Georg-August-Universität
Göttingen

Modulverzeichnis

zu der Prüfungs- und Studienordnung für den konsekutiven Master-Studiengang "Mathematik" (Amtliche Mitteilungen I Nr. 14/2013 S. 313, zuletzt geaendert durch Amtliche Mitteilungen I Nr. 36/2024 S. 867)

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Übersicht nach Modulgruppen

I. Study tracks in the Master's Degree programme in Mathematics (M.Sc.)

In the Master's Degree programme in Mathematics, one of the following study tracks has to be chosen, whereas modules with a total of at least 90C have to be completed successfully in accordance with the following regulations. The regulations for the modules that can be chosen within the scope of a study focus can be found in No. II "Elective courses in Mathematics (graduate studies)" and No. III "Professionalisation".

Im Master-Studiengang „Mathematik“ ist eines der nachfolgenden Studienprofile zu wählen, wobei nach Maßgabe der folgenden Bestimmungen Module im Umfang von wenigstens 90C erfolgreich zu absolvieren sind. Die im Rahmen eines Schwerpunktes wählbaren Module sind unter "II. Elective courses in Mathematics (graduate studies)" und III "Professionalisation" geregelt.

1. Study track F "Research-oriented - general"

In the study track F "Research-oriented - general" modules have to be completed successfully according to the regulations below.

Im Studienprofil F „Forschungsorientiert - allgemein“ sind Module nach Maßgabe der nachstehenden Bestimmungen erfolgreich zu absolvieren.

a. Elective compulsory modules in Mathematics (60C)

In the study track F, elective compulsory modules in the subject mathematics with a total of at least 60C have to be completed successfully according to the following regulations:

i) In the studi foci SP 1-4, at least two seminar modules (module number M.Mat.54**) or Oberseminar modules (module number M.Mat.59**) with a total of 6C have to be completed successfully.

ii) In the study foci SP 1 or SP 2, modules with a total of at least 9C have to be completed successfully. If the Master's thesis is in one out of these two study foci, a total of at least 6C of the modules out of the other study focus have to be completed successfully.

iii) In the study foci SP 3 or SP 4, modules with a total of at least 9C have to be completed successfully. If the Master's thesis is in one out of these two study foci, a total of at least 6C of the modules out of the other study focus have to be completed successfully.

iv) Further modules can be chosen freely out of the modules offered in all four mathematical study foci.

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Im Studienprofil F müssen Wahlpflichtmodule im Fach Mathematik im Umfang von insgesamt mindestens 60C nach Maßgabe der folgenden Bestimmungen erfolgreich absolviert werden:

i) In den Schwerpunkten SP 1-4 müssen mindestens zwei Seminare (Modulgruppen M.Mat.54**) oder Oberseminare (Modulgruppen M.Mat.59**) im Gesamtumfang von 6C erfolgreich absolviert werden.

ii) Aus den Schwerpunkten SP 1 oder SP 2 müssen Module im Umfang von insgesamt wenigstens 9C erfolgreich absolviert werden; ist einer dieser beiden Schwerpunkte der Studienschwerpunkt der Masterarbeit, so müssen mindestens 6C aus Modulen des anderen Schwerpunkts erworben werden.

iii) Aus den Schwerpunkten SP 3 oder SP 4 müssen Module im Umfang von insgesamt wenigstens 9C erfolgreich absolviert werden; ist einer dieser beiden Schwerpunkte der Studienschwerpunkt der Masterarbeit, so müssen mindestens 6C aus Modulen des anderen Schwerpunkts erworben werden.

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iv) Darüber hinaus kann frei aus den angebotenen Modulen aller vier mathematischen Studienschwerpunkte gewählt werden.

b. Elective compulsory modules in the area "Professionalisation"

In the study track F, further modules wiith a total of at least 30C have to be completed successfully in accordance with the regulations set out in section ‘III. Professionalisation’.

Im Studienprofil F sind weitere Module im Gesamtumfang von wenigstens 30C gemäß den Regelungen im Abschnitt "III. Professionalisation" erfoglreich zu absolvieren.

2. Study track Phy "Physics"

In the research-oriented study track Phy "Physics", modules below have to be completed successfully according to the regulations.

Im forschungsorientierten Studienprofil Phy "Physik" sind Module nach Maßgabe der nachstehenden Bestimmungen erfolgreich zu absolvieren.

a. Elective compulsory modules in Mathematics (60 C)

In the study track Phy, elective compulsory modules in mathematics covering a total of at least 60 C have to be completed successfully according to the following regulations:

i) In the studi foci SP 1, SP 3 or SP 4, at least two seminar modules (module number M.Mat.541*, M.Mat.543* or M.Mat.544*) or Oberseminar modules (module number M.Mat.591*, M.Mat.593* or M.Mat.594*) with a total of 6 C have to be completed successfully.

ii) In the study focus SP 1 modules with a total of at least 9 C have to be completed successfully.

iii) In the study foci SP 3 or SP 4, elective compulsory modules with a total of at least 9 C have to be completed successfully.

iv) Further moduls can be chosen freely out the modules offered in all four mathematical study foci SP1-4. Additionally, modules in the section No. III.6. "Physics" can be chosen freely, however this option is restricted to modules with a total of at most 12 C.

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Im Studienprofil Phy müssen Wahlpflichtmodule in Mathematik im Umfang von insgesamt mindestens 60 C nach Maßgabe der folgenden Bestimmungen erfolgreich absolviert werden.

i) In den Schwerpunkten SP 1, SP 3 oder SP 4 müssen mindestens zwei Seminar (Modulgruppen M.Mat.591*, M.Mat.543* oder M.Mat.544*) oder Oberseminare (Modulgruppen M.Mat.591*, M.Mat.593* oder M.Mat.594*) im Umfang von 6C erfolgreich absolviert werden.

ii) Es müssen Module im Gesamtumfang von mindestens 9 C aus dem Schwerpunkt SP 1 erfolgreich absolviert werden.

iii) Es müssen Wahlpflichtmodule aus den Schwerpunkten SP 3 oder SP 4 im Gesamtumfang von wenigstens 9 C erfolgreich absolviert werden.

iv) Ferner kann frei aus den angebotenen Modulen aller vier mathematischen Studienschwerpunkte gewählt werden. Weiterhin können Module im Gesamtumfang von maximal 12 C aus dem Bereich "III.6. Physics" frei gewählt werden.

b. Elective compulsory modules in the section "Professionalisation"

In the study track Phy, further modules wiith a total of at least 30C have to be completed successfully in accordance with the regulations set out in section ‘III. Professionalisation’. However, in this profile, only Physics is permitted as a minor subject.

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Im Studienprofil Phy sind weitere Module im Gesamtumfang von wenigstens 30C gemäß den Regelungen im Abschnitt "III. Professionalisation" erfoglