
6.16. Building Preservation in Steel Structures - T-BGU-110856	235
6.17. Building Preservation in Timber Structures - T-BGU-110857	236
6.18. Building Preservation of Concrete and Masonry Constructions - T-BGU-100038	237
6.19. Building Preservation of Steel and Timber Structures - T-BGU-100027	238
6.20. Building Technology - T-BGU-100040	239
6.21. Business and Human Resource Management - T-BGU-108002	240
6.22. City Transport Facilities - T-BGU-100083	241
6.23. Computational Analysis of Structures - T-BGU-100031	242
6.24. Computational Structural Dynamics - T-BGU-100999	243
6.25. Concrete Construction Technology - T-BGU-100036	244
6.26. Construction of Steel and Composite Bridges - T-BGU-100024	245
6.27. Contact Mechanics - T-BGU-109947	246
6.28. Continuum Mechanics - T-BGU-106196	247
6.29. Coupled Geomechanic Processes - T-BGU-100085	248
6.30. Decommissioning of Nuclear Facilities - T-BGU-100627	249
6.31. Design and Construction in Metal and Lightweight Structures - T-BGU-110852	250
6.32. Design and Construction of Components in Reinforced Concrete - T-BGU-100015	251
6.33. Digital Planning and Building Information Modeling - T-BGU-110382	252
6.34. Digitalization in Facility and Real Estate Management - T-BGU-108941	253
6.35. Durability and Service Life Design - T-BGU-100037	254
6.36. Dynamics of Structures - T-BGU-100077	255
6.37. Earthworks and Foundation Engineering - T-BGU-100068	256
6.38. Economics and Management in Construction - T-BGU-100143	257
6.39. Environmental Communication - T-BGU-101676	258
6.40. Environmental Fluid Mechanics - T-BGU-106767	259
6.41. Environmentally-Friendly Recycling and Disassembly of Buildings - T-BGU-100146	260
6.42. Equipment and special Construction Techniques in Building Practice - T-BGU-108009	261
6.43. Examination Prerequisite Environmental Communication - T-BGU-106620	262
6.44. Exercises and student research project City Transport Facilities - T-BGU-109912	263
6.45. Experimental Hydraulics II - T-BGU-106773	264
6.46. Experiments in Fluid Mechanics - T-BGU-106760	265
6.47. Facility Management in Hospitals and Hospital Management - T-BGU-109291	266
6.48. FE-Applications in Practical Engineering - T-BGU-100032	267
6.49. Field Training Water Quality - T-BGU-109957	268
6.50. Finite Elements in Solid Mechanics - T-BGU-100998	269
6.51. Flow and Sediment Dynamics in Rivers - T-BGU-108467	270
6.52. Flow Measurement Techniques - T-BGU-110411	271
6.53. Fluid Mechanics of Turbulent Flows - T-BGU-110841	272
6.54. Fracture and Damage Mechanics - T-BGU-100087	273
6.55. Freight Transport - T-BGU-106611	274
6.56. Geostatistics - T-BGU-106605	275
6.57. Geotechnical Testing and Measuring Technology - T-BGU-100075	276
6.58. Glass, Plastic and Cable Structures - T-BGU-100025	277
6.59. Ground Improvement, Grouting and Soil Freezing - T-BGU-100080	278
6.60. Ground Investigation - T-BGU-100072	279
6.61. Ground Water and Earth Dams - T-BGU-100091	280
6.62. Groundwater Flow around Structures - T-BGU-106774	281
6.63. Groundwater Hydraulics - T-BGU-100624	282
6.64. Group exercise Project Integrated Planning - T-BGU-109916	283
6.65. Group Exercise Project Management in Construction and Real Estate Industry - T-BGU-101006	284

6.66. Highway Design - T-BGU-100057	285
6.67. History of Urban Planning - T-BGU-108441	286
6.68. Hollow Section Structures - T-BGU-100086	287
6.69. Homework 'Basics of Finite Elements' - T-BGU-109908	288
6.70. Homework 'Introduction to Environmental Data Analysis and Statistical Learning' - T-BGU-109950	289
6.71. Homework 'Practical Noise Control' - T-BGU-109946	290
6.72. Hydraulic Engineering - T-BGU-106759	291
6.73. Hydro Power Engineering - T-BGU-100139	292
6.74. Hydrological Measurements in Environmental Systems - T-BGU-106599	293
6.75. Industrial Water Management - T-BGU-108448	294
6.76. Information Management for Public Mobility Services - T-BGU-106608	295
6.77. Infrastructure Management - T-BGU-106300	296
6.78. Innovations and Developments in Metal and Lightweight Structures - T-BGU-110854	297
6.79. Innovations and Developments in Timber Structures - T-BGU-110855	298
6.80. Interaction Flow - Hydraulic Structures - T-BGU-110404	299
6.81. Introduction to Environmental Data Analysis and Statistical Learning - T-BGU-109949	300
6.82. Introduction to Matlab - T-BGU-106765	301
6.83. Lab report 'Industrial Water Management' - T-BGU-109980	302
6.84. Landfills - T-BGU-100084	303
6.85. Laws and Proceedings concerning Traffic and Roads - T-BGU-106297	304
6.86. Lean Construction - T-BGU-108000	305
6.87. Long-Distance and Air Traffic - T-BGU-106301	306
6.88. Machinery and Process Engineering - T-BGU-100623	307
6.89. Management of Water Resources and River Basins - T-BGU-106597	308
6.90. Master Thesis - T-BGU-110135	309
6.91. Material Models in Solid Mechanics - T-BGU-100044	310
6.92. Material Science, Welding and Fatigue - T-BGU-100023	311
6.93. Materials Testing and Measuring Techniques - T-BGU-100043	312
6.94. Micromechanics of Heterogeneous Solids - T-BGU-108879	313
6.95. Modeling of Turbulent Flows - RANS and LES - T-BGU-110842	314
6.96. Modeling Techniques in Solid Mechanics - T-BGU-103223	315
6.97. Models and Methods in Traffic Engineering and Transportation Planning - T-BGU-100012	316
6.98. Non-linear Analysis of Beam Structures - T-BGU-100030	317
6.99. Non-linear Analysis of Surface Structures - T-BGU-100035	318
6.100. Numerical Flow Modeling in Hydraulic Engineering - T-BGU-106776	319
6.101. Numerical Fluid Mechanics - T-BGU-106758	320
6.102. Numerical Fluid Mechanics II - T-BGU-106768	321
6.103. Numerical Groundwater Modeling - T-BGU-100625	322
6.104. Numerical Methods in Structural Analysis - T-BGU-100034	323
6.105. Numerical Modelling in Geotechnics - T-BGU-100107	324
6.106. Numerics in Geotechnics - T-BGU-106197	325
6.107. Parallel Programming Techniques for Engineering - T-BGU-106769	326
6.108. Planning of Transportation Systems - T-BGU-100013	327
6.109. Practical Fire Protection - T-BGU-100042	328
6.110. Practical Noise Control - T-BGU-108024	329
6.111. Project Anchorage in Concrete - T-BGU-110850	330
6.112. Project Integrated Planning - T-BGU-100061	331
6.113. Project Management in Construction and Real Estate Industry - T-BGU-100622	332
6.114. Project Paper Lean Construction - T-BGU-101007	333
6.115. Project Report Water Distribution Systems - T-BGU-108485	334
6.116. Project Studies in Water Resources Management - T-BGU-106783	335
6.117. Real Estate Management - T-BGU-100629	336
6.118. Research Seminar Construction Management - T-BGU-108008	337
6.119. River Basin Modelling - T-BGU-106603	338
6.120. Road Construction - T-BGU-100058	339
6.121. Road Safety - T-BGU-100062	340
6.122. Rock Engineering and Underground Construction - T-BGU-100074	341

6.123. Rock Mechanics and Tunneling - T-BGU-100069	342
6.124. Seminar in Transportation - T-BGU-100014	343
6.125. Seminar Paper 'Flow Behavior of Rivers' - T-BGU-108466	344
6.126. Seminar paper Road Safety - T-BGU-109915	345
6.127. Seminar Paper 'Waterway Engineering' - T-BGU-106779	346
6.128. Shell Structures and Stability of Structures - T-BGU-100033	347
6.129. Solid Construction Bridges - T-BGU-100020	348
6.130. Space and Infrastructure - T-BGU-100056	349
6.131. Special Issues of Soil Mechanics - T-BGU-100071	350
6.132. Special Topics in Highway Engineering - T-BGU-106734	351
6.133. Steel and Composite Structures - T-BGU-100016	352
6.134. Student Research Project 'Building Preservation of Concrete and Masonry Constructions' - T-BGU-100175	353
6.135. Student Research Project 'Computational Analysis of Structures' - T-BGU-100174	354
6.136. Student Research Project 'Cost Estimation in Structural Engineering and Earthworks' - T-BGU-108010	355
6.137. Student Research Project 'Dynamics of Structures' - T-BGU-107819	356
6.138. Student Research Project 'Earthworks and Foundation Engineering' - T-BGU-100178	357
6.139. Student Research Project 'Excavation Pit Development and Shuttering Planning' - T-BGU-108012 ..	358
6.140. Student Research Project 'Reinforced Concrete' - T-BGU-100170	359
6.141. Student Research Project 'Rock Mechanics and Tunneling' - T-BGU-100179	360
6.142. Student Research Project 'Scheduling and Building Site Facilities' - T-BGU-108011	361
6.143. Student Research Project 'Shell Structures and Stability of Structures' - T-BGU-100254	362
6.144. Student Research Project 'Steel Structures' - T-BGU-100171	363
6.145. Student Research Project 'Surface Structures' - T-BGU-107818	364
6.146. Study project Design of a Rural Road - T-BGU-109917	365
6.147. Surface Structures - T-BGU-100017	366
6.148. Sustainability in Real Estate Management - T-BGU-100149	367
6.149. Tank Construction - T-BGU-101000	368
6.150. Technical Hydraulics - T-BGU-106770	369
6.151. Tendering, Planning and Financing in Public Transport - T-BGU-101005	370
6.152. Term Paper 'International Sanitary Engineering' - T-BGU-109265	371
6.153. Term Paper Tank Construction - T-BGU-101001	372
6.154. Term Paper Upgrading of Existing Buildings and Energetic Refurbishment - T-BGU-100621	373
6.155. Theoretical Soil Mechanics - T-BGU-100067	374
6.156. Timber and Wood-Based Materials - T-BGU-100029	375
6.157. Timber Structures - T-BGU-100028	376
6.158. Timber Structures: Materials and Appropriate Design - T-BGU-110853	377
6.159. Track Guided Transport Systems - Operation and Capacity - T-BGU-101002	378
6.160. Track Guided Transport Systems - Technical Design and Components - T-BGU-100052	379
6.161. Traffic Management und Simulation Methods - T-BGU-100008	380
6.162. Transport and Transformation of Contaminants in Hydrological Systems - T-BGU-106598	381
6.163. Turnkey Construction - T-BGU-101208	382
6.164. Upgrading of Existing Buildings and Energetic Refurbishment - T-BGU-108001	383
6.165. Urban and Regional Planning - T-BGU-100050	384
6.166. Urban Management - T-BGU-108442	385
6.167. Urban Water Infrastructure and Management - T-BGU-106600	386
6.168. Wastewater and Storm Water Treatment Facilities - T-BGU-109934	387
6.169. Wastewater Treatment Technologies - T-BGU-109948	388
6.170. Water and Energy Cycles - T-BGU-106596	389
6.171. Water Distribution Systems - T-BGU-108486	390
6.172. Waterway Engineering - T-BGU-106780	391
6.173. Wildcard - T-BGU-108027	392
7. Appendix: Curriculum by example	393

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

1 Preface

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/imstudium/masterbauingenieurwesen.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

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2 Curriculum

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

<https://www.sle.kit.edu/imstudium/master-bauingenieurwesen.php>

(2017 KIT 011 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. A curriculum by example in the appendix shows how to finish the studies within the standard period of study. The selected start of studies as well as the selected study focuses and modules are not at all any recommendation.

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 from all study focuses can be selected freely. Obtaining 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) can be selected.

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

2.2.1 Study Focus 'Construction Engineering' (SF 1)

Civil engineers 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)		In this study focus three compulsory modules are fixed: <ul style="list-style-type: none"> • Design and Construction of Components in Reinforced Concrete • Steel and Composite Structures • Surface Structures and Dynamics of Structures
3 PM are fixed:		
PM1	M1P1 - Design and Construction of Components in Reinforced Concrete WS	6 CP
PM2	M1P2 - Steel and Composite Structures SS	6 CP
PM3	M1P3 - Surface Structures and Dynamics of Structures WS	6 CP
2 SM have to be selected from M1S01 - M1S47 (s. Tab. 1):		
SM1	compulsory elective module 1	6 CP
SM2	compulsory elective module 2	6 CP
In addition two compulsory elective modules have to be selected from the offer of this study focus (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		
<i>compulsory modules:</i>								
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		
<i>compulsory elective modules:</i>								
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 ¹⁾	6	Applied Dynamics of Structures (G)	L/E		1/1	oE	6
			Earthquake Engineering (G)	L/E	1/1			
M1S05:	Anchorage in Concrete ¹⁾	6	Anchorage in Concrete I (G)	L/E		1/1	EoT oE	3 3
			Anchorage in Concrete II (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 ^{6a)}	6	Building Preservation in Steel Structures (G)	L	2		wE ⁸⁾	6 ⁸⁾
			Building Preservation in Timber Structures (G)	L/E	2			
M1S12:	Timber Structures	6	Timber Structures (G)	L/E		2/2	wE	6
M1S13:	Timber and Wood-based Materials ³⁾	6	Timber and Wood-based Materials (G)	L/E		4	oE	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 ⁷⁾ oE	2 4
M1S16:	FE-Applications in Practical Engineering	6	FE-Applications in Practical Engineering (G)	L/E		2/2	oE	6

(continuing next page)

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

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		
M1S17:	Shell Structures and Stability of Structures	6	Shell Structures (G)	L/E		1/1	ngA ⁷⁾ oE	2
			Stability of Structures (G)	L/E		1/1		4
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
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	oE	3
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 ^{2,5)}	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

(continuing next page)

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		
M1S43:	Design and Construction in Metal and Lightweight Structures ^{4,6b)}	6	Design and Construction in Metal and Lightweight Structures (G)	L/E	4		EoT	6
M1S44:	Timber Structures: Materials and Appropriate Design ^{4,6c)}	6	Materials in Timber Structures (G)	L/E	2		oE	6
			Appropriate Design in Timber Structures (G)	L/E	2			
M1S45:	Innovations and Developments in Steel and Timber Structures ^{4,6a)}	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 ^{4,6d)}	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 ^{4,6d)}	6	Building Preservation in Timber Structures (G)	L/E	2		wE	3
			Innovations and Developments Timber Structures (G)	L/E	2			
Sum compulsory elective modules		216			82	66		

explanations to Table 1:

general:	type of course:	type of learning control:
M1PX Study Focus I, compulsory modules	L lecture	wE written examination
M1SXX Study Focus I, compulsory elective modules	L/E lecture and exercise, separate or integrated	oE oral examination
LC learning control		EoT examination of other type
CP credit point		ngA not graded accomplishment
HpW / SWS hours per week		ngA ⁷⁾ not graded accomplishment as examination prerequisite
W / S winter term / summer term		⁸⁾ As from winter term 2020/21 the module examination consists of two partial examinations with 3 CP each.
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 not be offered any more as from winter term 2020/21.		
4) Module is newly offered as from winter term 2020/21.		
5) Module must not be selected together with module M5P4 (SF 5).		
6a) Module must not be selected together with the modules M1S46 and M1S47.		
6b) Module must not be selected together with module M1S10 not offered any more.		
6c) Module must not be selected together with the modules M1S10 and M1S13 (as from winter term 2020/21) not offered any more.		
6d) Module must not be selected together with the modules M1S11 and M1S45.		

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

Civil engineers 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	M2P9 - Advanced Fluid Mechanics SS	6 CP
PM2	M2P5 - Numerical Fluid Mechanics WS	6 CP
PM3	M2P6 - Hydraulic Engineering SS	6 CP
PM4	M2P10 - Urban Water Infrastructure and Management WS	6 CP
PM5	M2P8 - Water and Energy Cycles WS	6 CP
2 SM have to be selected from M2S01 - M2S46 or M2P5 - M2P10, if not already selected as PM (s. Tab. 2):		
SM1	compulsory elective module 1	6 CP
SM2	compulsory elective module 2	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 missing modules have to be selected from the offer of this study focus (Tab 2).

Table 2: Modules in Study Focus Water and Environment

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(bau)					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	Multiphase Flow in Hydraulic Engineering (E)	L/E		2	wE	6
			Design of Hydraulic Structures (E)	L/E		2		
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
Sum compulsory modules		30			12	8		
<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.								
M2S01:	Management of Water Resources and River Basins	6	Management of Water Resources and River Basins (E)	L/E		4	EoT	6
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 ²⁾ (G)	S	2	2	ngA ⁸⁾ EoT	0 6
M2S08:	Groundwater Management ¹⁾	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 ⁸⁾ oE	1 5
M2S16:	Interaction Flow - Building Structure ^{6a)}	6	Interaction Flow - Hydraulic Structures (E)	L/E	2		wE	3
			Building and Environmental Aerodynamics (G)	L/E	1/1		oE	3
M2S17:	Technical Hydraulics	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

(continuing next page)

**) Course will not be offered in summer term 2020.

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

Module			Course				LC	
Code	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
(bau)					W	S		
M2S29:	Industrial Water Management	6	Industrial Water Management (E)	L/E		4	ngA ⁸⁾ oE	1 5
M2S32:	Analysis of Turbulent Flows ³⁾	6	Fluid Mechanics of Turbulent Flows (E)	L		2	oE	6
			Modeling of Turbulent Flows - RANS and LES (E)	L	2			
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	6	Morphodynamics (E)	L/E		2	ngA ⁸⁾ oE	2 4
			Flow Behavior of Rivers (E)	L/E		2		
M2S36:	Hydraulic Structures ^{6b)}	6	Groundwater Flow around Structures (E)	L/E		2	oE	3
			Interaction Flow - Hydraulic Structures (E)	L/E	2			
M2S37:	Experimental Hydraulics and Measuring Techniques	6	Flow Measurement Techniques (E)	L/E	2		oE	3
			Experimental Hydraulics II (G)	L/E	2			
M2S38:	Water Distribution Systems	6	Water Distribution Systems (E)	L/E	4		ngA ⁸⁾ oE	2 4
M2S39:	Experiments in Fluid Mechanics	6	Experiments in Fluid Mechanics (E)	L/E		4	EoT	6
M2S40:	Wastewater and Storm Water Treatment Facilities	6	Wastewater and Storm Water Treatment Facilities (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		
M2S42:	River Basin Modeling ¹⁾	6	Mass Fluxes in River Basins (E)	L		2	EoT	6
			Modeling Mass Fluxes in River Basins (E)	E	2			
M2S43:	Wastewater Treatment Technologies	6	Municipal Wastewater Treatment (E)	L/E	2		ngA ⁸⁾ wE	1 5
			International Sanitary Engineering (E)	L/E	2			
M2S44:	Introduction to Environmental Data Analysis and Statistical Learning	6	Introduction to Environmental Data Analysis and Statistical Learning (E)	L/E	4		ngA ⁸⁾ wE	2 4
M2S45:	Fluid Mechanics of Turbulent Flows ^{4,7)}	6	Fluid Mechanics of Turbulent Flows (E)	L/E		2/2	oE	6
M2S46:	Modeling of Turbulent Flows – RANS and LES ^{5,7)}	6	Modeling of Turbulent Flows – RANS and LES (E)	L/E	2/2		oE	6
Sum compulsory elective modules		156			42	54		

explanations to Table 2:

general:		type of course:		type of learning control:	
M2PX	Study Focus II, compulsory modules	L	lecture	wE	written examination
M2SXX	Study Focus II, compulsory elective modules	L/E	lecture and exercise, separate or integrated	oE	oral examination
LC	learning control	L/S	lecture and seminar integrated	EoT	examination of other type
CP	credit point	E	exercise	ngA ⁸⁾	not graded accomplishment as examination prerequisite
HpW /		S	seminar		
SWS	hours per week	PE	practical exercise		
W / S	winter term / summer term	Pj	project		
G / E	language German / English				
1)	Starting the module in summer term (S) is recommended.				
2)	Course is offered every semester.				
3)	Module is not be offered anymore as from summer term 2020.				
4)	Module is newly offered as from summer term 2020.				
5)	Module is newly offered as winter term 2020/21.				
6a)	Module must not be selected together with module M2S36.				
6b)	Module must not be selected together with module M2S16.				
7)	Module must not be selected together with module M2S32.				

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

Civil Engineers 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)		<p>In this study focus five compulsory modules are predetermined:</p> <ul style="list-style-type: none"> • 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 <p>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).</p>
3 PM out of 5 PM have to be selected:		
PM1	M3P1 - Urban and Regional Planning WS 6 CP	
PM2	M3P2 - Models and Methods in Traffic Engineering and Transportation Planning WS 6 CP	
PM3	M3P3 - Infrastructure Management SS 6 CP	
PM4	M3P5 - Laws and Proceedings concerning Traffic and Roads SS 6 CP	
PM5	M3P6 - City Transport Facilities 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	compulsory elective module 1 6 CP	
SM2	compulsory elective module 2 6 CP	

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**Please note:**

Only some modules about railroads can be offered currently. Already begun modules can be completed.

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 ⁴⁾ oE	2 4
Sum compulsory modules		30			12	8		
<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		
M3S02:	Space and Infrastructure	6	Logistics, Supply and Disposal (G)	L/E		2	wE	6
			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 ⁴⁾ 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			

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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		
M3S09:	Project Integrated Planning ¹⁾	6	Project Integrated Planning (G)	Pj	4		ngA ⁴⁾ 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		wE	3
M3S12:	Road Safety	6	Safety Management in Highway Engineering (G)	L/E	2		ngA ⁴⁾ oE	3 3
			Seminar in Highway Engineering (G)	S	2			
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	oE	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 ²⁾	6	Tendering, Planning and Financing in Public Transport (G)	L		2	oE	3
			Seminar in Transportation ³⁾ (G)	S	2	2	EoT	3
			Information Management for Public Mobility Services (G)	L/E		2	EoT	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
Sum compulsory elective modules		78			28	34		

#) is offered again as from winter term 2020/21 !

explanations to Table 3:

general:	type of course:	type of learning control:
M3PX Study Focus III, compulsory modules	L lecture	wE written examination
M3SXX Study Focus III, compulsory elective modules	L/E lecture and exercise, separate or integrated	oE oral examination
LC learning control	S seminar	EoT examination of other type
CP credit point	Pj project	ngA ⁴⁾ not graded accomplishment as examination prerequisite
HpW / SWS hours per week		
W / S winter term / summer term		
G / E language German / English		
¹⁾ Taking this module in the first semester is not recommended.		
²⁾ Two of these courses with the related learning controls have to be selected.		
³⁾ Course is offered every semester.		

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

Civil engineers 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:		In this study focus four compulsory modules are predetermined: <ul style="list-style-type: none"> • Project Management in Construction and Real Estate Industry • Machinery and Process Engineering • Economics and Management in Construction • Sustainability in Real Estate Management In addition one compulsory elective module has to be selected from the offer of this study focus (Tab. 4).	
PM3	M4P3 - Economics and Management in Construction SS		6 CP
PM4	M4P4 - Sustainability in Real Estate Management SS		6 CP
PM1	M4P5 - Project Management in Construction and Real Estate Industry WS		6 CP
PM2	M4P6 - Machinery and Process Engineering WS		6 CP
1 SM has to be selected from M4S01 - M4S19 (s. Tab. 4):			
SM1	compulsory elective module 1	6 CP	

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		
<i>compulsory modules:</i>								
M4P3:	Economics and Management in Construction	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	3/1		ngA ngA wE	1 1 4
M4P6:	Machinery and Process Engineering	6	Construction Equipment (G)	L	2		ngA wE	1 5
			Process Engineering (G)	L	2			
Sum compulsory modules		24			8	8		
<i>compulsory elective modules:</i>								
M4S01:	Business and Human Resource Management	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		1/1	oE	6
			Disassembly Process Engineering (G)	L/E		1/1		
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			

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

Module			Course				LC	
Code (bauI)	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
					W	S		
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	6	Turnkey Construction I - Processes and Methods (G)	L		1	wE	6
			Turnkey Construction II - Trades and Technology (G)	L/E		2		
			Claim Management (G)	L		1		
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	oE	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
Sum compulsory elective modules		78			32	20		

explanations to Table 4:

general:	type of course:	type of learning control:
M4PX Study Focus IV, compulsory modules	L lecture	wE written examination
M4SXX Study Focus IV, compulsory elective modules	L/E lecture and exercise, separate or integrated	oE oral examination
LC learning control	S seminar	EoT examination of other type
CP credit point		ngA not graded
HpW / SWS hours per week		accomplishment
W / S winter term / summer term		
G / E language German / English		

2.2.5 Study Focus 'Geotechnical Engineering' (SF 5)

Civil engineers 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)			<p>In this study focus five compulsory modules are predetermined:</p> <ul style="list-style-type: none"> • Theoretical Soil Mechanics • Earthworks and Foundation Engineering • Rock Mechanics and Tunnelling • Basics in Numerical Modelling • Design and Construction of Components in Reinforced Concrete <p>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.</p>
5 PM are fixed:			
PM1	M5P1 - Theoretical Soil Mechanics SS	6 CP	
PM2	M5P2 - Earthworks and Foundation Engineering WS	6 CP	
PM3	M5P3 - Rock Mechanics and Tunnelling SS	6 CP	
PM4	M5P4 - Basics in Numerical Modelling WS	6 CP	
PM5	M1P1 - Design and Construction of Components in Reinforced Concrete *) 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	M5S02 - Ground Investigation SS	6 CP	
SM2	M5S03 - Applied Geotechnics SS	6 CP	

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 ¹⁾	6	Continuum Mechanics (G)	L	2		oE	3 3
			Numerics in Geotechnics (G)	L	2			
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
Sum compulsory modules		30			12	8		
<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	oE	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	2		oE	6
			Testing in Dam and Wastefill Engineering (G)	L	2			

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*) 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 (bauI)	Name	CP	Name (Language)	Type	HpW / SWS		Type	CP
					W	S		
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
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	6	Special Issues in Rock Mechanics ²⁾ (G)	L/E	2		oE	6
			Coupled Phenomena in Geomechanics ²⁾ (G)	L/E	2			
Sum compulsory elective modules		60			20	20		

explanations to Table 5:

general:		type of course:		type of learning control:	
M5PX	Study Focus V, compulsory modules	L	lecture	wE	written examination
M5SXX	Study Focus V, compulsory elective modules	L/E	lecture and exercise, separate or integrated	oE	oral examination
LC	learning control	E	exercise	ngA	not graded accomplishment
CP	credit point				
HpW / SWS	hours per week				
W / S	winter term / summer term				
G / E	language German / English				
1)	Module must not be selected together with module M1S32 (SF 1).				
2)	Course is not offered in winter term 2019/20.				

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.

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 respective offering of the KIT House of Competence (HoC) or the Centre for Cultural and General Studies (ZAK). In special cases the mentor eventually in coordination with the Examination Committee Master can accept further suitable courses as interdisciplinary qualifications which are not included in the offers of HoC and ZAK as mentioned above. 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.

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, <https://www.tmb.kit.edu/PAM.php>, 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>.

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 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 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.

2.5 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>. The following functions can be accessed there after login:

- register to and deregister from examinations
- retrieve examination results
- 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 require the approval of the examination committee. A counseling interview is mandatory.

Further information is available in the examination regulation (ER/SPO, <http://www.sle.kit.edu/imstudium/masterbauingenieurwesen.php>), and from the **Examination Committee Master** or the 'Fachschaft' (student council).

2.6 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. The examination committee defines in agreement with the examiner the details for the respective examination and informs the student in time.

2.7 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 (<https://www.tmb.kit.edu/PAM.php>). 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. 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 (<https://www.tmb.kit.edu/PAM.php>). A recognition is possible if the obtained competences contribute to achieve the qualification goals of the study program. The Examination Committee Master 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 which transfers it for crediting the accomplishments. Further information about recognitions can be found on the web page of the Examination Committee Master (<https://www.tmb.kit.edu/PAM.php>).

2.8 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 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. 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) 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. These steps have to be completed **before starting** the thesis (date of beginning).

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.

2.9 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 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.

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, <https://www.tmb.kit.edu/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
 Department of Civil Engineering, Geo and Environmental Sciences, Bldg. 10.81, R. 311
 consultation: on appointment
 Phone: 0721/608-46517
 Email: ulf.mohrlök@kit.edu

Examination Committee Master:

Prof. Dr.-Ing. Kunibert Lennerts (chairperson)
 Dipl.-Wi.-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/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'):

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

Fachschaft:

Students in Civil Engineering
 Bldg. 10.81 (Altes Bauing. Geb.), R. 317.1 (3rd 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

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 2020. Although this process was done with great care, other/minor changes may exist.

modules not offered any more as from summer term 2020:

- Structures in Steel and Timber [bauim1s10-BAUING-TSH]
- Analysis of Turbulent Flows [bauim2s32-NS3]

modules offered newly as from summer term 2020:

- Fluid Mechanics of Turbulent Flows [bauim2s45-NS4], replaces part of the module Analysis of Turbulent Flows [bauim2s32-NS3]

modules not offered any more as from winter term 2020/21:

- Timber and Wood-based Materials [bauim1s13-BAUING-HHW]

modules offered newly as from winter term 2020/21:

- Design and Construction in Metal and Lightweight Structures [bauim1s43-ENTW-MLB], replaces part of the module Structures in Steel and Timber [bauim1s10-BAUING-TSH]
- Timber Structures: Materials and Appropriate Design [bauim1s44-BST-HB], replaces parts of the modules Structures in Steel and Timber [bauim1s10-BAUING-TSH] and Timber and Wood-based Materials [bauim1s13-BAUING-HHW]
- Innovations and Developments in Steel and Timber Structures [bauim1s45-INNO-MHB]
- Building Preservation and Innovations in Metal and Lightweight Structures [bauim1s46-BWE-INNO-MLB]
- Building Preservation and Innovations in Timber Structures [bauim1s47-BWE-INNO-HB]
- Modeling of Turbulent Flows - RANS and LES [bauim2s46-NS5], replaces part of the module Analysis of Turbulent Flows [bauim2s32-NS3]
- Track Guided Transport Systems - Technical Design and Components [bauim3s23-EBTECHNIK], will be offered again as compulsory elective module.

changes of the courses assigned to the modules as from winter term 2020/21:

- Special Issues of Public Transport [bauim3s22-VERSPEZOEV]:
the course Information Management for Public Mobility Services (6232813), 2 HpW/SWS, will be offered in winter term.
- Geotechnical Testing and Measuring Technology [bauim5s07-VERSMESS]:
Only the courses Rock Testing (6251909), 2 HpW/SWS, and Testing in Dam and Wastefill Engineering (6251910), 2 HpW/SWS, will be offered.

changed examinations and not graded accomplishments as from summer term 2020:

- Anchorage in Concrete [bauim1s05-BEFTECH]:
The module examination consists of the partial examinations Project Anchorage in Concrete, examination of other type with 3 CP, and Anchorage in Concrete, oral examination with 3 CP.
- Water and Energy Cycles [bauim2p8-WATENCYC]:
The module examination is an examination of other type.
- Space and Infrastructure [bauim3s02-PLRAUMINF]:
The module examination is a written examination.
- Planning of Transportation Systems [bauim3s04-VERPLAN]:
The module examination is a written examination.

changed examinations and not graded accomplishments as from winter term 2020/21:

- Building Preservation of Steel and Timber Structures [bauim1s11-BAUING-BSH]:
The module examination consists of the partial examinations Building Preservation in Steel Structures, written examination with 3 CP, and Building Preservation in Timber Structures, written examination with 3 CP.

5 Modules

M

5.1 Module: Design and Construction of Components in Reinforced Concrete (bauI1P1-BEMISTB) [M-BGU-100033]

Responsible: Prof. Dr.-Ing. Lothar Stempniewski
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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	2

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

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'

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.

Module grade calculation

grade of module is grade of the exam

Prerequisites

none

Content

Design and Construction of Components, Design for bending and Torsion, Biaxial Bending, Punching, Truss Analogy

Recommendation

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

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

Literature

lecture notes

M

5.2 Module: Steel and Composite Structures (bauM1P2-STAHLBAU) [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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-100171	Student Research Project 'Steel Structures'	2 CR	Ummenhofer
T-BGU-100016	Steel and Composite Structures	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

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

Recommendation

lecture Basics in Steel Structures (6200504)

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

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 (bauIM1P3-FTW-BD) [M-BGU-100035]

Responsible: Prof. Dr.-Ing. Werner Wagner
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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	3

Mandatory			
T-BGU-107818	Student Research Project 'Surface Structures'	1 CR	Wagner
T-BGU-107819	Student Research Project 'Dynamics of Structures'	1 CR	Betsch
T-BGU-100017	Surface Structures	2 CR	Wagner
T-BGU-100077	Dynamics of Structures	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'

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.

Module grade calculation

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

Prerequisites

none

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.

Recommendation

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

laboratory course Dynamics of Structures (6215905) in addition to the lecture Dynamics of Structures (6215701)

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

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. Lothar Stempniewski
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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100018	Bracing and Stability in Reinforced Concrete	6 CR	Stempniewski

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

- bracing and stability of buildings
- design of columns
- fire protection, fatigue, determination of stress resultants

Recommendation

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

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

Literature

lecture notes

M

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

Responsible: Prof. Dr.-Ing. Lothar Stempniewski
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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100019	Basics of Prestressed Concrete	6 CR	Stempniewski

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

- Types and systems for prestressing
- loss of prestressing forces
- proof in ultimate limit state and in serviceability limit state

Recommendation

module [Design and Construction of Components in Reinforced Concrete \[bauIM1P1-BEMISTB\]](#)

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

Literature

lecture notes

M

5.6 Module: Solid Construction Bridges (bauIM1S03-MASSBRUE) [M-BGU-100037]

Responsible:	Prof. Dr.-Ing. Lothar Stempniewski
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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100020	Solid Construction Bridges	6 CR	Stempniewski

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

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

Recommendation

module Basics of Prestressed Concrete [bauIM1S02-GDLSPANNB]

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

Literature

lecture notes

M

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

Responsible: Prof. Dr.-Ing. Lothar Stempniewski
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	Recurrence	Duration	Language	Level	Version
6	Each summer term	2 term	German	4	1

Mandatory			
T-BGU-100021	Applied Dynamics of Structures	6 CR	Stempniewski

Competence Certificate

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

Competence Goal

The students can transfer their basic knowledge of the modules 'Dynamics' and 'Surface Structures and Dynamics of Structures' to the field of earthquake engineering. By that, the students can evaluate the dynamic behavior of structures in practical application. Based on material science and the modules 'Geology in Civil Engineering' and 'Bracing and Stability in Reinforced Concrete' the students can describe the basic seismological relationships regarding soil-building-interaction. The students can design basically design structures by impact of earthquake loads.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

- basics of dynamics of structures
- man-made excited, machinery excited, wind excited vibrations and counteractions
- basics in earthquake engineering
- presentation of practical relevant calculation methods
- modeling, calculation, designing, and construction of buildings

Recommendation

none

Annotation

none

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

Literature

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

M

5.8 Module: Anchorage in Concrete (bauM1S05-BEFTECH) [M-BGU-100001]

Responsible: Prof. Dr.-Ing. Lothar Stempniewski
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	Recurrence	Duration	Language	Level	Version
6	Each summer term	2 term	German	4	2

Mandatory			
T-BGU-110850	Project Anchorage in Concrete	3 CR	Fuchs, Stempniewski
T-BGU-100022	Anchorage in Concrete	3 CR	Fuchs, Stempniewski

Competence Certificate

- 'Teilleistung' T-BGU-110850 with examination of other type according to § 4 Par. 2 No. 3
- 'Teilleistung' T-BGU-100022 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Competence Goal

The students can explain the importance of the use of the appropriate anchorage system. Hence, they are able to select it for the specific case and to apply it in an appropriate way.

Module grade calculation

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

Prerequisites

none

Content

The anchorage systems relevant for the application in concrete and their load bearing behavior are presented. Furthermore, the importance of appropriate selection and economical design of the systems is explained.

Recommendation

modules Basics of Reinforced Concrete [bauIBFP2-KSTR.A], Design and Construction of Components in Reinforced Concrete [bauIM1P1-BEMISTB]

Annotation

As from summer term 2020 the project work is a separate examination (Teilprüfung).

Workload

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

- Anchorage in Concrete I lecture, exercise: 30 h
- Anchorage in Concrete II lecture, exercise: 30 h

independent study:

- preparation and follow-up lectures, exercises Anchorage in Concrete I: 20 h
- preparation of Project Anchorage in Concrete (partial examination): 80 h
- examination preparation Anchorage in Concrete (partial examination): 30 h

total: 190 h

Literature

Eligehausen, Mallée: 'Befestigungstechnik im Beton- und Mauerwerksbau'

M

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

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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100023	Material Science, Welding and Fatigue	6 CR	Knödel

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

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

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

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

5.10 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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100024	Construction of Steel and Composite Bridges	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'

Competence Goal

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

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

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

Recommendation

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

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

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

5.11 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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100086	Hollow Section Structures	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'

Competence Goal

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

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

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

Recommendation

course Basics in Steel Structures (6200504)

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

Literature

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

M

5.12 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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100025	Glass, Plastic and Cable Structures	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'

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).

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

course Basics in Steel Structures (6200504)

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

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

5.13 Module: Building Preservation of Steel and Timber Structures (bauIM1S11-BAUING-BSH) [M-BGU-100043]

Responsible: Dr.-Ing. Matthias Frese
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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	3

Mandatory			
T-BGU-100027	Building Preservation of Steel and Timber Structures	6 CR	Frese, Ummenhofer

Competence Certificate

- 'Teilleistung' T-BGU-100027 with written examination according to § 4 Par. 2 No. 1
 details about the learning control see at the 'Teilleistung'

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.

Module grade calculation

grade of the module is grade of the exam

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].

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

Recommendation

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

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
- preparation and follow-up lectures/exercises Preservation of Timber Structures: 30 h
- examination preparation: 60 h

total: 180 h

Literature

lecture accompanying documents

M

5.14 Module: Timber Structures (bauM1S12-BAUING-HB) [M-BGU-100044]

Responsible: Prof. Dr.-Ing. Hans Joachim Blaß
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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100028	Timber Structures	6 CR	Blaß

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'

Competence Goal

The students are able to design composite glued or mechanically jointed components as well as special connection details. They have knowledge about detailing for durability and fire resistance of timber. The students are qualified to design timber structures.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

- elements: mechanically jointed beams, stressed skin panels, purlins
- joints: moment resisting connections, multiple-shear joints with dowel-type fasteners, joist hangers and framing anchors, reinforced connections
- construction details: tension perpendicular to the grain in joints, notched beam and holes in glulam beams, fire resistance, detailing for durability, durability - preservative treatment

Recommendation

none

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

Literature

Blaß, H.J.; Görlacher, R.; Steck, G. (Ed.) Holzbauwerke STEP 1 - Bemessung und Baustoffe. Fachverlag Holz, Düsseldorf, 1995 (ISSN-Nr. 04462114)

M

5.15 Module: Timber and Wood-Based Materials (bauM1S13-BAUING-HHW) [M-BGU-100045]

Responsible: Prof. Dr.-Ing. Hans Joachim Blaß

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

Part of: [Study Focus I / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage until 9/30/2020)
[Subject-Specific Supplements](#) (Usage until 9/30/2020)
[Study Focus II / Structural Engineering \(Compulsory Elective Modules\)](#) (Usage until 9/30/2020)

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

Mandatory			
T-BGU-100029	Timber and Wood-Based Materials	6 CR	Blaß, Sandhaas

Competence Certificate

- 'Teilleistung' T-BGU-100029 with oral examination according to § 4 Par. 2 No. 2

details about the learning control see at the 'Teilleistung'

Competence Goal

The students can utilize the building material timber and its derived products in civil engineering appropriately and are aware of possible problems caused by the hygroscopic, anisotropic, heterogeneous and biological properties of wood. They developed methods to handle the variable properties of timber in construction practice. The students can develop different timber-based materials target-oriented by themselves based on wood-anatomic, wood-physical and biological knowledge.

Their questionable and critical cogitation is educated with respect to well realized, robust and reliable details of timber construction and the students can transfer problems from civil engineering to other context. Based on their material understanding the students can analyse and evaluate the material-specific quality of construction details.

Another competence after completing the module is the ability to read, analyse and comprehend coherently and critically English-language technical texts. A short scientific presentation is developed and presented in English as teamwork.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

- wood anatomy
- wood characteristics
- wood physics
- durability
- drying and strength grading of wood
- solid timber
- engineered wood products
- glued laminated timber
- wood-based panels

Recommendation

module Timber Structures [bauM1S12-HB]

Annotation

IMORTANT:

The module will not be offered any more as from winter term 2020/21.

Workload

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

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises, preparation of scientific presentation: 60 h
- examination preparation: 60 h

total: 180 h

Literature

lecture notes „Holz und Holzwerkstoffe“, Lehrstuhl für Holzbau und Baukonstruktionen, Karlsruher Institut für Technologie (in German)

M

5.16 Module: Non-linear Analysis of Beam Structures (bauM1S14-NILI-STAB) [M-BGU-100046]

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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100030	Non-linear Analysis of Beam Structures	6 CR	Wagner

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

courses Structural Analysis I+II (6200401, 6200501)

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

Literature

lecture notes 'Nichtlineare Modellierung von Stabtragwerken'

M

5.17 Module: Computational Analysis of Structures (bauIM1S15-CTWM) [M-BGU-100047]

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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100174	Student Research Project 'Computational Analysis of Structures'	2 CR	Wagner
T-BGU-100031	Computational Analysis of Structures	4 CR	Wagner

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

module Surface Structures and Dynamics of Structures [bauIM1P3-FTW-BD]

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

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

5.18 Module: FE-Applications in Practical Engineering (bauM1S16-FE-PRAXIS) [M-BGU-100048]

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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100032	FE-Applications in Practical Engineering	6 CR	Wagner

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

module Computational Analysis of Structures [bauM1S15-CTWM]

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

Literature

lecture notes Computational Analysis of Structures

M

5.19 Module: Shell Structures and Stability of Structures (bauIM1S17-STABISHELL) [M-BGU-100049]

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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100254	Student Research Project 'Shell Structures and Stability of Structures'	2 CR	Wagner
T-BGU-100033	Shell Structures and Stability of Structures	4 CR	Wagner

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'

Competence Goal

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

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

course Surface Structures (6214701)

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

Literature

lecture notes Schalentragerwerke

lecture notes Stabilität der Tragwerke

M

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

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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100034	Numerical Methods in Structural Analysis	6 CR	Wagner

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

module Computational Analysis of Structures [bauIM1S15-CTWM]

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

Literature

lecture notes Computational Analysis of Structures

M

5.21 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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100035	Non-linear Analysis of Surface Structures	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

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

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

Literature

lecture notes

M

5.22 Module: Basics of Finite Elements (bauI1S20-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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	4

Mandatory			
T-BGU-109908	Homework 'Basics of Finite Elements'	1 CR	Betsch
T-BGU-100047	Basics of Finite Elements	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

none

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

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

5.23 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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100087	Fracture and Damage Mechanics	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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)

Recommendation

course Introduction to Continuum Mechanics (6200607)

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

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

5.24 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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100044	Material Models in Solid Mechanics	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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)

Recommendation

course Introduction to Continuum Mechanics (6200607)

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

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

5.25 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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100036	Concrete Construction Technology	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

none

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

M

5.26 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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100037	Durability and Service Life Design	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

course Building Chemistry (6200108)

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

M

5.27 Module: Building Preservation of Concrete and Masonry Constructions (bauM1S26-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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-100175	Student Research Project 'Building Preservation of Concrete and Masonry Constructions'	1 CR	Kotan
T-BGU-100038	Building Preservation of Concrete and Masonry Constructions	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

none

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

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

5.28 Module: Building Physics I (bauM1S27-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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100039	Applied Building Physics	3 CR	Kotan
T-BGU-100040	Building Technology	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'

Competence Goal

see German version

Module grade calculation

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

Prerequisites

none

Content

see German version

Recommendation

none

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

M

5.29 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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	3

Mandatory			
T-BGU-109946	Homework 'Practical Noise Control'	1 CR	Grigo
T-BGU-108024	Practical Noise Control	2 CR	Grigo
T-BGU-100042	Practical Fire Protection	3 CR	Schröder

Competence Certificate

- 'Teilleistung' T-BGU-109946 with examination of other type according to § 4 Par. 2 No. 3
- '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'

Competence Goal

see German version

Module grade calculation

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

Prerequisites

none

Content

see German version

Recommendation

none

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: 15 h
- preparation of Homeworks 'Practical Noise Control' (partial exam): 20 h
- examination preparation Practical Noise Control (partial exam): 25 h
- preparation and follow-up lectures Practical Fire Protection: 30 h
- examination preparation Practical Fire Protection (partial exam): 30 h

total: 180 h

M

5.30 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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-100043	Materials Testing and Measuring Techniques	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

none

Annotation

maximum number of participants: 12

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

M

5.31 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	Recurrence	Duration	Language	Level	Version
6	Each winter term	2 term	German	4	2

Mandatory			
T-BGU-106196	Continuum Mechanics	3 CR	Franke
T-BGU-108879	Micromechanics of Heterogeneous Solids	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'

Competence Goal

see German version

Module grade calculation

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

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.

Content

see German version

Recommendation

none

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

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**5.32 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	Recurrence	Language	Level	Version
6	Each summer term	German	4	1

Mandatory			
T-BGU-100998	Finite Elements in Solid Mechanics	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

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

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

M**5.33 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	Recurrence	Language	Level	Version
6	Each summer term	German	4	1

Mandatory			
T-BGU-100999	Computational Structural Dynamics	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

module Basics in Finite Elements [bauIM1S20-GRUNDFE]

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

M

5.34 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	Recurrence	Language	Level	Version
6	Each winter 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'

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.

Module grade calculation

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

Prerequisites

none

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

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.

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

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.; Ruckenbrod, 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

5.35 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	Recurrence	Language	Level	Version
6	Each summer term	German	4	2

Mandatory			
T-BGU-103223	Modeling Techniques in Solid Mechanics	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

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

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

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

5.36 Module: Contact Mechanics (bauIM1S41-KONTMECH) [M-BGU-104916]

Responsible: 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	Recurrence	Language	Level	Version
6	Each summer term	German	4	1

Mandatory			
T-BGU-109947	Contact Mechanics	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

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

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

Literature

- [1] Laursen: Computational Contact and Impact Mechanics
 [2] Wriggers: Computational Contact Mechanics

M

5.37 Module: Digital Planning and Building Information Modeling (bauIM1S42-DIGIPLAN) [M-BGU-105135]

Responsible: Dr.-Ing. 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	Recurrence	Language	Level	Version
6	Each winter term	German	4	1

Mandatory			
T-BGU-110382	Digital Planning and Building Information Modeling	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

course Computer Aided Design (CAD) (6200520)
 course Steel and Composite Structures (6212801 und 6212802)

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

Literature

- [1] Borrman, 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-Kompodium: Building Information Modeling als neue Planungsmethode. Stuttgart: Fraunhofer IRB.

M

5.38 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	Recurrence	Language	Level	Version
6	Each winter term	German	4	1

Mandatory			
T-BGU-110852	Design and Construction in Metal and Lightweight Structures	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

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

Content

see German version

Recommendation

course Basics in Steel Structures;
module Steel and Composite Structures

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

M

5.39 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	Recurrence	Language	Level	Version
6	Each winter term	German	4	1

Mandatory			
T-BGU-110853	Timber Structures: Materials and Appropriate Design	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

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].

Content

see German version

Recommendation

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

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

Literature

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

M

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

Responsible: Dr.-Ing. Matthias Albiez
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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-110854	Innovations and Developments in Metal and Lightweight Structures	3 CR	Albiez
T-BGU-110855	Innovations and Developments in Timber Structures	3 CR	Sandhaas

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'

Competence Goal

see German version

Module grade calculation

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

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].

Content

see German version

Recommendation

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

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

Literature

lecture accompanying documents

M

**5.41 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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	1

Mandatory			
T-BGU-110856	Building Preservation in Steel Structures	3 CR	Ummenhofer
T-BGU-110854	Innovations and Developments in Metal and Lightweight Structures	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'

Competence Goal

see German version

Module grade calculation

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

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].

Content

see German version

Recommendation

none

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

Literature

lecture accompanying documents

M

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

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
6

Recurrence
Each winter term

Duration
1 term

Language
German

Level
4

Version
1

Mandatory			
T-BGU-110857	Building Preservation in Timber Structures	3 CR	Frese
T-BGU-110855	Innovations and Developments in Timber Structures	3 CR	Sandhaas

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'

Competence Goal

see German version

Module grade calculation

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

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].

Content

see German version

Recommendation

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

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

Literature

lecture accompanying documents

M

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

Responsible: 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	Recurrence	Language	Level	Version
6	Each winter 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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

course Sanitary Environmental Engineering (6200603)

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

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

5.44 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	Recurrence	Language	Level	Version
6	Each winter term	English	4	1

Mandatory			
T-BGU-106758	Numerical Fluid Mechanics	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

modules Hydromechanics [bauIBGP04-HYDRO] (understanding of physical processes of advektion 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)

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

M

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

Responsible:	Prof. Dr. Franz Nestmann
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	Recurrence	Language	Level	Version
6	Each summer term	English	4	1

Mandatory			
T-BGU-106759	Hydraulic Engineering	6 CR	Nestmann

Competence Certificate

- 'Teilleistung' T-BGU-106759 with written examination according to § 4 Par. 2 No. 1
 details about the learning control see at the 'Teilleistung'

Competence Goal

Students are able to describe and analyze interactive water management processes (water-air and water-solid). They are able to assign these basic interactive processes to engineering tasks and carry out the dimensioning of hydraulic structures with suitable approaches. Based on the acquired process knowledge, they are able to analyze the different results of these dimensioning in a critical manner.

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

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

The module provides students with basic theoretical and practical aspects of water-air and water-solid interactions as well as the relevance to engineering. Beginning with the basics in morphodynamics approaches for motion and mass fluxes at the river bed are presented. As another focus buildings in hydraulic engineering are addressed as well as their embedding in the river system.

Recommendation

none

Annotation

none

Workload

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

- Multiphase Flow in Hydraulic Engineering lecture/exercise: 30 h
- Design of Hydraulic Structures lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Multiphase Flow in Hydraulic Engineering: 30 h
- preparation and follow-up lecture/exercises Design of Hydraulic Structures: 30 h
- examination preparation: 60 h

total: 180 h

M

5.46 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	Recurrence	Language	Level	Version
6	Each winter term	English	4	1

Mandatory			
T-BGU-106596	Water and Energy Cycles	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'

Competence Goal

Students are able to explain the most relevant processes of the terrestrial water and energy cycles including their feedbacks and limitations. They know the concepts to quantitatively describe and predict these processes in the context of science and water management and are 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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

course Hydrology (6200511) and module Water Resources Management and Engineering [bauIBFW9-WASSRM]; knowledge of programming with Matlab, otherwise the attendance of the course 'Introduction to Matlab' (6224907) is strongly recommended

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

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

5.47 Module: Advanced Fluid Mechanics (bauIM2P9-ADVFM) [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	Recurrence	Language	Level	Version
6	Each summer term	English	4	1

Mandatory			
T-BGU-106612	Advanced Fluid Mechanics	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

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)

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

Literature

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

M

5.48 Module: Management of Water Resources and River Basins (bauIM2S01-HY1) [M-BGU-103364]

Responsible: Dr.-Ing. Uwe Ehret

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

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

Credits	Recurrence	Language	Level	Version
6	Each summer term	English	4	1

Mandatory			
T-BGU-106597	Management of Water Resources and River Basins	6 CR	Ehret

Competence Certificate

- 'Teilleistung' T-BGU-106597 with examination of other type according to § 4 Par. 2 No. 3
 details about the learning control see at the 'Teilleistung'

Competence Goal

Students are able to identify the components of tasks related to Water Management. They are able to formulate solutions for these tasks based on the principles of Integrated Water Resources Management (IWRM). Students are familiar with the principles, methods and limitations of environmental systems modeling and are able to set up and apply water balance models for given tasks of Water Resources Management. They are able to interpret the results and quantify and evaluate the related uncertainties. Students are able to solve problems and to present the related results in teamwork.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

- definition, scope and examples of Integrated River Basin Management
- methods for Multi-Objective Decision Making (Utility Matrix)
- hydrological Modeling: Environmental Systems Theory, Calibration and Validation, Sensitivity and Uncertainty Analysis
- methods of Engineering Hydrology
- computer-based application of hydrological models (HBV, Larsim): manual and automated calibration, Monte-Carlo based uncertainty estimation, identification of design storm hydrographs

Preparation of assignments and presentation in small groups.

Recommendation

courses Hydrology (6200513), Water Resources Management and Engineering Hydrology (6200617)

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 course associated assignments (parts of the exam): 60 h
- preparation of final take home exam (part of the exam): 40 h

total: 180 h

M

5.49 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	Recurrence	Language	Level	Version
6	Each summer term	English	4	1

Mandatory			
T-BGU-106598	Transport and Transformation of Contaminants in Hydrological Systems	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

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)

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

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

5.50 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	Recurrence	Language	Level	Version
6	Each summer term	English	4	1

Mandatory			
T-BGU-106605	Geostatistics	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

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)

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

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 Rodriguez-Iturbe, I. (1985): Random Functions and Hydrology. Addison-Wesley Massachusetts.

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

M

5.51 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	Recurrence	Language	Level	Version
6	Each summer term	English	4	1

Mandatory			
T-BGU-106599	Hydrological Measurements in Environmental Systems	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

knowledge in hydrology

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 year of study and in 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

Literature

notes for field exercises

M**5.52 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	Recurrence	Language	Level	Version
6	Each winter term	German	4	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'

Competence Goal

(see German version)

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

(see German version)

Recommendation

none

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

Literature

(see German version)

M

5.53 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	Recurrence	Language	Level	Version
6	Each summer term	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'

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.

Module grade calculation

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

Prerequisites

none

Content

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

Recommendation

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

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

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

5.54 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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100139	Hydro Power Engineering	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

course Hydraulic Engineering and Water Management (6200511)

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

Literature

Foliendrucke;

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

M

5.55 Module: Waterway Engineering (bauM2S12-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	Recurrence	Language	Level	Version
6	Each summer term	German	4	1

Mandatory			
T-BGU-106779	Seminar Paper 'Waterway Engineering'	1 CR	Kron
T-BGU-106780	Waterway Engineering	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

course Hydraulic Engineering and Water Management (6200511)

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

M

5.56 Module: Interaction Flow - Building Structure (bauIM2S16-SM2) [M-BGU-103897]

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	Recurrence	Language	Level	Version
6	Each winter term	German/English	4	2

Mandatory			
T-BGU-110404	Interaction Flow - Hydraulic Structures	3 CR	Gebhardt
T-BGU-103563	Building and Environmental Aerodynamics	3 CR	Gromke

Competence Certificate

- 'Teilleistung' T-BGU-110404 with written examination according to § 4 Par. 2 No. 1
- 'Teilleistung' T-BGU-103563 with oral examination according to § 4 Par. 2 No. 2

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

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.

Module grade calculation

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

Prerequisites

The module must not be selected together with the module 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.

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.

Recommendation

course Hydromechanics (6200304), modules Advanced Fluid Mechanics [bauIM2P9-ADVFM], Technical Hydraulics [bauIM2S17-SM3]

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

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

5.57 Module: Technical Hydraulics (bauIM2S17-SM3) [M-BGU-103385]

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	Recurrence	Language	Level	Version
6	Each summer term	German	4	1

Mandatory			
T-BGU-106770	Technical Hydraulics	6 CR	Eiff

Competence Certificate

- 'Teilleistung' T-BGU-106770 with written examination according to § 4 Par. 2 No. 1
 details about the learning control see at the 'Teilleistung'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

course Hydromechanics (6200304),
 module Advanced Fluid Mechanics [bauIM2P9-ADVFM]

Annotation**IMPORTANT:**

The module will not be offered in summer term 2020.

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

Literature

Vorlesungsskript Rohrhydraulik, 2009
 Lang, C., Jirka, G., 2009, Einführung in die Gerinnehydraulik, Universitätsverlag Karlsruhe
 Naudascher, E., 1992, Hydraulik der Gerinne und Gerinnebauwerke, Springer Verlag Berlin

M

5.58 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	Recurrence	Language	Level	Version
6	Each winter term	English	4	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

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

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

M

5.59 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	Recurrence	Language	Level	Version
6	Each summer term	English	4	2

Mandatory			
T-BGU-106769	Parallel Programming Techniques for Engineering	3 CR	Uhlmann
T-BGU-106768	Numerical Fluid Mechanics II	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'

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.

Module grade calculation

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

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.

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.

Recommendation

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

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

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

5.60 Module: Industrial Water Management (bauIM2S29-SW6) [M-BGU-104073]**Responsible:** Dr.-Ing. Tobias Morck**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**
6**Recurrence**
Each summer term**Language**
English**Level**
4**Version**
2

Mandatory			
T-BGU-108448	Industrial Water Management	5 CR	Morck
T-BGU-109980	Lab report 'Industrial Water Management'	1 CR	Morck

Competence Certificate

- 'Teilleistung' T-BGU-109980 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-108448 with oral examination according to § 4 Par. 2 No. 2

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

Competence Goal

Students acquire knowledge about techniques for wastewater treatment in industrial production processes and based on it, they can explain functioning principles of the techniques. Students are able to assess wastewater constituents from industrial effluents and its emissions on the basis of legal regulations. They can analyze arising problems in the industrial wastewater treatment and select appropriate methods for emission reduction and water recycling.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

In this module, different types of industrial wastewater (e.g. leather, paper, metal industries) are considered and studied. Customized chemical, physico-chemical and, if necessary, biological treatment processes are presented and discussed.

Recommendation

course Sanitation and Environmental Engineering (6200603)

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
- report on laboratory work (examination prerequisite): 30 h
- examination preparation: 50 h

total: 180 h

M

5.61 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	Recurrence	Language	Level	Version
6	Each winter term	German	4	1

Mandatory			
T-BGU-106783	Project Studies in Water Resources Management	6 CR	Nestmann, 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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

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

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

M

5.62 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	Recurrence	Language	Level	Version
6	Each winter term	German	4	1

Mandatory			
T-BGU-106776	Numerical Flow Modeling in Hydraulic Engineering	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

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

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

Literature

lecture notes

M

5.63 Module: Flow and Sediment Dynamics in Rivers (bauim2S35-WB8) [M-BGU-104083]**Responsible:** Prof. Dr. Franz Nestmann**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	Recurrence	Language	Level	Version
6	Each summer term	English	4	1

Mandatory			
T-BGU-108466	Seminar Paper 'Flow Behavior of Rivers'	2 CR	Nestmann, Seidel
T-BGU-108467	Flow and Sediment Dynamics in Rivers	4 CR	Nestmann

Competence Certificate

- 'Teilleistung' T-BGU-108466 with not graded accomplishment according to § 4 Par. 3 as examination prerequisite
- 'Teilleistung' T-BGU-108467 with oral examination according to § 4 Par. 2 No. 2

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

Competence Goal

Students are able to name and explain the basic relationships and interactions between topography, flow and morphodynamics in natural streams. They can describe and apply the respective design approaches. Students are able to analyze the engineering design methods and combine this information with the basics of hydromechanics. They actively and independently inform themselves about the latest state in technology and can use adequate methods to solve engineering problems. They can present their findings and discuss the themes with specialists.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

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

- geomorphic cycle
- space-time approach in morphology
- anthropogenic influences on streams
- vegetation hydraulics
- approaches to interactions
- bed load and sediment management in streams
- practical examples

Recommendation

basics in fluid mechanics, module Hydraulic Engineering [bauim2P6-ADVHYENG]

Annotation

none

Workload

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

- Morphodynamics lecture/exercise: 30 h
- Flow Behavior of Rivers lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Morphodynamics: 15 h
- preparation and follow-up lecture/exercises Flow Behavior of Rivers: 15 h
- preparation of the seminar paper (exam prerequisite): 45 h
- examination preparation: 45 h

total: 180 h

M

5.64 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	Recurrence	Language	Level	Version
6	Each term	English	4	2

Mandatory			
T-BGU-106774	Groundwater Flow around Structures	3 CR	Trevisan
T-BGU-110404	Interaction Flow - Hydraulic Structures	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'

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.

Module grade calculation

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

Prerequisites

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

Modeled Conditions

The following conditions have to be fulfilled:

1. The module [M-BGU-103897 - Interaction Flow - Building Structure](#) must not have been started.

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

Recommendation

none

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

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

5.65 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	Recurrence	Language	Level	Version
6	Each winter term	German/English	4	2

Mandatory			
T-BGU-106773	Experimental Hydraulics II	3 CR	Seidel
T-BGU-110411	Flow Measurement Techniques	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'

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.

Module grade calculation

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

Prerequisites

The module must not be selected together with the module Experimental Techniques II: Measurement Techniques [bauIM2S18-SM4].

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)

Recommendation

module Experiments in Fluid Mechanics [bauIM2S39-SM6], hydraulic lab practice

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

M

5.66 Module: Water Distribution Systems (bauim2S38-WB11) [M-BGU-104100]

Responsible: Prof. Dr. Franz Nestmann

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	Recurrence	Language	Level	Version
6	Each winter term	English	4	1

Mandatory			
T-BGU-108485	Project Report Water Distribution Systems	2 CR	Nestmann
T-BGU-108486	Water Distribution Systems	4 CR	Nestmann

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

hydromechanics (specifically pipe hydraulics)

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

Literature

Mutschmann und Stimmelmayer (2007). Taschenbuch der Wasserversorgung, 14. Aufg., 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

5.67 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	Recurrence	Language	Level	Version
6	Each summer term	English	4	1

Mandatory			
T-BGU-106760	Experiments in Fluid Mechanics	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

module Advanced Fluid Mechanics (bauIM2P9)

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

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

5.68 Module: Wastewater and Storm Water Treatment Facilities (bauIM2S40-SW7) [M-BGU-104898]

Responsible: Dr.-Ing. Stephan Fuchs
Dr.-Ing. Tobias Morck

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
6

Recurrence
Each summer term

Language
English

Level
4

Version
1

Mandatory			
T-BGU-109934	Wastewater and Storm Water Treatment Facilities	6 CR	Fuchs, Morck

Competence Certificate

- 'Teilleistung' T-BGU-109934 with examination of other type according to § 4 Par. 2 No. 3
details about the learning control see at the 'Teilleistung'

Competence Goal

Students get familiar with technical plants for wastewater and storm water treatment. They can explain operating principles of individual system components as well as assess their suitability for specific applications and apply basic dimensioning approaches.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

Guided visits, description and evaluation of different water treatment plants:

- storm water sedimentation tanks
- storm water overflow
- retention soil filters
- sewage treatment plants

Dimensioning approaches for the design of storm water treatment facilities.

Recommendation

module 'Urban Water Infrastructure and Management' [bauIM2P10-URBIM]

Annotation

The number of participants in the course is limited to 20 persons. The registration is to be made via ILIAS. The places are allocated with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoecology* and further study programs. The allocation is made by consideration of the semester and the time of entry of the registration. 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):

- lecture/exercise: 60 h

independent study:

- preparation and follow-up lecture/exercises: 30 h
- presentation and preparation of term paper (examination): 90 h

total: 180 h

Literature

Gujer, W. „Siedlungswasserwirtschaft“, Springer, Berlin 3.Aufl., 2007

Grigg, N, S „Water, Wastewater, and Stormwater Infrastructure Management“, Second Edition (Englisch) Francis and Taylor 2012

M

5.69 Module: Freshwater Ecology (bauIM2S41-SW8) [M-BGU-104922]**Responsible:** 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	Recurrence	Language	Level	Version
6	Each summer term	English	4	1

Mandatory			
T-BGU-109956	Applied Ecology and Water Quality	3 CR	Fuchs, Hilgert
T-BGU-109957	Field Training Water Quality	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'

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.

Module grade calculation

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

Prerequisites

none

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.

Recommendation

none

Annotation

The number of participants in the courses is limited to 20 persons. The registration is to be made via ILIAS. The places are allocated with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoecology* and further study programs. The allocation is made by consideration of the semester and the time of entry of the registration. 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: 45 h
- Field Training Water Quality (block): 20 h

independent study:

- preparation of the report on Field Training Water Quality (partial examination): 55 h
- preparation of the seminar paper with presentation (partial examination): 60 h

total: 180 h

Literature

Wetzel, Limnology, 3rd Edition, Academic Press 2001

Jürgen Schwörbel, Methoden der Hydrobiologie, UTB für Wissenschaft 1999

kursbegleitende Materialien

M

5.70 Module: River Basin Modeling (bauim2S42-SW9) [M-BGU-103373]

Responsible: 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	Recurrence	Language	Level	Version
6	Each summer term	English	4	1

Mandatory			
T-BGU-106603	River Basin Modelling	6 CR	Fuchs

Competence Certificate

- 'Teilleistung' T-BGU-106603 with examination of other type according to § 4 Par. 2 No. 3 details about the learning control see at the 'Teilleistung'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

modules [Urban Water Infrastructure and Management \[bauim2P10-URBIM\]](#), [Water Ecology \[bauim2S41-SW8\]](#)

Annotation

none

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: 60 h
- project work on River Basin Modeling (exam): 60 h

total: 180 h

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

5.71 Module: Wastewater Treatment Technologies (bauim2S43-SW10) [M-BGU-104917]

Responsible: Dr.-Ing. Tobias Morck

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	Recurrence	Language	Level	Version
6	Each winter term	English	4	1

Mandatory			
T-BGU-109265	Term Paper 'International Sanitary Engineering'	1 CR	Fuchs, Morck
T-BGU-109948	Wastewater Treatment Technologies	5 CR	Fuchs, Morck

Competence Certificate

- 'Teilleistung' T-BGU-109265 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'

Competence Goal

Students acquire knowledge about typical techniques 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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content**Municipal Wastewater Treatment:**

Students gain deep knowledge about design and operation of typical process technologies in municipal wastewater treatment in Germany. Following processes are covered:

- different activated sludge processes
- anaerobic technologies and energy-recovery systems
- filtration technologies
- wastewater disinfection and pathogen removal
- chemical and biological phosphorus removal
- micro-pollutants removal
- resource management and energy efficiency

International Sanitary Engineering:

Students get acquainted with the design and operation used for wastewater treatment at international level. They analyze, evaluate and take decisions when new and more holistic oriented methods can be implemented. Following topics are covered:

- activated sludge processes
- trickling filters and rotating biological contactors
- treatment ponds
- retention soil filter / Wetlands
- UASB/EGSB/Anaerobic filter
- decentralized versus centralized systems
- material flow separation
- energy-recovery from wastewater
- drinking water purification
- waste management

Recommendation

module Urban Water Infrastructure and Management [bauIM2S43-SW10]

Annotation

none

Workload

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

- Municipal Wastewater Treatment lecture/exercise: 30 h
- International Sanitary Engineering lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Municipal Wastewater Treatment: 30 h
- preparation of Term paper 'International Sanitary Engineering' (exam prerequisite): 45 h
- examination preparation: 45 h

total: 180 h

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.; Chericaro, 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

5.72 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	Recurrence	Language	Level	Version
6	Each winter term	English	4	1

Mandatory			
T-BGU-109950	Homework 'Introduction to Environmental Data Analysis and Statistical Learning'	2 CR	Ehret
T-BGU-109949	Introduction to Environmental Data Analysis and Statistical Learning	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

preliminary knowledge in statistics, e.g. successful completion of Probability and Statistics (WSEM-CC911), and Matlab programming skills, e.g. successful completion of Introduction to Matlab (WSEM-CC772)

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

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

5.73 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	Recurrence	Language	Level	Version
6	Each summer term	English	4	1

Mandatory			
T-BGU-110841	Fluid Mechanics of Turbulent Flows	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

The present module gives a general introduction to the analysis of turbulent flows. The mathematical description of the physics of turbulence is successively developed, i.e. the properties of the conservation laws, the required mathematical tools and the most useful modeling approaches for fluids engineering problems. The course Fluid Mechanics of Turbulent Flows 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.

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'.

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

M

5.74 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	Recurrence	Language	Level	Version
6	Each winter term	English	4	1

Mandatory			
T-BGU-110842	Modeling of Turbulent Flows - RANS and LES	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

In the course Modeling of Turbulent Flows - RANS and LES, 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.

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.

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

M**5.75 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	Recurrence	Duration	Language	Level	Version
6	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

module Mobility and Infrastructure [bauibfp5-MOBIN]

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

Literature

list of literature to module

M

5.76 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	Recurrence	Duration	Language	Level	Version
6	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

none

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

Literature

lecture notes with additional references / exercises

M

5.77 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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-106300	Infrastructure Management	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

none

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

M

5.78 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)
[Study Focus II / Mobility and Infrastructure \(Compulsory Elective Modules\)](#) (Usage from 4/1/2020)**Credits**
6**Recurrence**
Each winter term**Duration**
1 term**Language**
German**Level**
4**Version**
1

Mandatory			
T-BGU-100052	Track Guided Transport Systems - Technical Design and Components	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

none

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

Literature

Zilch, Diederichs, Katzenbach: Handbuch f. Bauingenieure, Springer-Verlag
Pachl, J.; Systemtechnik des Schienenverkehrs, Springer Vieweg

M

5.79 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	Recurrence	Duration	Language	Level	Version
6	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

none

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

M

5.80 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	Recurrence	Duration	Language	Level	Version
6	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'

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.

Module grade calculation

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

Prerequisites

none

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.

Recommendation

none

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

Literature

list of literature to module

M

5.81 Module: Space and Infrastructure (bauIM3S02-PLRAUMINF) [M-BGU-100014]

Responsible: 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	Recurrence	Duration	Language	Level	Version
6	Each term	1 term	German	4	1

Mandatory			
T-BGU-100056	Space and Infrastructure	6 CR	Kagerbauer, Keller

Competence Certificate

- 'Teilleistung' T-BGU-100056 with written examination according to § 4 Par. 2 No. 1
 details about the learning control see at the 'Teilleistung'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

none

Annotation

As from summer term 2020 the learning control is a written exam.

Workload

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

- Logistics, Supply and Disposal lectures/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/exercises: 30 h
- preparation and follow-up Fundamentals of Geographic Information Systems for Modelling and Planning lectures/exercises: 15 h
- examination preparation: 45 h

total: 180 h

Literature

list of literature to module

M

5.82 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	Recurrence	Duration	Language	Level	Version
6	Each term	1 term	German	4	1

Mandatory			
T-BGU-100008	Traffic Management und Simulation Methods	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

none

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 h
- examination preparation: 60 h

total: 180 h

Literature

lecture notes

guidelines ('Handbuch zur Bemessung von Straßen', 'Richtlinien für Lichtsignalanlagen'),

software documentations

M

5.83 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	Recurrence	Duration	Language	Level	Version
6	Each term	1 term	German	4	1

Mandatory			
T-BGU-100013	Planning of Transportation Systems	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

course Transportation (6200406)

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

Literature

lecture notes and materials are available for downloading

M**5.84 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	Recurrence	Duration	Language	Level	Version
6	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

preliminary attendance of the compulsory module Infrastructure Management [bauIM3P3-STRINFRA]

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

M

5.85 Module: Road Construction (bauM3S06-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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

preliminary attendance of the compulsory module Infrastructure Management [mobiM301-STRINFRA]

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

M

5.86 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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	2

Mandatory			
T-BGU-109916	Group exercise Project Integrated Planning	5 CR	Roos
T-BGU-100061	Project Integrated Planning	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

preliminary attendance of at least 2 compulsory modules in the study focus Mobility and Infrastructure

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

M

5.87 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	Recurrence	Language	Level	Version
6	Each term	German	4	4

Mandatory			
T-BGU-106611	Freight Transport	3 CR	Chlond
T-BGU-106301	Long-Distance and Air Traffic	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'

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.

Module grade calculation

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

Prerequisites

none

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

Recommendation

none

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

Literature

lecture accompanying documents

M

5.88 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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	2

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 oral examination according to § 4 Par. 2 No. 2

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

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

none

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

M

5.89 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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-106734	Special Topics in Highway Engineering	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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).

Recommendation

preliminary attendance of the compulsory module Infrastructure Management [bauim3P3-STRINFRA]

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

M

5.90 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
6

Recurrence
Each winter term

Duration
1 term

Language
German

Level
4

Version
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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

none

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

M

5.91 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	Recurrence	Language	Level	Version
6	Each summer term	German	4	1

Mandatory			
T-BGU-101002	Track Guided Transport Systems - Operation and Capacity	6 CR	Tzschaschel

Competence Certificate

- 'Teilleistung' T-BGU-101002 with oral examination according to § 4 Par. 2 No. 2
 details about the learning control see at the 'Teilleistung'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

none

Annotation

none

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

Literature

Fiedler, Grundlagen der Bahntechnik, Werner-Verlag, Düsseldorf

Hausmann, Enders, Grundlagen des Bahnbetriebs, Bahn-Fachverlag, Heidelberg

Pachl, Systemtechnik des Schienenverkehrs, Teubner-Verlag, Stuttgart

M

5.92 Module: Analysis and Evolution of Mobility (bauIM3S20-VERANAMOB) [M-BGU-100583]

Responsible: 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	Recurrence	Language	Level	Version
6	Each term	German	4	2

Mandatory			
T-BGU-101004	Analysis and Evolution of Mobility	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

course Transportation (6200406)

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

M

5.93 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	Recurrence	Language	Level	Version
6	Each summer term	German	4	2

Election block: Electives (2 items as well as 6 credits)			
T-BGU-101005	Tendering, Planning and Financing in Public Transport	3 CR	Vortisch
T-BGU-100014	Seminar in Transportation	3 CR	Chlond, Vortisch
T-BGU-106608	Information Management for Public Mobility Services	3 CR	Vortisch

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

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

Competence Goal

see German version

Module grade calculation

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

Prerequisites

none

Content

see German version

Recommendation

course Transportation (6200406)

Annotation

none

Workload

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

- Tendering, Planning and Financing in Public Transport lectures: 30 h
- Seminar in Transportation: 30 h
- Regional Planning lectures: 30 h
- Information Management for public Mobility Services lectures/exercises: 30 h

independent study, as 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

total: 180 h

M

5.94 Module: Economics and Management in Construction (bauIM4P3-) [M-BGU-100102]

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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-100143	Economics and Management in Construction	5 CR	Haghsheno
T-BGU-108010	Student Research Project 'Cost Estimation in Structural Engineering and Earthworks'	1 CR	Schneider

Competence Certificate

- 'Teilleistung' T-BGU-108010 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100143 with written examination according to § 4 Par. 2 No. 1

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

Competence Goal

Students can define the term accounting and can explain the various components and tasks. They gain the ability to apply the various types of depreciation. 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.

Students have the ability to assign the different stakeholders to partnerships and corporate enterprises and to explain the construction contract laws as well as the difference between BGB and VOB. Furthermore, students can explain the different types of procurement. Students can explain legal bases of construction law and are able to assess and evaluate the contents of a construction contract. Moreover, students develop legal thinking regarding contract and employment law and can apply the basic to construction projects.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

This module covers the calculation of various factors (Mittelohn, EKT, BGK, AGK and W&G). After a manual example for tendering, the result will be transferred to currently applied software. Furthermore following topics are discussed within the lectures: • financing • investing • basics of controlling • forms of organisation

Recommendation

none

Annotation

none

Workload

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

- Cost Estimation lecture/exercise: 30 h
- Building Laws lecture: 30 h

independent study:

- preparation and follow-up lecture/exercises Cost Estimation: 20 h
- preparation and follow-up lectures Building Laws: 20 h
- preparation of student research project: 30 h
- examination preparation: 50 h

total: 180 h

Literature

- 1) Bronner, Albert: Angebots- und Projektkalkulation - Leitfaden für Praktiker, Springer, 3., aktualisierte Aufl., Berlin, Heidelberg, 2008.
- 2) Drees, Gerhard u. Paul, Wolfgang: Kalkulation von Baupreisen - Hochbau, Tiefbau, Schlüsselfertiges Bauen, Bauwerk, 10., erw. und aktualisierte Aufl., Berlin, 2008.
- 3) Leimböck, Egon; Klaus, Ulf Rüdiger u. Hölckermann Oliver: Baukalkulation und Projektcontrolling unter Berücksichtigung der KLR Bau und der VOB, Vieweg, 11., überarb. Aufl., Wiesbaden, 2007.
- 4) Girmscheid, Gerhard, Motzko, Christoph: Kalkulation und Preisbildung in Bauunternehmen - Grundlagen, Methodik und Organisation, Springer, Berlin, Heidelberg, 2007.
- 5) Handwörterbuch der Betriebswirtschaft (HWB), Herausgegeben von: Prof. Dr. Dr. h.c. Richard Köhler, Prof. Dr. Dr. h.c. Hans-Ulrich Küpper, Prof. Dr. Andreas Pfingsten, Schäffer Pöeschel, 6. Auflage, 2007

M

5.95 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	Recurrence	Language	Level	Version
6	Each summer term	German	4	1

Mandatory			
T-BGU-100149	Sustainability in Real Estate Management	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

courses Facility und Real Estate Management I (6200414), Life Cycle Management (6200615)

Annotation

none

Workload

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

- Sustainability in Real Estate Management lecture/exercise: 30 h
- Real Estate Life Cycle Management 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 Real Estate Life Cycle Management: 15 h
- preparation and follow-up lectures Facility and Real Estate Management II: 15 h
- examination preparation: 60 h

total: 180 h

M

5.96 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	Recurrence	Language	Level	Version
6	Each winter term	German	4	3

Mandatory			
T-BGU-101006	Group Exercise Project Management in Construction and Real Estate Industry	1 CR	Haghsheno
T-BGU-100622	Project Management in Construction and Real Estate Industry	4 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-101006 with not graded accomplishment according to § 4 Par. 3
- 'Teilleistung' T-BGU-100622 with written examination according to § 4 Par. 2 No. 1

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

Competence Goal

Students have advanced knowledge in the area of project management, particularly in the planning and management of the construction and real estate projects. They are able to name and analyze the different project parties, structures and types of contracts. Furthermore, they are able to apply methods and tools in construction projects.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

In the area of project management the topics project organization, awards and types of contracts, quality management, production planning and construction logistics, schedule management, cost management and conflict management are discussed.

In addition, skills for technical project development will be imparted. Complex issues are clarified using practical examples. In case of process planning, basic principles (terms, definitions, basic variables, current trends), methods of process comparison, methods of construction scheduling (classification and structuring of projects, structure, time and cost analyzes), optimization techniques, and basic knowledge of site facilities and formwork are explained. 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.

In addition, students need to develop two exercises within the scope of their seminar paper as part of this module.

Recommendation

none

Annotation

none

Workload

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

- lecture, exercise: 60 h

independent study:

- preparation and follow-up lectures, exercises: 20 h
- group exercise (not graded accomplishment as exam prerequisite): 30 h
- preparation of student research project (not graded accomplishment): 30 h
- examination preparation: 40 h

total: 180 h

Literature

DIETHELM, G.: Projektmanagement, Band 1: Grundlagen, Verlag Neue Wirtschafts-Briefe, Herne, 2000
DIETHELM, G.: Projektmanagement, Band 2: Sonderfragen, Verlag Neue Wirtschafts-Briefe, Herne, 2001
ESCHENBRUCH, K.: Recht der Projektsteuerung, Werner Verlag, München, 2003
HAHN, R.: Projektmanagement für Ingenieure, Wiley-VCH Verlag, Weinheim, 2002
KERZNER, H.: Project Management - A Systems Approach to Planning, Scheduling and Controlling, Wiley & Sons, 2006
KOCHENDÖRFER, B., LIEBCHEN, J.: Bau-Projekt-Management, Verlag B. G. Teubner, Stuttgart, 2001
Project Management Institute: A Guide to the Project Management Body of Knowledge: PMBOK Guide, 2008
ROSENAU, M., W.: Successful Project Management, Van Nostrand Reinhold, New York, 1992
VOLKMANN, W.: Projektabwicklung, Verlag für Wirtschaft und Verwaltung Hubert Wingen, Essen, 2002

M

5.97 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	Recurrence	Language	Level	Version
6	Each winter 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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

none

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

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

5.98 Module: Business and Human Resource Management (bauIM4S01-) [M-BGU-100111]

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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-108002	Business and Human Resource Management	6 CR	Haghsheno

Competence Certificate

- 'Teilleistung' T-BGU-108002 with written examination according to § 4 Par. 2 No. 1
 details about the learning control see at the 'Teilleistung'

Competence Goal

Students are able to explain principles of business and human resource management as well as key corporate functions in construction companies. They are able to name and describe the different forms of organizations and can distinguish between these forms. Furthermore, students achieve knowledge to identify and analyze different types of strategies in construction companies. In the area of communication and motivation, students gain basic knowledge and are able to implement methods of human resources management. In the course site management, students know about technical, business and organizational tasks and are able to analyze and evaluate the individual process steps.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

In the area of operational management generic strategies for contractors and their implementation in the context of organizational structures and legal forms are discussed. Moreover, procedures and processes to develop and implement a corporate strategy are explained. Basic principles and methods of human resource management are exemplified, implying the topics determination of personnel requirements, development, acquisition, and motivation. In addition, communication and motivation are highlighted in context to human resources management. 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.

Recommendation

none

Annotation

none

Workload

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

- Business and Human Resources lecture/exercise: 45 h
- Site Management lecture: 15 h

independent study:

- preparation and follow-up lecture/exercises Business and Human Resources: 45 h
- preparation and follow-up lectures Site Management: 15 h
- examination preparation: 60 h

total: 180 h

M

5.99 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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100146	Environmentally-Friendly Recycling and Disassembly of Buildings	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

none

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

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**5.100 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	Recurrence	Language	Level	Version
6	Each winter term	German	4	3

Mandatory			
T-BGU-100621	Term Paper Upgrading of Existing Buildings and Energetic Refurbishment	1,5 CR	Lennerts
T-BGU-108001	Upgrading of Existing Buildings and Energetic Refurbishment	4,5 CR	Lennerts

Competence Certificate

- 'Teilleistung' T-BGU-100621 with examination of pther 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'

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.

Module grade calculation

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

Prerequisites

none

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

Recommendation

none

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

M**5.101 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	Recurrence	Language	Level	Version
6	Each winter term	German	4	1

Mandatory			
T-BGU-100629	Real Estate Management	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

none

Annotation

none

Workload

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

- Controlling in Real Estate Management lecture: 15 h
- Public Real Estate Management and Public Private Partnership lecture: 15 h
- Project Development lecture: 15 h
- Corporate Real Estate Management and Human Resources in Real Estate lecture: 15 h

independent study:

- preparation and follow-up lectures Controlling in Real Estate Management: 15 h
- preparation and follow-up lectures Public Real Estate Management and Public Private Partnership: 15 h
- preparation and follow-up lectures Project Development: 15 h
- preparation and follow-up lectures Corporate Real Estate Management and Human Resources in Real Estate: 15 h
- examination preparation: 60 h

total: 180 h

M

5.102 Module: Lean Construction (bauIM4S09-) [M-BGU-100104]**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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	3

Mandatory			
T-BGU-101007	Project Paper Lean Construction	1,5 CR	Haghsheno
T-BGU-108000	Lean Construction	4,5 CR	Haghsheno

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'

Competence Goal

see German version

Module grade calculation

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

Prerequisites

none

Content

see German version

Recommendation

none

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): 40 h
- examination preparation (partial exam): 50 h

total: 180 h

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

5.103 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	Recurrence	Language	Level	Version
6	Each winter term	German	4	2

Mandatory			
T-BGU-108003	Advanced Studies in Construction Engineering	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

none

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

M**5.104 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	Recurrence	Language	Level	Version
6	Each winter term	German	4	1

Mandatory			
T-BGU-100627	Decommissioning of Nuclear Facilities	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

none

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

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**5.105 Module: Facility Management in Hospitals and Hospital Management (bauM4S13-) [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	Recurrence	Language	Level	Version
6	Each winter term	German	4	2

Mandatory			
T-BGU-109291	Facility Management in Hospitals and Hospital Management	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

course Facility and Real Estate Management (6200414)

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

M

5.106 Module: Turnkey Construction (bauM4S15-) [M-BGU-100676]**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	Recurrence	Language	Level	Version
6	Each summer term	German	4	1

Mandatory			
T-BGU-101208	Turnkey Construction	6 CR	Haghsheno

Competence Certificate

- 'Teilleistung' T-BGU-101208 with written examination according to § 4 Par. 2 No. 1

details about the learning control see at the 'Teilleistung'

Competence Goal

Students are able to describe the basic technologies and design techniques in shell and finishes as well as in building services. Furthermore, they are able to apply technologies and techniques under project-specific conditions. They know the basic processes in turnkey construction.

Students know the eligibility requirements for the calculation of additional or reduced cost based on VOB/B. They are able to created, examine and avoid claims.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

In the area of turnkey projects the detailed design and basic construction services for various construction trades (e.g. drywall construction, floating screed, Facing) are discussed. Furthermore, processes of turnkey construction are explained from the beginning of the design phase till the acceptance of the work and the beginning of warranty.

In terms of claim management the course clarifies, how to create, justify, and calculate claims based on the VOB by using practical examples.

Recommendation

none

Annotation

none

Workload

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

- Turnkey Construction I - Processes and Methods lecture: 15 h
- Turnkey Construction II - Trades and Technology lecture/exercise: 30 h
- Supplementary Claim Management lecture: 15 h

independent study:

- preparation and follow-up lectures Turnkey Construction I - Processes and Methods: 15 h
- preparation and follow-up lecture/exercises Turnkey Construction II - Trades and Technology: 30 h
- preparation and follow-up lectures Supplementary Claim Management: 15 h
- examination preparation: 60 h

total: 180 h

Literature

ELWERT, Ulrich, Flassak, Alexander: Nachtragsmanagement in der Baupraxis - Grundlagen, Beispiele, Anwendung, Vieweg, 2., erw. und aktualisierte Aufl., Wiesbaden, 2008.

WÜRFELE, Falk [Hrsg.]: Nachtragsmanagement - Leistungsbeschreibung, Leistungsabweichung, Bauzeitverzögerung, Werner, Neuwied, 2006.

SCHERER, Holger: Integriertes Nachtragsmanagement - Verfahrenshandbuch für die Dokumentation von Behinderungen, Störungen und Nachtragssachverhalten auf der Grundlage der VOB, Zeittechnik-Verlag, Neu-Isenburg, 2001.

HELLER, Jörg: Sicherung der Nachtragsvergütung nach VOB und BGB, Zeittechnik-Verlag, Neu-Isenburg, 2000.

M

5.107 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**
6**Recurrence**
Each summer term**Language**
German**Level**
4**Version**
1

Mandatory			
T-BGU-108007	Building Information Modeling (BIM)	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam;

the grade of the exam is defined by the evaluation of the project report by 75% and by the evaluation of the presentation by 25%.

Prerequisites

none

Content

see German version

Recommendation

course Computer Aided Design (CAD) (6200520) course Cost Estimation (6241801) from the module Economics and Management in Construction [bauIM4P3-]

Annotation

registration procedure: see German version

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

Literature

[1] Borrman, 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-Kompendium. Building Information Modeling als neue Planungsmethode. Stuttgart: Fraunhofer IRB Verlag.

M

5.108 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	Recurrence	Language	Level	Version
6	Each term	German	4	1

Mandatory			
T-BGU-108008	Research Seminar Construction Management	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

none

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

M

5.109 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
6

Recurrence
Each term

Language
German

Level
4

Version
1

Mandatory			
T-BGU-108009	Equipment and special Construction Techniques in Building Practice	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'

Competence Goal

see German version

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

none

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

M

5.110 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	Recurrence	Language	Level	Version
6	Each winter term	German	4	1

Mandatory			
T-BGU-108941	Digitalization in Facility and Real Estate Management	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

none

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

M**5.111 Module: Theoretical Soil Mechanics (bauM5P1-THEOBM) [M-BGU-100067]**

Responsible: N.N.
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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100067	Theoretical Soil Mechanics	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

fundamentals in soil mechanics and continuum mechanics, module Basics of Numerical Modelling [bauM5P4-NUMGRUND]

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

Literature

Niemunis (2009): Über die Anwendung der Kontinuumstheorie auf bodenmechanische Probleme (download)

M**5.112 Module: Earthworks and Foundation Engineering (bauIM5P2-ERDGB) [M-BGU-100068]**

Responsible: N.N.
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	Recurrence	Duration	Language	Level	Version
6	Each winter term	1 term	German	4	2

Mandatory			
T-BGU-100068	Earthworks and Foundation Engineering	4 CR	Bieberstein, Kudella
T-BGU-100178	Student Research Project 'Earthworks and Foundation Engineering'	2 CR	Bieberstein, Kudella

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

basic knowledge of Soil Mechanics and Foundation Engineering;

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

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

Literature

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

M

5.113 Module: Rock Mechanics and Tunneling (bauIM5P3-FMTUB) [M-BGU-100069]

Responsible: N.N.
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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-100069	Rock Mechanics and Tunneling	5 CR	Mutschler, Wagner
T-BGU-100179	Student Research Project 'Rock Mechanics and Tunneling'	1 CR	Mutschler, Wagner

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

basic knowledge of Engineering Geology;

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

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

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] Goodmann, 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

5.114 Module: Basics of Numeric Modeling (bauIM5P4-NUMGRUND) [M-BGU-100070]

Responsible: N.N.
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	Recurrence	Language	Level	Version
6	Each winter term	German	4	2

Mandatory			
T-BGU-106196	Continuum Mechanics	3 CR	Franke
T-BGU-106197	Numerics in Geotechnics	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'

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.

Module grade calculation

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

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.

Content

see German version

Recommendation

course 'Introduction to Continuum Mechanics' (6200607) or similar basic knowledge

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

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] Zienkewicz 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**5.115 Module: Special Issues of Soil Mechanics (bauIM5S01-SPEZBM) [M-BGU-100005]****Responsible:** N.N.**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Subject-Specific Supplements](#)

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

Mandatory			
T-BGU-100071	Special Issues of Soil Mechanics	6 CR	Niemunis

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'

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.

Module grade calculation

grade of the module is grade of the exams

Prerequisites

none

Content

see German version

Recommendation

module Theoretical Soil Mechanics [bauIM5P1-THEOBM]

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

M**5.116 Module: Ground Investigation (bauIM5S02-BERKUND) [M-BGU-100071]****Responsible:** N.N.**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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	1

Mandatory			
T-BGU-100072	Ground Investigation	6 CR	Kudella

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

none

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

M**5.117 Module: Applied Geotechnics (bauIM5S03-ANGEOTEC) [M-BGU-100072]****Responsible:** N.N.**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	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-100073	Applied Geotechnics	6 CR	Kudella

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

module Earthworks and Foundation Engineering [bauIM5P2-ERDGB]

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

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**5.118 Module: Ground Water and Earth Dams (bauIM5S04-GWDAMM)
[M-BGU-100073]**

Responsible: N.N.
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [Subject-Specific Supplements](#)

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

Mandatory			
T-BGU-100091	Ground Water and Earth Dams	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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.

Recommendation

module Earthworks and Foundation Engineering [bauIM5P2-ERDGB]

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

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

5.119 Module: Rock Engineering and Underground Construction (bauIM5S05-FELSHOHL) [M-BGU-100074]

Responsible: N.N.
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [Subject-Specific Supplements](#)

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

Mandatory			
T-BGU-100074	Rock Engineering and Underground Construction	6 CR	Kudella

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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

see German version

Recommendation

module Rock Engineering and Tunneling [bauIM5P3-FMTUB]

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

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

**5.120 Module: Numerical Modelling in Geotechnics (bauIM5S06-
NUMMOD) [M-BGU-100075]****Responsible:** N.N.**Organisation:** KIT Department of Civil Engineering, Geo- and Environmental Sciences**Part of:** [Subject-Specific Supplements](#)

Credits	Recurrence	Duration	Language	Level	Version
6	Each summer term	1 term	German	4	2

Mandatory			
T-BGU-100107	Numerical Modelling in Geotechnics	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'

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.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

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

Recommendation

module Basics of Numeric Modelling [bauIM5P4-NUMGRUND]

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

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**5.121 Module: Geotechnical Testing and Measuring Technology (bauIM5S07-VERSMESS) [M-BGU-100076]**

Responsible: N.N.
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [Subject-Specific Supplements](#)

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

Mandatory			
T-BGU-100075	Geotechnical Testing and Measuring Technology	6 CR	Bieberstein

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'

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.

Module grade calculation

none

Prerequisites

none

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.

Recommendation

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

M**5.122 Module: Special Underground Engineering (bauIM5S08-SPEZTIEF) [M-BGU-100078]**

Responsible: N.N.
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [Subject-Specific Supplements](#)

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

Mandatory			
T-BGU-100080	Ground Improvement, Grouting and Soil Freezing	3 CR	Riegger
T-BGU-100079	Anchoring, Piling and Slurry Wall Technology	3 CR	Vogelsang

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'

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.

Module grade calculation

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

Prerequisites

none

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

Recommendation

none

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

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

5.123 Module: Environmental Geotechnics (bauIM5S09-UMGEOTEC) [M-BGU-100079]

Responsible: N.N.
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [Subject-Specific Supplements](#)

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

Mandatory			
T-BGU-100084	Landfills	3 CR	Bieberstein
T-BGU-100089	Brownfield Sites - Investigation, Evaluation, Rehabilitation	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'

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.

Module grade calculation

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

Prerequisites

none

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.

Recommendation

none

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

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**5.124 Module: Coupled Geomechanic Processes (bauIM5S10-GEKOPPRO) [M-BGU-100077]**

Responsible: N.N.
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [Subject-Specific Supplements](#)

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

Mandatory			
T-BGU-100085	Coupled Geomechanic Processes	6 CR	N.N.

Competence Certificate

- 'Teilleistung' T-BGU-100085 with oral examination according to § 4 Par. 2 No. 2
 details about the learning control see at the 'Teilleistung'

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, chemomechanical, thermomechanical and biomechanical processes and to express mathematically their interdependence with mechanical properties.

Module grade calculation

grade of the module is grade of the exam

Prerequisites

none

Content

The module takes into account unconsolidated and hard rock as multiphase systems, in which mechanical processes takes 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, moisture conditions, solute transport, internal erosion, climatic influence of precipitation and freeze-thaw changes as well as influences of bacteria and flora.

Recommendation

module Rock Engineering and Tunneling [bauIM5P3-FMTUB]

Annotation**IMPORTANT:**

The module will not be offered in winter term 2019/20.

Workload

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

- Special Issues in Rock Mechanics lecture/exercise: 30 h
- Coupled Phenomena in Geomechanics lecture/exercise: 30 h

independent study:

- preparation and follow-up lecture/exercises Special Issues in Rock Mechanics: 30 h
- preparation and follow-up lecture/exercises Coupled Phenomena in Geomechanics: 30 h
- examination preparation: 60 h

total: 180 h

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/hoeks_corner)

M

5.125 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	Recurrence	Language	Level	Version
30	Each term	German/English	5	1

Mandatory			
T-BGU-110135	Master Thesis	30 CR	Vortisch

Competence Certificate

thesis and final presentation according to § 14 ER/SPO

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.

Module grade calculation

The grade of the module results from the evaluation of the Master Thesis and the final presentation.

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-JEQUAL] cannot be counted for this purpose.

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.

Recommendation

All technical skills and soft skills required for working on the selected topic and the preparation of the thesis should be attained.

Annotation

Information about the procedure regarding admission and registration of the Master Thesis see chap. 2.8.

Workload

- working on thesis project: 720 h
- thesis writing: 150 h.
- preparation of presentation: 30 h

total: 900 h

M**5.126 Module: Interdisciplinary Qualifications (bauimW0-UEQUAL) [M-BGU-103927]**

Responsible: Prof. Dr.-Ing. Peter Vortisch
Organisation: University
Part of: [Interdisciplinary Qualifications](#)

Credits	Recurrence	Language	Level	Version
6	Each term	German	4	1

Election block: Interdisciplinary Qualifications (at least 6 credits)			
T-BGU-106765	Introduction to Matlab	3 CR	Ehret
T-BGU-108027	Wildcard	1 CR	

Competence Certificate

according to elected courses, freely be chosen from the course catalogue for Interdisciplinary Qualifications of HoC and ZAK

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.

Module grade calculation

not graded

Prerequisites

none

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 (<http://www.hoc.kit.edu/lehrangebot.php>) and ZAK (http://www.zak.kit.edu/english/general_studies.php).

Recommendation

none

Annotation

The mentor can recognize, if applicable in consultation with the Examination Committee, further suitable courses as interdisciplinary qualifications which are not listed in the mentioned offers of Hoc and ZAK. If the Examination Committee accepted the recognition of a course in principle, online registration to the respective examination is possible. Language courses of the 'Sprachenzentrum' (SpZ) are usually recognized. Further information about the Interdisciplinary Qualifications see Sect. 2.3.

Workload

see course description of HoC, and lecture descriptions of ZAK

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	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6221701	Advanced Fluid Mechanics	4 SWS	Lecture / Practice (VÜ)	Eiff

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	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
WS 19/20	6241903	Tunnelbau und Sprengtechnik	2 SWS	Lecture (V)	Haghsheno, Scheuble, Matz
WS 19/20	6241904	Tiefbau	1 SWS	Lecture (V)	Haghsheno, Schneider
WS 19/20	6241905	Erdbau	1 SWS	Lecture (V)	Haghsheno, Mitarbeiter/innen

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.3 Course: Analysis and Evolution of Mobility [T-BGU-101004]

Responsible: 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6232901	Empirische Daten im Verkehrswesen	2 SWS	Lecture / Practice (VÜ)	Kagerbauer
SS 2020	6232811	Mobilitätsservices und neue Formen der Mobilität	2 SWS	Lecture / Practice (VÜ)	Kagerbauer

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.4 Course: Anchorage in Concrete [T-BGU-100022]

Responsible: Prof. Dr. Werner Fuchs
Prof. Dr.-Ing. Lothar Stempniewski

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

Part of: [M-BGU-100001 - Anchorage in Concrete](#)

Type	Credits	Recurrence	Version
Oral examination	3	Each term	2

Events					
WS 19/20	6211905	Befestigungstechnik II	1 SWS	Lecture (V)	Fuchs
WS 19/20	6211906	Übungen zu Befestigungstechnik II	1 SWS	Practice (Ü)	Fuchs, Rizzo
SS 2020	6211807	Befestigungstechnik I	1 SWS	Lecture (V)	Fuchs
SS 2020	6211808	Übungen zu Befestigungstechnik I	1 SWS	Practice (Ü)	Fuchs

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: Jakob Vogelsang

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

Part of: [M-BGU-100078 - Special Underground Engineering](#)

Type	Credits	Recurrence	Version
Oral examination	3	Each term	1

Events					
SS 2020	6251822	Anchoring, Piling and Slurry Wall Technology	2 SWS	Lecture / Practice (VÜ)	Vogelsang

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	Credits	Recurrence	Version
Oral examination	3	Each term	3

Events					
WS 19/20	6211909	Angewandte Bauphysik	2 SWS	Lecture (V)	Kotan, Vogel, Dehn

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. Lothar Stempniewski
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100038 - Applied Dynamics of Structures](#)

Type	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6211903	Erdbebeningenieurwesen	1 SWS	Lecture (V)	Stempniewski
WS 19/20	6211904	Übungen zu Erdbebeningenieurwesen	1 SWS	Practice (Ü)	Sedlmair
SS 2020	6211805	Praktische Baudynamik	1 SWS	Lecture (V)	Stempniewski
SS 2020	6211806	Übungen zu Praktische Baudynamik	1 SWS	Practice (Ü)	Kohm

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.8 Course: Applied Ecology and Water Quality [T-BGU-109956]

Responsible: 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	Recurrence	Version
Examination of another type	3	Each summer term	1

Events					
SS 2020	6223813	Applied Ecology and Water Quality	3 SWS	Seminar (S)	Fuchs, Hilgert

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 20 persons. The registration is to be made via ILIAS. The places are allocated with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoecology* and further study programs. The allocation is made by consideration of the semester and the time of entry of the registration. 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: Dr.-Ing. Peter Kudella
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100072 - Applied Geotechnics](#)

Type	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6251810	Foundations and Retaining Structures	2 SWS	Lecture / Practice (VÜ)	Kudella
SS 2020	6251812	Special Foundation Engineering and Design	2 SWS	Lecture / Practice (VÜ)	Kudella

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.10 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	Credits	Recurrence	Version
Oral examination	5	Each term	2

Events					
WS 19/20	6215901	Grundlagen Finite Elemente	2 SWS	Lecture (V)	Betsch
WS 19/20	6215902	Übungen zu Grundlagen Finite Elemente	2 SWS	Practice (Ü)	Schneider

Competence Certificate
 oral exam, appr. 30 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.11 Course: Basics of Prestressed Concrete [T-BGU-100019]

Responsible: Prof. Dr.-Ing. Lothar Stempniewski
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100036 - Basics of Prestressed Concrete](#)

Type	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6211803	Grundlagen des Spannbetons	2 SWS	Lecture (V)	Stempniewski
SS 2020	6211804	Übungen zu Grundlagen des Spannbetons	2 SWS	Practice (Ü)	Manny

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.12 Course: Bracing and Stability in Reinforced Concrete [T-BGU-100018]

Responsible: Prof. Dr.-Ing. Lothar Stempniewski
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100003 - Bracing and Stability in Reinforced Concrete](#)

Type	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6211801	Aussteifung und Stabilität im Stahlbetonbau	2 SWS	Lecture (V)	Stempniewski
SS 2020	6211802	Übungen zu Aussteifung und Stabilität im Stahlbetonbau	2 SWS	Practice (Ü)	Kohns

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.13 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	Credits	Recurrence	Version
Oral examination	3	Each winter term	1

Events					
WS 19/20	6251915	Brownfield Sites - Investigation, Evaluation, Rehabilitation	2 SWS	Lecture (V)	Bieberstein, Eiche, Würdemann, Mohrlök

Competence Certificate

oral exam, appr. 20 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.14 Course: Building and Environmental Aerodynamics [T-BGU-103563]

Responsible: Dr.-Ing. Christof-Bernhard Gromke
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-103897 - Interaction Flow - Building Structure](#)

Type	Credits	Recurrence	Version
Oral examination	3	Each term	1

Events					
WS 19/20	6221905	Gebäude- und Umweltaerodynamik	2 SWS	Lecture / Practice (VÜ)	Gromke

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.15 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	Recurrence	Version
Examination of another type	6	Each summer term	1

Events					
SS 2020	6241812	Building Information Modeling	4 SWS	Lecture / Practice (VÜ)	Haghsheno

Competence Certificate

project report appr. 10 pages and presentation appr. 10 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.16 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-105373 - Building Preservation and Innovations in Metal and Lightweight Structures](#)

Type	Credits	Recurrence	Expansion	Version
Written examination	3	Each term	1 terms	1

Competence Certificate
written exam, 60 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.17 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-105374 - Building Preservation and Innovations in Timber Structures](#)

Type	Credits	Recurrence	Expansion	Version
Written examination	3	Each term	1 terms	1

Competence Certificate

written exam, 60 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.18 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	Credits	Recurrence	Version
Oral examination	5	Each term	2

Events					
SS 2020	6211811	Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions	2 SWS	Lecture (V)	Kotan
SS 2020	6211812	Exercises to Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions	1 SWS	Practice (Ü)	Kotan
SS 2020	6211813	Building Analysis	1 SWS	Lecture (V)	Kotan, Vogel

Competence Certificate

oral exam, appr. 30 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.19 Course: Building Preservation of Steel and Timber Structures [T-BGU-100027]

Responsible: Dr.-Ing. Matthias Frese
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](#)

Type	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
WS 19/20	6212909	Bauwerkserhaltung im Stahlbau	2 SWS	Lecture (V)	Ummenhofer, Damm
WS 19/20	6213903	Bauwerkserhaltung im Holzbau	2 SWS	Lecture / Practice (VÜ)	Frese, Mitarbeiter/innen

Competence Certificate

written exam, 90 min. (45 min. for each course)

Prerequisites

none

Recommendation

none

Annotation

none

T

6.20 Course: Building Technology [T-BGU-100040]

Responsible: Dr.-Ing.habil Stefan Wirth
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-103950 - Building Physics I](#)

Type	Credits	Recurrence	Version
Oral examination	3	Each term	2

Events					
WS 19/20	6211910	Gebäudetechnik	2 SWS	Lecture (V)	Wirth

Competence Certificate
 oral exam, appr. 20 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.21 Course: Business and Human Resource Management [T-BGU-108002]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100111 - Business and Human Resource Management](#)

Type	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6241805	Unternehmensführung im Bauwesen	3 SWS	Lecture / Practice (VÜ)	Haghsheno, Eschen
SS 2020	6241807	Bauleitung	1 SWS	Lecture (V)	Steffek

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.22 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	Credits	Recurrence	Version
Oral examination	4	Each term	2

Events					
WS 19/20	6233909	Innerstädtische Verkehrsanlagen	4 SWS	Lecture / Practice (VÜ)	Roos, Zimmermann

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

6.23 Course: Computational Analysis of Structures [T-BGU-100031]

Responsible: Prof. Dr.-Ing. Werner Wagner
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100047 - Computational Analysis of Structures](#)

Type	Credits	Recurrence	Version
Oral examination	4	Each term	3

Events					
SS 2020	6214801	Computational Analysis of Structures	2 SWS	Lecture (V)	Wagner
SS 2020	6214802	Exercises to Computational Analysis of Structures	2 SWS	Practice (Ü)	Weber

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

6.24 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6215810	Numerische Strukturdynamik	4 SWS	Lecture / Practice (VÜ)	Betsch, Ströhle

Competence Certificate
 oral exam, appr. 30 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.25 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6211914	Betontechnologie	3 SWS	Lecture / Practice (VÜ)	Dehn, Kvitsel
WS 19/20	6211915	Verformungs- und Bruchprozesse	1 SWS	Lecture (V)	Dehn, Kotan

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.26 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	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6212805	Stahl- und Verbundbrückenbau	2 SWS	Lecture (V)	Ummenhofer
SS 2020	6212806	Übungen zu Stahl- und Verbundbrückenbau	2 SWS	Practice (Ü)	Boretzki

Competence Certificate

oral exam, 60 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.27 Course: Contact Mechanics [T-BGU-109947]

Responsible: Marlon Franke
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-104916 - Contact Mechanics](#)

Type	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6215909	Contact Mechanics	2 SWS	Lecture (V)	Konyukhov, Franke
WS 19/20	6215910	Exercises Contact Mechanic	2 SWS	Practice (Ü)	Konyukhov, Franke

Competence Certificate
 oral exam, appr. 30 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.28 Course: Continuum Mechanics [T-BGU-106196]

Responsible: 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	Credits	Recurrence	Version
Oral examination	3	Each term	1

Events					
WS 19/20	6215702	Kontinuumsmechanik	2 SWS	Lecture (V)	Franke

Competence Certificate
 oral exam, appr. 30 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.29 Course: Coupled Geomechanic Processes [T-BGU-100085]

Responsible: N.N.
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100077 - Coupled Geomechanic Processes](#)

Type	Credits	Recurrence	Version
Oral examination	6	Each term	1

Competence Certificate

oral exam, appr. 40 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.30 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6243901	Demontage und Dekontamination von kerntechnischen Anlagen	2 SWS	Lecture / Practice (VÜ)	Gentes, Mitarbeiter/innen
WS 19/20	6243903	Neuentwicklungen und Optimierungen in der Maschinenteknik der Demontage und des Rückbaus	2 SWS	Lecture / Practice (VÜ)	Gentes, Mitarbeiter/innen

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
keine

Recommendation
none

Annotation
none

T

6.31 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	Recurrence	Expansion	Version
Examination of another type	6	Each term	1 terms	1

Competence Certificate

structure and construction proposal, report appr. 20 pages, colloquium appr. 30 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.32 Course: Design and Construction of Components in Reinforced Concrete [T-BGU-100015]

Responsible: Prof. Dr.-Ing. Lothar Stempniewski

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	Recurrence	Version
Written examination	4	Each term	2

Events					
WS 19/20	6211701	Bemessung und Konstruktion von Bauteilen im Stahlbeton	2 SWS	Lecture (V)	Stempniewski
WS 19/20	6211702	Übungen zu Bemessung und Konstruktion von Bauteilen im Stahlbeton	2 SWS	Practice (Ü)	Rizzo

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.33 Course: Digital Planning and Building Information Modeling [T-BGU-110382]

Responsible: Dr.-Ing. 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	Recurrence	Expansion	Version
Examination of another type	6	Each winter term	1 terms	1

Events					
WS 19/20	6212912	Digital Planning and Building Information Modeling	4 SWS	Lecture / Practice (VÜ)	Zinke

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

6.34 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	Recurrence	Version
Examination of another type	6	Each term	1

Events					
WS 19/20	6242907	Digitization in Facility- and Real Estate Management	4 SWS	Lecture / Practice (VÜ)	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

6.35 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6211907	Korrosive Prozesse und Lebensdauer	3 SWS	Lecture / Practice (VÜ)	Vogel, Dehn
WS 19/20	6211908	Analytische Verfahren	1 SWS	Practice (Ü)	Vogel

Competence Certificate
 oral exam, appr. 30 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.36 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	Credits	Recurrence	Version
Written examination	2	Each term	2

Events					
WS 19/20	6215701	Baudynamik	2 SWS	Lecture (V)	Franke

Competence Certificate
written exam, 60 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.37 Course: Earthworks and Foundation Engineering [T-BGU-100068]

Responsible: Dr.-Ing. Andreas Bieberstein
Dr.-Ing. Peter Kudella

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

Part of: [M-BGU-100068 - Earthworks and Foundation Engineering](#)

Type	Credits	Recurrence	Version
Written examination	4	Each term	2

Events					
WS 19/20	6251701	Foundation Types	2 SWS	Lecture / Practice (VÜ)	N.N.
WS 19/20	6251703	Basics in Earthworks and Embankment Dams	2 SWS	Lecture / Practice (VÜ)	Bieberstein

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

preparation of the student research project for examination preparation

Annotation

none

T

6.38 Course: Economics and Management in Construction [T-BGU-100143]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100102 - Economics and Management in Construction](#)

Type	Credits	Recurrence	Version
Written examination	5	Each term	2

Events					
SS 2020	6241801	Kalkulation	2 SWS	Lecture / Practice (VÜ)	Haghsheno
SS 2020	6241803	Baurecht	2 SWS	Lecture (V)	Miernik, Kohlhammer

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.39 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	Recurrence	Version
Examination of another type	6	Each term	2

Events					
WS 19/20	6224905	Umweltkommunikation / Environmental Communication	2 SWS	Seminar (S)	Kämpf
SS 2020	6224905	Environmental Communication	2 SWS	Seminar (S)	Kämpf

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

6.40 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	Credits	Recurrence	Version
Written examination	6	Each winter term	1

Events					
WS 19/20	6221909	Environmental Fluid Mechanics	4 SWS	Lecture / Practice (VÜ)	Eiff

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.41 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6243801	Projektstudien	2 SWS	Lecture / Practice (VÜ)	Hauptenthal, Gentes
SS 2020	6243803	Verfahrenstechniken der Demontage	2 SWS	Lecture / Practice (VÜ)	Gentes

Competence Certificate

oral exam, appr. 30 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.42 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6243905	Geräte und spezielle Verfahren in der Baupraxis II	2 SWS	Lecture (V)	Gentes, Schneider
SS 2020	6241815	Geräte und spezielle Verfahren in der Baupraxis I	2 SWS	Lecture (V)	Gentes, Mitarbeiter/innen

Competence Certificate

oral exam, appr. 45 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.43 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	Recurrence	Version
Completed coursework	0	Each summer term	1

Events					
WS 19/20	6224905	Umweltkommunikation / Environmental Communication	2 SWS	Seminar (S)	Kämpf
SS 2020	6224905	Environmental Communication	2 SWS	Seminar (S)	Kämpf

Competence Certificate

2 literature annotations, appr. 150 words each, and short presentation, appr. 10 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.44 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	Credits	Recurrence	Expansion	Version
Completed coursework	2	Each winter term	1 terms	1

Events					
WS 19/20	6233909	Innerstädtische Verkehrsanlagen	4 SWS	Lecture / Practice (VÜ)	Roos, Zimmermann

Competence Certificate

1 report approx. 5 pages and 3 planning documents

Prerequisites

none

Recommendation

none

Annotation

none

T

6.45 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	Recurrence	Version
Examination of another type	3	Each winter term	1

Events					
WS 19/20	6222907	Experimental Hydraulics II	2 SWS	Lecture / Practice (VÜ)	Nestmann, Seidel

Competence Certificate
term paper, appr. 10 pages

Prerequisites
none

Recommendation
none

Annotation
none

T

6.46 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	Recurrence	Version
Examination of another type	6	Each summer term	2

Events					
SS 2020	6221802	Experiments in Fluid Mechanics	4 SWS	Lecture / Practice (VÜ)	Eiff, Mitarbeiter/innen

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

6.47 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	Recurrence	Expansion	Version
Examination of another type	6	Each winter term	1 terms	1

Events					
WS 19/20	6242905	Facility Management in Hospitals	3 SWS	Lecture / Practice (VÜ)	Lennerts, Mitarbeiter/innen
WS 19/20	6242906	Facility Management in Hospitals	1 SWS	Lecture (V)	Lennerts, Mitarbeiter/innen

Competence Certificate

term paper appr. 10 pages, with final presentation appr. 10 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.48 Course: FE-Applications in Practical Engineering [T-BGU-100032]

Responsible: Prof. Dr.-Ing. Werner Wagner
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100048 - FE-Applications in Practical Engineering](#)

Type	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6214803	FE-Applications in Practical Engineering	2 SWS	Lecture (V)	Wagner
SS 2020	6214804	Übungen zu FE-Anwendung in der Baupraxis	2 SWS	Practice (Ü)	Geiger

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.49 Course: Field Training Water Quality [T-BGU-109957]

Responsible: 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	Recurrence	Version
Examination of another type	3	Each summer term	1

Events					
SS 2020	6223814	Field Training Water Quality	1 SWS	Practice (Ü)	Fuchs, Hilgert

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 20 persons. The registration is to be made via ILIAS. The places are allocated with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoecology* and further study programs. The allocation is made by consideration of the semester and the time of entry of the registration. 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

6.50 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6215808	Finite Elemente in der Festkörpermechanik	2 SWS	Lecture (V)	Franke
SS 2020	6215809	Übungen zu Finite Elemente in der Festkörpermechanik	2 SWS	Practice (Ü)	Schneider

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.51 Course: Flow and Sediment Dynamics in Rivers [T-BGU-108467]

Responsible: Prof. Dr. Franz Nestmann
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-104083 - Flow and Sediment Dynamics in Rivers](#)

Type	Credits	Recurrence	Version
Oral examination	4	Each term	2

Events					
SS 2020	6222805	Morphodynamics	2 SWS	Lecture / Practice (VÜ)	Nestmann
SS 2020	6222807	Flow Behavior of Rivers	2 SWS	Lecture / Practice (VÜ)	Seidel, Eiff, Dupuis

Competence Certificate

oral exam, appr. 30 min.

Prerequisites

The accomplishment 'Seminar Paper Flow Behavior of Rivers' (T-BGU-108466) has to be passed.

Modeled Conditions

The following conditions have to be fulfilled:

1. The course [T-BGU-108466 - Seminar Paper 'Flow Behavior of Rivers'](#) must have been passed.

Recommendation

none

Annotation

none

T

6.52 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	Recurrence	Expansion	Version
Oral examination	3	Each term	1 terms	1

Events					
WS 19/20	6221907	Flow Measurement Techniques	2 SWS	Lecture / Practice (VÜ)	Gromke

Competence Certificate

oral exam, appr. 30 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.53 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6221806	Fluid Mechanics of Turbulent Flows	4 SWS	Lecture / Practice (VÜ)	Uhlmann

Competence Certificate
oral exam, appr. 45 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.54 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6215903	Bruch- und Schädigungsmechanik	2 SWS	Lecture (V)	Seelig
SS 2020	6215904	Übungen zu Bruch- und Schädigungsmechanik	2 SWS	Practice (Ü)	Laschütza

Competence Certificate
oral exam, appr. 45 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.55 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	Credits	Recurrence	Version
Written examination	3	Each term	2

Events					
SS 2020	6232809	Güterverkehr	2 SWS	Lecture / Practice (VÜ)	Chlond

Competence Certificate

written exam, 60 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.56 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6224805	Geostatistics	4 SWS	Lecture / Practice (VÜ)	Zehe, Ehret, Mälicke

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.57 Course: Geotechnical Testing and Measuring Technology [T-BGU-100075]

Responsible: Dr.-Ing. Andreas Bieberstein

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

Part of: [M-BGU-100076 - Geotechnical Testing and Measuring Technology](#)

Type	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6251909	Rock Testing	1 SWS	Lecture (V)	N.N.
WS 19/20	6251910	Testing in Dam and Wastefill Engineering	1 SWS	Lecture (V)	Bieberstein
WS 19/20	6251911	Geotechnical Measuring Technology	2 SWS	Lecture / Practice (VÜ)	Huber

Competence Certificate

oral exam, appr. 40 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.58 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6212905	Glas-, Kunststoff- und Seiltragwerke	3 SWS	Lecture (V)	Ruff
WS 19/20	6212906	Übungen zu Glas-, Kunststoff- und Seiltragwerke	1 SWS	Practice (Ü)	Ruff

Competence Certificate

oral exam, appr. 30 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.59 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	Credits	Recurrence	Version
Oral examination	3	Each term	1

Events					
SS 2020	6251820	Ground Improvement, Grouting and Soil Freezing	2 SWS	Lecture / Practice (VÜ)	Riegger

Competence Certificate
oral exam, appr. 20 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.60 Course: Ground Investigation [T-BGU-100072]

Responsible: Dr.-Ing. Peter Kudella
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100071 - Ground Investigation](#)

Type	Credits	Recurrence	Version
Oral examination	6	Each summer term	1

Events					
SS 2020	6251808	Soil Mechanical Laboratory Exercises	2 SWS	Practice (Ü)	Reith, Kudella
SS 2020	6251809	Geomechanical Field Exercise	2 SWS	Practice (Ü)	Reith, Kudella

Competence Certificate
 oral exam, appr. 40 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.61 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6251814	Geotechnical Ground Water Problems	2 SWS	Lecture / Practice (VÜ)	Bieberstein
SS 2020	6251816	Embankment Dams (Advanced)	2 SWS	Lecture / Practice (VÜ)	Bieberstein

Competence Certificate

oral exam, appr. 40 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.62 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	Credits	Recurrence	Version
Oral examination	3	Each term	1

Events					
SS 2020	6221815	Groundwater Flow around Structures	2 SWS	Lecture / Practice (VÜ)	Trevisan

Competence Certificate

oral exam, appr. 30 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.63 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	Credits	Recurrence	Version
Oral examination	3	Each term	1

Events					
SS 2020	6221801	Groundwater Hydraulics	2 SWS	Lecture / Practice (VÜ)	Mohrlök

Competence Certificate
 oral exam, appr. 20 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.64 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	Credits	Recurrence	Expansion	Version
Completed coursework	5	Each winter term	1 terms	1

Events					
WS 19/20	6230901	Projekt Integriertes Planen	4 SWS	Project (PRO)	Roos, Zimmermann, Chlond

Competence Certificate

integrated term paper of the whole group and 2 presentations of the result

Prerequisites

none

Recommendation

none

Annotation

none

T

6.65 Course: Group Exercise Project Management in Construction and Real Estate Industry [T-BGU-101006]

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	Recurrence	Version
Completed coursework	1	Each winter term	2

Events					
WS 19/20	6241701	Projektmanagement in der Bau- und Immobilienwirtschaft	4 SWS	Lecture / Practice (VÜ)	Haghsheno, Hirschberger, Sittinger, Münzl

Competence Certificate

term paper, appr. 10 pages

Prerequisites

none

Recommendation

none

Annotation

none

T

6.66 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	Recurrence	Version
Oral examination	4	Each term	2

Events					
WS 19/20	6233901	DV-gestützter Straßenentwurf	2 SWS	Lecture / Practice (VÜ)	Zimmermann
WS 19/20	6233903	Projektstudie Außerortsstraße	2 SWS	Lecture / Practice (VÜ)	Zimmermann, Roos

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

6.67 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	Credits	Recurrence	Version
Written examination	3	Each term	2

Events					
SS 2020	6328016	Städtebau I: Städtebaugeschichte	2 SWS	Lecture (V)	Vogt, Ross

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.68 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6212903	Hohlprofilkonstruktionen	2 SWS	Lecture (V)	Herion
WS 19/20	6212904	Übungen zu Hohlprofilkonstruktionen	2 SWS	Practice (Ü)	Herion

Competence Certificate
 oral exam, appr. 30 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.69 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	Recurrence	Version
Completed coursework	1	Each winter term	1

Events					
WS 19/20	6215901	Grundlagen Finite Elemente	2 SWS	Lecture (V)	Betsch
WS 19/20	6215902	Übungen zu Grundlagen Finite Elemente	2 SWS	Practice (Ü)	Schneider

Competence Certificate

processing of two exercise sheets

Prerequisites

none

Recommendation

none

Annotation

none

T

6.70 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	Recurrence	Version
Completed coursework	2	Each winter term	1

Events					
WS 19/20	6224908	Introduction to Environmental Data Analysis and Statistical Learning	4 SWS	Lecture / Practice (VÜ)	Ehret

Competence Certificate

course associated assignments, short reports appr. 1 page each

Prerequisites

none

Recommendation

none

Annotation

none

T

6.71 Course: Homework 'Practical Noise Control' [T-BGU-109946]

Responsible: Dr.-Ing. Reiner Grigo
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100060 - Building Physics II](#)

Type	Credits	Recurrence	Version
Examination of another type	1	Each summer term	1

Events					
SS 2020	6211814	Practical Noise Control	2 SWS	Lecture (V)	Grigo, Grunau

Competence Certificate

2 short reports, appr. 5 pages each

Prerequisites

none

Recommendation

none

Annotation

none

T

6.72 Course: Hydraulic Engineering [T-BGU-106759]

Responsible: Prof. Dr. Franz Nestmann
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-103376 - Hydraulic Engineering](#)

Type	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6222701	Multiphase Flow in Hydraulic Engineering	2 SWS	Lecture / Practice (VÜ)	Nestmann
SS 2020	6222703	Design of Hydraulic Structures	2 SWS	Lecture / Practice (VÜ)	Nestmann

Competence Certificate

written exam, 75 min.

Prerequisites

none

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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6222801	Hydro Power Engineering	4 SWS	Lecture / Practice (VÜ)	Oberle

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	Recurrence	Version
Examination of another type	6	Each summer term	1

Events					
SS 2020	6224807	Hydrological Measurements in Environmental Systems	4 SWS		Wienhöfer, Mitarbeiter/innen

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

none

T

6.75 Course: Industrial Water Management [T-BGU-108448]

Responsible: Dr.-Ing. Tobias Morck
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-104073 - Industrial Water Management](#)

Type	Credits	Recurrence	Version
Oral examination	5	Each term	2

Events					
SS 2020	6223810	Industrial Water Management	4 SWS	Lecture / Practice (VÜ)	Morck

Competence Certificate

oral exam, appr. 30 min.

Prerequisites

Lab report 'Industrial Water Management' has to bve passed.

Modeled Conditions

The following conditions have to be fulfilled:

1. The course [T-BGU-109980 - Lab report 'Industrial Water Management'](#) must have been passed.

Recommendation

none

Annotation

none

T

6.76 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	Recurrence	Version
Examination of another type	3	Each summer term	1

Competence Certificate

lecture accompanying exercises, appr. 5 pieces

Prerequisites

none

Recommendation

none

Annotation

none

T

6.77 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	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6233801	Entwurf und Bau von Straßen	2 SWS	Lecture (V)	Roos
SS 2020	6233802	Betrieb und Erhaltung von Straßen	2 SWS	Lecture (V)	Roos

Competence Certificate

written exam, 120 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.78 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	Recurrence	Expansion	Version
Oral examination	3	Each term	1 terms	1

Competence Certificate

oral exam, appr. 30 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.79 Course: Innovations and Developments in Timber Structures [T-BGU-110855]

Responsible: Dr. Carmen Sandhaas

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	Recurrence	Expansion	Version
Oral examination	3	Each term	1 terms	1

Competence Certificate

oral exam, appr. 30 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-103897 - Interaction Flow - Building Structure](#)

Type	Credits	Recurrence	Expansion	Version
Written examination	3	Each term	1 terms	1

Events					
WS 19/20	6221903	Interaction Flow - Hydraulic Structures	2 SWS	Lecture / Practice (VÜ)	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	Credits	Recurrence	Version
Written examination	4	Each term	1

Events					
WS 19/20	6224908	Introduction to Environmental Data Analysis and Statistical Learning	4 SWS	Lecture / Practice (VÜ)	Ehret

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	Recurrence	Version
Completed coursework	3	Each winter term	1

Events					
WS 19/20	6224907	Introduction to Matlab	2 SWS	Lecture / Practice (VÜ)	Ehret, Wienhöfer

Competence Certificate

implementation of a Matlab code with report, appr. 1 page

Prerequisites

none

Recommendation

none

Annotation

none

T

6.83 Course: Lab report 'Industrial Water Management' [T-BGU-109980]

Responsible: Dr.-Ing. Tobias Morck
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-104073 - Industrial Water Management](#)

Type	Credits	Recurrence	Version
Completed coursework	1	Each summer term	1

Events					
SS 2020	6223810	Industrial Water Management	4 SWS	Lecture / Practice (VÜ)	Morck

Competence Certificate

report on laboratory work, appr. 10 pages, as examination prerequisite

Prerequisites

none

Recommendation

none

Annotation

none

T

6.84 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	Credits	Recurrence	Version
Oral examination	3	Each winter term	1

Events					
WS 19/20	6251913	Landfills	2 SWS	Lecture / Practice (VÜ)	Bieberstein

Competence Certificate
 oral exam, appr. 20 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.85 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	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6232801	Bewertungs- und Entscheidungsverfahren	1 SWS	Lecture (V)	Chlond
SS 2020	6233803	Verkehrs-, Planungs- und Wegerecht	2 SWS	Lecture (V)	Hönig
SS 2020	6233804	Umweltverträglichkeitsstudien im Straßenwesen	1 SWS	Lecture (V)	Roos

Competence Certificate

written exam, 120 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	Credits	Recurrence	Version
Written examination	4,5	Each term	1

Events					
WS 19/20	6241901	Lean Construction	4 SWS	Lecture / Practice (VÜ)	Haghsheno, Mitarbeiter/innen

Competence Certificate

written exam, 70 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.87 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	Credits	Recurrence	Version
Written examination	3	Each term	1

Events					
WS 19/20	6232904	Fern- und Luftverkehr	2 SWS	Lecture (V)	Chlond, Dozenten

Competence Certificate

written exam, 60 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.88 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	Credits	Recurrence	Version
Written examination	5	Each term	2

Events					
WS 19/20	6241703	Verfahrenstechnik	2 SWS	Lecture (V)	Schneider, Schlick
WS 19/20	6243701	Maschinentchnik	2 SWS	Lecture (V)	Gentes, Dörfler

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.89 Course: Management of Water Resources and River Basins [T-BGU-106597]

Responsible: Dr.-Ing. Uwe Ehret

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

Part of: [M-BGU-103364 - Management of Water Resources and River Basins](#)

Type	Credits	Recurrence	Version
Examination of another type	6	Each summer term	1

Events					
SS 2020	6224801	Management of Water Resources and River Basins	4 SWS	Lecture / Practice (VÜ)	Ehret

Competence Certificate

course associated assignments, short reports appr. 2 pages each, and final take home exam, report appr. 10 pages and colloquium

Prerequisites

none

Recommendation

none

Annotation

none

T

6.90 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	Recurrence	Version
Final Thesis	30	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. 2.8.

T

6.91 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6215801	Anwendungsorientierte Materialtheorien	2 SWS	Lecture (V)	Seelig
WS 19/20	6215802	Übungen zu Anwendungsorientierte Materialtheorien	2 SWS	Practice (Ü)	Mitarbeiter/innen

Competence Certificate
 oral exam, appr. 45 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.92 Course: Material Science, Welding and Fatigue [T-BGU-100023]

Responsible: Dr. Peter Knödel
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100039 - Material Science, Welding and Fatigue](#)

Type	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6212803	Stahlwerkstoffe, Schweißtechnik und Ermüdung	4 SWS	Lecture / Practice (VÜ)	Knödel, Seyfried

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.93 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6211911	Messverfahren im konstruktiven Ingenieurbau	1 SWS	Lecture (V)	Herrmann, Dehn
WS 19/20	6211912	Übungen zu Messverfahren im konstruktiven Ingenieurbau	1 SWS	Practice (Ü)	Herrmann
WS 19/20	6211913	Materialprüfung im Stahlbetonbau	2 SWS	Lecture (V)	Herrmann, Dehn

Competence Certificate

oral exam, appr. 30 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.94 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	Credits	Recurrence	Version
Oral examination	3	Each term	1

Events					
SS 2020	6215805	Mechanik heterogener Festkörper	2 SWS	Lecture (V)	Seelig, Hund

Competence Certificate

oral exam, appr. 20 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.95 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	Recurrence	Expansion	Version
Oral examination	6	Each term	1 terms	1

Competence Certificate
oral exam, appr. 45 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.96 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6215807	Modellbildung in der Festigkeitslehre	4 SWS	Lecture / Practice (VÜ)	Konyukhov

Competence Certificate

oral exam, appr. 30 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.97 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6232701	Berechnungsverfahren und Modelle in der Verkehrsplanung	2 SWS	Lecture / Practice (VÜ)	Vortisch, Mitarbeiter/innen
WS 19/20	6232703	Straßenverkehrstechnik	2 SWS	Lecture / Practice (VÜ)	Vortisch, Mitarbeiter/innen

Competence Certificate

oral exam, appr. 20 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.98 Course: Non-linear Analysis of Beam Structures [T-BGU-100030]

Responsible: Prof. Dr.-Ing. Werner Wagner
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100046 - Non-linear Analysis of Beam Structures](#)

Type	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
WS 19/20	6214702	Non-linear Analysis of Beam Structures	2 SWS	Lecture (V)	Keller
WS 19/20	6214703	Exercises to Non-linear Analysis of Beam Structures	2 SWS	Practice (Ü)	Keller

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.99 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6214903	Non-linear Analysis of Surface Structures	2 SWS	Lecture (V)	Wagner
WS 19/20	6214904	Übungen zu Nichtlineare Modellierung von Flächentragwerken	2 SWS	Practice (Ü)	Fina

Competence Certificate
oral exam, appr. 3 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.100 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6222903	Numerische Strömungsmodellierung im Wasserbau	4 SWS	Lecture / Practice (VÜ)	Oberle

Competence Certificate

oral exam, appr. 20 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.101 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	Credits	Recurrence	Version
Written examination	6	Each term	2

Events					
WS 19/20	6221702	Numerical Fluid Mechanics I	4 SWS	Lecture / Practice (VÜ)	Uhlmann

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.102 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	Credits	Recurrence	Version
Oral examination	3	Each term	1

Events					
SS 2020	6221809	Numerical Fluid Mechanics II	2 SWS	Lecture / Practice (VÜ)	Uhlmann

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

6.103 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	Recurrence	Version
Examination of another type	3	Each winter term	1

Events					
WS 19/20	6221901	Numerical Groundwater Modelling	2 SWS	Project (PRO)	Mohrlök

Competence Certificate

project report, appr. 15 pages

Prerequisites

none

Recommendation

none

Annotation

none

T

6.104 Course: Numerical Methods in Structural Analysis [T-BGU-100034]

Responsible: Prof. Dr.-Ing. Werner Wagner
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100050 - Numerical Methods in Structural Analysis](#)

Type	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6214901	Numerische Methoden in der Baustatik	2 SWS	Lecture (V)	Panther
WS 19/20	6214902	Übungen zu Numerische Methoden in der Baustatik	2 SWS	Practice (Ü)	Panther

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.105 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6251818	Exercises in Numerical Modelling	2 SWS	Practice (Ü)	Niemunis
SS 2020	6251819	FEM Applications in Geotechnical Modelling	2 SWS	Lecture (V)	Niemunis

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

6.106 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	Credits	Recurrence	Version
Oral examination	3	Each term	1

Events					
WS 19/20	6251707	Numerics in Geotechnics	2 SWS	Lecture (V)	Niemunis

Competence Certificate
 oral exam, appr. 30 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.107 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	Credits	Recurrence	Version
Oral examination	3	Each term	2

Events					
SS 2020	6221807	Parallel programming techniques for engineering problems	2 SWS	Lecture / Practice (VÜ)	Uhlmann

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

6.108 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	Credits	Recurrence	Version
Written examination	6	Each term	2

Events					
SS 2020	6232806	Eigenschaften von Verkehrsmitteln	2 SWS	Lecture (V)	Vortisch
SS 2020	6232808	Strategische Verkehrsplanung	2 SWS	Lecture (V)	Waßmuth

Competence Certificate
written exam, 120 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.109 Course: Practical Fire Protection [T-BGU-100042]

Responsible: Prof.Dipl.-Ing. Hermann Schröder
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100060 - Building Physics II](#)

Type	Credits	Recurrence	Version
Oral examination	3	Each term	1

Events					
SS 2020	6211815	Practical Fire Protection	2 SWS	Lecture (V)	Schröder

Competence Certificate
 oral exam, appr. 20 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.110 Course: Practical Noise Control [T-BGU-108024]

Responsible: Dr.-Ing. Reiner Grigo
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100060 - Building Physics II](#)

Type	Credits	Recurrence	Version
Oral examination	2	Each term	2

Events					
SS 2020	6211814	Practical Noise Control	2 SWS	Lecture (V)	Grigo, Grunau

Competence Certificate
 oral exam, appr. 20 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T

6.111 Course: Project Anchorage in Concrete [T-BGU-110850]

Responsible: Prof. Dr. Werner Fuchs
Prof. Dr.-Ing. Lothar Stempniewski

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

Part of: [M-BGU-100001 - Anchorage in Concrete](#)

Type	Credits	Recurrence	Version
Examination of another type	3	Each winter term	1

Competence Certificate

project work, partial report appr. 20 pages, presentation appr. 15 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.112 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	Credits	Recurrence	Version
Oral examination	1	Each term	2

Events					
WS 19/20	6230901	Projekt Integriertes Planen	4 SWS	Project (PRO)	Roos, Zimmermann, Chlond

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

6.113 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	Recurrence	Version
Written examination	4	Each term	3

Events					
WS 19/20	6241701	Projektmanagement in der Bau- und Immobilienwirtschaft	4 SWS	Lecture / Practice (VÜ)	Haghsheno, Hirschberger, Sittinger, Münzl

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.114 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	Recurrence	Version
Examination of another type	1,5	Each winter term	1

Events					
WS 19/20	6241901	Lean Construction	4 SWS	Lecture / Practice (VÜ)	Haghsheno, Mitarbeiter/innen

Competence Certificate

project:
 report, appr. 10 pages, and
 presentation, appr. 10 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.115 Course: Project Report Water Distribution Systems [T-BGU-108485]

Responsible: Prof. Dr. Franz Nestmann
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-104100 - Water Distribution Systems](#)

Type	Credits	Recurrence	Version
Completed coursework	2	Each winter term	2

Events					
WS 19/20	6222905	Water Distribution Systems	4 SWS	Lecture / Practice (VÜ)	Oberle, Kron

Competence Certificate

project report, appr. 15 pages, and
 presentation, appr. 15 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.116 Course: Project Studies in Water Resources Management [T-BGU-106783]

Responsible: Prof. Dr. Franz Nestmann
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	Recurrence	Version
Examination of another type	6	Each winter term	1

Events					
WS 19/20	6222901	Projektstudium: Wasserwirtschaftliche Planungen	4 SWS	Lecture / Practice (VÜ)	Seidel, Nestmann

Competence Certificate

project work: term paper, appr. 15 pages, with presentation

Prerequisites

none

Recommendation

none

Annotation

none

T

6.117 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6242901	Real Estate Management Controlling	1 SWS	Lecture (V)	Lennerts, Adams
WS 19/20	6242902	Property Valuation Basics	1 SWS	Lecture (V)	Lennerts, Adams
WS 19/20	6242903	Corporate and Public Real Estate Management	1 SWS	Lecture (V)	Lennerts, Janowski
WS 19/20	6242904	Projectdevelopment with Case Study	1 SWS	Lecture (V)	Lennerts, Mitarbeiter/ innen

Competence Certificate

oral exam, appr. 40 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.118 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	Recurrence	Version
Examination of another type	6	Each term	1

Events					
WS 19/20	6241906	Baubetriebliches Forschungsseminar II	2 SWS	Seminar (S)	Haghsheno, Mitarbeiter/innen
SS 2020	6241814	Baubetriebliches Forschungsseminar I	2 SWS	Seminar (S)	Haghsheno, Mitarbeiter/innen

Competence Certificate

project report, appr. 25 pages, and colloquium

Prerequisites

none

Recommendation

none

Annotation

none

T

6.119 Course: River Basin Modelling [T-BGU-106603]

Responsible: Dr.-Ing. Stephan Fuchs
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-103373 - River Basin Modeling](#)

Type	Credits	Recurrence	Version
Examination of another type	6	Each term	1

Events					
WS 19/20	6223904	Modelling Mass Fluxes in River Basins	2 SWS	Lecture / Practice (VÜ)	Fuchs
SS 2020	6223812	Mass Fluxes in River Basins	2 SWS	Lecture (V)	Fuchs

Competence Certificate

project report, appr. 10 pages, and
 presentation, appr. 15 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.120 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6233904	Laborpraktikum im Straßenwesen	2 SWS	Lecture / Practice (VÜ)	Plachkova-Dzhurova
WS 19/20	6233905	Bemessung von Fahrbahnkonstruktionen und Schadensanalytik	2 SWS	Lecture (V)	Plachkova-Dzhurova

Competence Certificate

oral exam, appr. 30 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.121 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	Credits	Recurrence	Version
Oral examination	3	Each term	2

Events					
WS 19/20	6233906	Sicherheitsmanagement im Straßenwesen	2 SWS	Lecture / Practice (VÜ)	Zimmermann
WS 19/20	6233908	Seminar im Straßenwesen	2 SWS	Seminar (S)	Zimmermann

Competence Certificate

oral exam, appr. 30 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

6.122 Course: Rock Engineering and Underground Construction [T-BGU-100074]

Responsible: Dr.-Ing. Peter Kudella

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

Part of: [M-BGU-100074 - Rock Engineering and Underground Construction](#)

Type	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
WS 19/20	6251905	Aboveground Rock Engineering	2 SWS	Lecture / Practice (VÜ)	Kudella
WS 19/20	6251907	Tunnel Construction in Soils and in Existence	2 SWS	Lecture / Practice (VÜ)	Kudella, Wagner

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.123 Course: Rock Mechanics and Tunneling [T-BGU-100069]

Responsible: Thomas Mutschler
Martin Wagner

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

Part of: [M-BGU-100069 - Rock Mechanics and Tunneling](#)

Type	Credits	Recurrence	Version
Written examination	5	Each term	2

Events					
SS 2020	6251804	Basics in Rock Mechanics	2 SWS	Lecture / Practice (VÜ)	Mutschler
SS 2020	6251806	Basics in Tunnel Construction	2 SWS	Lecture / Practice (VÜ)	Wagner

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

preparation of the student research project for examination preparation

Annotation

none

T

6.124 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	Recurrence	Version
Examination of another type	3	Each term	1

Events					
WS 19/20	6232903	Seminar Verkehrswesen	2 SWS	Seminar (S)	Vortisch, KIT
SS 2020	6232903	Seminar Verkehrswesen	2 SWS	Seminar (S)	Vortisch, Kagerbauer

Competence Certificate

seminar paper, appr. 10 pages, and presentation, appr. 10 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.125 Course: Seminar Paper 'Flow Behavior of Rivers' [T-BGU-108466]

Responsible: Prof. Dr. Franz Nestmann
Dr.-Ing. Frank Seidel

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

Part of: [M-BGU-104083 - Flow and Sediment Dynamics in Rivers](#)

Type	Credits	Recurrence	Version
Completed coursework	2	Each summer term	2

Events					
SS 2020	6222807	Flow Behavior of Rivers	2 SWS	Lecture / Practice (VÜ)	Seidel, Eiff, Dupuis

Competence Certificate

seminar paper in the course Flow Behavior of Rivers, appr. 15 pages

Prerequisites

none

Recommendation

none

Annotation

none

T

6.126 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	Recurrence	Expansion	Version
Completed coursework	3	Each winter term	1 terms	1

Events					
WS 19/20	6233908	Seminar im Straßenwesen	2 SWS	Seminar (S)	Zimmermann

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

6.127 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	Credits	Recurrence	Version
Completed coursework	1	Each summer term	2

Events					
SS 2020	6222803	Waterway Engineering	4 SWS	Lecture / Practice (VÜ)	Kron

Competence Certificate

seminar paper, appr. 15 pages

Prerequisites

none

Recommendation

none

Annotation

none

T

6.128 Course: Shell Structures and Stability of Structures [T-BGU-100033]

Responsible: Prof. Dr.-Ing. Werner Wagner
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100049 - Shell Structures and Stability of Structures](#)

Type	Credits	Recurrence	Version
Oral examination	4	Each term	3

Events					
SS 2020	6214805	Schalentragwerke	1 SWS	Lecture (V)	Fina
SS 2020	6214806	Übungen zu Schalentragwerke	1 SWS	Practice (Ü)	Fina
SS 2020	6214807	Stabilität von Tragwerken	1 SWS	Lecture (V)	Fina
SS 2020	6214808	Übungen zu Stabilität von Tragwerken	1 SWS	Practice (Ü)	Weber

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

6.129 Course: Solid Construction Bridges [T-BGU-100020]

Responsible: Prof. Dr.-Ing. Lothar Stempniewski
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100037 - Solid Construction Bridges](#)

Type	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
WS 19/20	6211901	Massivbrücken	2 SWS	Lecture (V)	Retzepis
WS 19/20	6211902	Übungen zu Massivbrücken	2 SWS	Practice (Ü)	N.N.

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.130 Course: Space and Infrastructure [T-BGU-100056]

Responsible: 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	Recurrence	Version
Written examination	6	Each term	2

Events					
SS 2020	6072201	Grundlagen Geographischer Informationssysteme für die Modellierung und Planung	2 SWS	Lecture (V)	Keller, Stirnberg
SS 2020	6072202	Grundlagen Geographischer Informationssysteme für die Modellierung und Planung, Übung	2 SWS	Practice (Ü)	Keller, Stirnberg
SS 2020	6231805	Erschließung, Ver- und Entsorgungsplanung	2 SWS	Lecture / Practice (VÜ)	Kagerbauer

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.131 Course: Special Issues of Soil Mechanics [T-BGU-100071]

Responsible: apl. Prof. Dr. Andrzej Niemunis
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100005 - Special Issues of Soil Mechanics](#)

Type	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6251901	Unsaturated, Viscous and Cyclic Soil Behaviour - Theory and Element Tests	2 SWS	Lecture / Practice (VÜ)	Niemunis
WS 19/20	6251903	Soil Dynamics	2 SWS	Lecture / Practice (VÜ)	Osinov

Competence Certificate

oral exam, appr. 40 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.132 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	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6233805	Steuerungsinstrumente für Betrieb und Erhaltung von Straßeninfrastruktur	2 SWS	Lecture (V)	Hess
SS 2020	6233806	Simulationen und Analysemethoden im Straßenwesen	1 SWS	Lecture (V)	Roos, Mitarbeiter/innen
SS 2020	6233807	Besondere Kapitel im Straßenwesen	1 SWS	Lecture (V)	Roos

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.133 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	Credits	Recurrence	Version
Written examination	4	Each term	2

Events					
SS 2020	6212801	Stahl- und Stahlverbundbau	2 SWS	Lecture (V)	Ummenhofer
SS 2020	6212802	Übungen zu Stahl- und Stahlverbundbau	2 SWS	Practice (Ü)	Kuon

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.134 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	Recurrence	Version
Completed coursework	1	Each summer term	2

Events					
SS 2020	6211811	Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions	2 SWS	Lecture (V)	Kotan
SS 2020	6211812	Exercises to Protection, Rehabilitation and Reinforcement of Concrete and Masonry Constructions	1 SWS	Practice (Ü)	Kotan
SS 2020	6211813	Building Analysis	1 SWS	Lecture (V)	Kotan, Vogel

Competence Certificate

student research paper, 15-20 pages;

definition of a project available from lecturer

Prerequisites

none

Recommendation

none

Annotation

none

T

6.135 Course: Student Research Project 'Computational Analysis of Structures' [T-BGU-100174]

Responsible: Prof. Dr.-Ing. Werner Wagner
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100047 - Computational Analysis of Structures](#)

Type	Credits	Recurrence	Version
Completed coursework	2	Each summer term	2

Events					
SS 2020	6214801	Computational Analysis of Structures	2 SWS	Lecture (V)	Wagner
SS 2020	6214802	Exercises to Computational Analysis of Structures	2 SWS	Practice (Ü)	Weber

Competence Certificate

student research project, appr. 15 pages
 definition of a project available from lecturer

Prerequisites

none

Recommendation

none

Annotation

none

T

6.136 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-100102 - Economics and Management in Construction](#)

Type	Credits	Recurrence	Version
Completed coursework	1	Each summer term	2

Events					
SS 2020	6241801	Kalkulation	2 SWS	Lecture / Practice (VÜ)	Haghsheno

Competence Certificate

term paper, appr. 15 pages, with test

Prerequisites

none

Recommendation

none

Annotation

none

T

6.137 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	Recurrence	Version
Completed coursework	1	Each winter term	2

Events					
WS 19/20	6215701	Baudynamik	2 SWS	Lecture (V)	Franke

Competence Certificate

term paper;

definition of a project available from lecturer

Prerequisites

none

Recommendation

none

Annotation

none

T

6.138 Course: Student Research Project 'Earthworks and Foundation Engineering' [T-BGU-100178]

Responsible: Dr.-Ing. Andreas Bieberstein
Dr.-Ing. Peter Kudella

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

Part of: [M-BGU-100068 - Earthworks and Foundation Engineering](#)

Type	Credits	Recurrence	Version
Completed coursework	2	Each winter term	2

Events					
WS 19/20	6251701	Foundation Types	2 SWS	Lecture / Practice (VÜ)	N.N.
WS 19/20	6251703	Basics in Earthworks and Embankment Dams	2 SWS	Lecture / Practice (VÜ)	Bieberstein

Competence Certificate

report appr. 45 pages;
definition of a project available from lecturer

Prerequisites

none

Recommendation

none

Annotation

none

T

6.139 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	Recurrence	Version
Completed coursework	1	Each winter term	2

Events					
WS 19/20	6241703	Verfahrenstechnik	2 SWS	Lecture (V)	Schneider, Schlick
WS 19/20	6243701	Maschinentchnik	2 SWS	Lecture (V)	Gentes, Dörfler

Competence Certificate

term paper, appr. 15 pages, with test

Prerequisites

none

Recommendation

none

Annotation

none

T

6.140 Course: Student Research Project 'Reinforced Concrete' [T-BGU-100170]

Responsible: Prof. Dr.-Ing. Lothar Stempniewski

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	Recurrence	Version
Completed coursework	2	Each winter term	2

Events					
WS 19/20	6211701	Bemessung und Konstruktion von Bauteilen im Stahlbeton	2 SWS	Lecture (V)	Stempniewski
WS 19/20	6211702	Übungen zu Bemessung und Konstruktion von Bauteilen im Stahlbeton	2 SWS	Practice (Ü)	Rizzo

Competence Certificate

term paper;

definition of a project available from lecturer

Prerequisites

none

Recommendation

none

Annotation

none

T

6.141 Course: Student Research Project 'Rock Mechanics and Tunneling' [T-BGU-100179]

Responsible: Thomas Mutschler
Martin Wagner

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

Part of: [M-BGU-100069 - Rock Mechanics and Tunneling](#)

Type	Credits	Recurrence	Version
Completed coursework	1	Each summer term	2

Events					
SS 2020	6251804	Basics in Rock Mechanics	2 SWS	Lecture / Practice (VÜ)	Mutschler
SS 2020	6251806	Basics in Tunnel Construction	2 SWS	Lecture / Practice (VÜ)	Wagner

Competence Certificate

report appr. 15 pages;

definition of a project available from lecturer

Prerequisites

none

Recommendation

none

Annotation

none

T

6.142 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	Recurrence	Version
Completed coursework	1	Each winter term	2

Events					
WS 19/20	6241701	Projektmanagement in der Bau- und Immobilienwirtschaft	4 SWS	Lecture / Practice (VÜ)	Haghsheno, Hirschberger, Sittinger, Münzl

Competence Certificate

term paper, appr. 15 pages, with test

Prerequisites

none

Recommendation

none

Annotation

none

T

6.143 Course: Student Research Project 'Shell Structures and Stability of Structures' [T-BGU-100254]

Responsible: Prof. Dr.-Ing. Werner Wagner
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100049 - Shell Structures and Stability of Structures](#)

Type	Credits	Recurrence	Version
Completed coursework	2	Each summer term	2

Events					
SS 2020	6214805	Schalentragerwerke	1 SWS	Lecture (V)	Fina
SS 2020	6214806	Übungen zu Schalentragerwerke	1 SWS	Practice (Ü)	Fina
SS 2020	6214807	Stabilität von Tragwerken	1 SWS	Lecture (V)	Fina
SS 2020	6214808	Übungen zu Stabilität von Tragwerken	1 SWS	Practice (Ü)	Weber

Competence Certificate

student research project, appr. 15 pages
 definition of a project available from lecturer

Prerequisites

none

Recommendation

none

Annotation

none

T

6.144 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	Credits	Recurrence	Version
Completed coursework	2	Each summer term	2

Events					
SS 2020	6212801	Stahl- und Stahlverbundbau	2 SWS	Lecture (V)	Ummenhofer
SS 2020	6212802	Übungen zu Stahl- und Stahlverbundbau	2 SWS	Practice (Ü)	Kuon

Competence Certificate

term paper;

definition of a project available from lecturer

Prerequisites

none

Recommendation

none

Annotation

none

T

6.145 Course: Student Research Project 'Surface Structures' [T-BGU-107818]

Responsible: Prof. Dr.-Ing. Werner Wagner
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100035 - Surface Structures and Dynamics of Structures](#)

Type	Credits	Recurrence	Version
Completed coursework	1	Each winter term	2

Events					
WS 19/20	6214701	Surface Structures	2 SWS	Lecture (V)	Wagner

Competence Certificate

term paper;
 definition of a project available from lecturer

Prerequisites

none

Recommendation

none

Annotation

none

T

6.146 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
Completed coursework

Credits
2

Recurrence
Each winter term

Expansion
1 terms

Version
1

Events					
WS 19/20	6233903	Projektstudie Außerortsstraße	2 SWS	Lecture / Practice (VÜ)	Zimmermann, Roos

Competence Certificate

preparation of 4 planning documents

Prerequisites

none

Recommendation

none

Annotation

none

T

6.147 Course: Surface Structures [T-BGU-100017]

Responsible: Prof. Dr.-Ing. Werner Wagner
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100035 - Surface Structures and Dynamics of Structures](#)

Type	Credits	Recurrence	Version
Written examination	2	Each term	2

Events					
WS 19/20	6214701	Surface Structures	2 SWS	Lecture (V)	Wagner

Competence Certificate
written exam, 60 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.148 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	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6242801	Nachhaltigkeit im Immobilienmanagement	2 SWS	Lecture / Practice (VÜ)	Lennerts
SS 2020	6242803	Lebenszyklusmanagement von Immobilien	1 SWS	Lecture (V)	Lennerts
SS 2020	6242804	Facility- und Immobilienmanagement 2	1 SWS	Lecture (V)	Lennerts

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.149 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	Credits	Recurrence	Version
Oral examination	3	Each term	2

Events					
WS 19/20	6212910	Tank Construction	3 SWS	Lecture (V)	Knödel
WS 19/20	6212911	Übungen zu Behälterbau	1 SWS	Practice (Ü)	Bräutigam

Competence Certificate
 oral exam, appr. 20 min.

Prerequisites
 none

Recommendation
 none

Annotation
 none

T**6.150 Course: Technical Hydraulics [T-BGU-106770]**

Responsible: Prof. Dr. Olivier Eiff
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-103385 - Technical Hydraulics](#)

Type	Credits	Recurrence	Version
Written examination	6	Each term	1

Competence Certificate

written exam, 100 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.151 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	Credits	Recurrence	Version
Oral examination	3	Each term	1

Events					
SS 2020	6232807	Wettbewerb, Planung und Finanzierung im ÖPNV	2 SWS	Lecture (V)	Pischon

Competence Certificate

oral exam, appr. 20 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.152 Course: Term Paper 'International Sanitary Engineering' [T-BGU-109265]

Responsible: Dr.-Ing. Stephan Fuchs
Dr.-Ing. Tobias Morck

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

Part of: [M-BGU-104917 - Wastewater Treatment Technologies](#)

Type	Credits	Recurrence	Version
Completed coursework	1	Each winter term	2

Events					
WS 19/20	6223902	International Sanitary Engineering	2 SWS	Lecture / Practice (VÜ)	Fuchs, Morck

Competence Certificate

presentation, appr. 15 min., term paper, appr. 10 pages

Prerequisites

none

Recommendation

none

Annotation

keine

T

6.153 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	Recurrence	Version
Examination of another type	3	Each winter term	2

Events					
WS 19/20	6212910	Tank Construction	3 SWS	Lecture (V)	Knödel
WS 19/20	6212911	Übungen zu Behälterbau	1 SWS	Practice (Ü)	Bräutigam

Competence Certificate

term paper with presentation, appr. 20 pages

Prerequisites

none

Recommendation

none

Annotation

none

T

6.154 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	Recurrence	Version
Examination of another type	1,5	Each winter term	1

Events					
WS 19/20	6240901	Bauen im Bestand	3 SWS	Lecture / Practice (VÜ)	Lennerts, Schneider
WS 19/20	6240903	Energetische Sanierung	1 SWS	Lecture (V)	Medgenberg, Schneider

Competence Certificate

term paper, appr. 10 pages, and presentation, appr. 10 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.155 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	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6251801	Theoretical Soil Mechanics	4 SWS	Lecture / Practice (VÜ)	Niemunis

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.156 Course: Timber and Wood-Based Materials [T-BGU-100029]

Responsible: Prof. Dr.-Ing. Hans Joachim Blaß
Dr. Carmen Sandhaas

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

Part of: [M-BGU-100045 - Timber and Wood-Based Materials](#)

Type	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6213803	Timber and wood-based materials	4 SWS	Lecture / Practice (VÜ)	Sandhaas

Competence Certificate
oral exam, appr. 30 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.157 Course: Timber Structures [T-BGU-100028]

Responsible: Prof. Dr.-Ing. Hans Joachim Blaß
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100044 - Timber Structures](#)

Type	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6213801	Holzbau	2 SWS	Lecture (V)	Blaß
SS 2020	6213802	Übungen zu Holzbau	2 SWS	Practice (Ü)	Blaß, Mitarbeiter/innen

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

T**6.158 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	Recurrence	Expansion	Version
Oral examination	6	Each term	1 terms	1

Competence Certificate

oral exam, appr. 40 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.159 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6234801	Operation Track Guided Systems	2 SWS	Lecture (V)	Tzschaschel
SS 2020	6234804	Operation Systems and Track Guided Infrastructure Capacity	2 SWS	Lecture (V)	Tzschaschel, Mitarbeiter/innen

Competence Certificate

oral exam, appr. 45 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.160 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	Credits	Recurrence	Version
Written examination	6	Each term	1

Competence Certificate

written exam, 90 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.161 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	Credits	Recurrence	Version
Oral examination	6	Each term	1

Events					
SS 2020	6232802	Verkehrsmanagement und Telematik	2 SWS	Lecture / Practice (VÜ)	Vortisch
SS 2020	6232804	Simulation von Verkehr	2 SWS	Lecture / Practice (VÜ)	Vortisch, Mitarbeiter/innen

Competence Certificate

oral exam, appr. 20 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.162 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	Credits	Recurrence	Version
Oral examination	6	Each term	2

Events					
SS 2020	6224803	Transport and Transformation of Contaminants in Hydrological Systems	4 SWS	Lecture / Practice (VÜ)	Zehe, Wienhöfer

Competence Certificate

oral exam, appr. 30 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.163 Course: Turnkey Construction [T-BGU-101208]

Responsible: Prof. Dr.-Ing. Shervin Haghsheno
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-100676 - Turnkey Construction](#)

Type	Credits	Recurrence	Version
Written examination	6	Each term	1

Events					
SS 2020	6241808	Schlüsselfertiges Bauen I	1 SWS	Lecture (V)	Teizer
SS 2020	6241809	Schlüsselfertiges Bauen II (Gewerke und Technik)	2 SWS	Lecture / Practice (VÜ)	Teizer, Denzer
SS 2020	6241811	Nachtragsmanagement	1 SWS	Lecture (V)	Haghsheno, Pietsch

Competence Certificate
written exam, 90 min.

Prerequisites
none

Recommendation
none

Annotation
none

T

6.164 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	Credits	Recurrence	Version
Written examination	4,5	Each term	1

Events					
WS 19/20	6240901	Bauen im Bestand	3 SWS	Lecture / Practice (VÜ)	Lennerts, Schneider
WS 19/20	6240903	Energetische Sanierung	1 SWS	Lecture (V)	Medgenberg, Schneider

Competence Certificate

written exam, 70 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.165 Course: Urban and Regional Planning [T-BGU-100050]

Responsible: Dr. 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	Recurrence	Version
Oral examination	6	Each term	1

Events					
WS 19/20	6231701	Stadtplanung	2 SWS	Lecture / Practice (VÜ)	Soylu
WS 19/20	6231703	Regionalplanung	2 SWS	Lecture (V)	Wilske

Competence Certificate

oral exam, appr. 30 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.166 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	Credits	Recurrence	Version
Oral examination	3	Each term	1

Events					
SS 2020	6231801	Stadtmanagement	2 SWS	Lecture / Practice (VÜ)	Karmann-Woessner

Competence Certificate

oral exam, appr. 15 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.167 Course: Urban Water Infrastructure and Management [T-BGU-106600]

Responsible: 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	Credits	Recurrence	Version
Written examination	6	Each term	2

Events					
WS 19/20	6223701	Urban Water Infrastructure and Management	4 SWS	Lecture / Practice (VÜ)	Fuchs

Competence Certificate

written exam, 60 min.

Prerequisites

none

Recommendation

none

Annotation

none

T

6.168 Course: Wastewater and Storm Water Treatment Facilities [T-BGU-109934]

Responsible: Dr.-Ing. Stephan Fuchs
Dr.-Ing. Tobias Morck

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

Part of: [M-BGU-104898 - Wastewater and Storm Water Treatment Facilities](#)

Type	Credits	Recurrence	Version
Examination of another type	6	Each summer term	1

Events					
SS 2020	6223801	Wastewater and Storm Water Treatment Facilities	4 SWS	Lecture / Practice (VÜ)	Fuchs, Morck

Competence Certificate

term paper, appr. 10 pages, and presentation, appr. 15 min.

Prerequisites

none

Recommendation

none

Annotation

The number of participants in the course is limited to 20 persons. The registration is to be made via ILIAS. The places are allocated with priority to students from *Water Science and Engineering*, then *Civil Engineering* and *Geoecology* and further study programs. The allocation is made by consideration of the semester and the time of entry of the registration. 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

6.169 Course: Wastewater Treatment Technologies [T-BGU-109948]

Responsible: Dr.-Ing. Stephan Fuchs
Dr.-Ing. Tobias Morck

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

Part of: [M-BGU-104917 - Wastewater Treatment Technologies](#)

Type	Credits	Recurrence	Version
Written examination	5	Each winter term	1

Events					
WS 19/20	6223901	Municipal Wastewater Treatment	2 SWS	Lecture / Practice (VÜ)	Morck
WS 19/20	6223902	International Sanitary Engineering	2 SWS	Lecture / Practice (VÜ)	Fuchs, Morck

Competence Certificate

written exam, 60 min.

Prerequisites

The accomplishment Term paper 'International Sanitary Engineering' (T-BGU-109265) has to be passed.

Modeled Conditions

The following conditions have to be fulfilled:

1. The course [T-BGU-109265 - Term Paper 'International Sanitary Engineering'](#) must have been passed.

Recommendation

none

Annotation

none

T

6.170 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	Credits	Recurrence	Version
Examination of another type	6	Each term	2

Events					
WS 19/20	6224702	Water and Energy Cycles in Hydrological Systems: Processes, Predictions and Management	4 SWS	Lecture / Practice (VÜ)	Zehe

Competence Certificate
term paper, appr. 15 pages

Prerequisites
none

Recommendation
none

Annotation
as from summer term 2020 examination of other type

T

6.171 Course: Water Distribution Systems [T-BGU-108486]

Responsible: Prof. Dr. Franz Nestmann
Organisation: KIT Department of Civil Engineering, Geo- and Environmental Sciences
Part of: [M-BGU-104100 - Water Distribution Systems](#)

Type	Credits	Recurrence	Version
Oral examination	4	Each winter term	2

Events					
WS 19/20	6222905	Water Distribution Systems	4 SWS	Lecture / Practice (VÜ)	Oberle, Kron

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

6.172 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	Recurrence	Version
Oral examination	5	Each summer term	2

Events					
SS 2020	6222803	Waterway Engineering	4 SWS	Lecture / Practice (VÜ)	Kron

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 6.173 Course: Wildcard [T-BGU-108027]**Organisation:** University**Part of:** [M-BGU-103927 - Interdisciplinary Qualifications](#)

Type	Credits	Version
Completed coursework	1	1

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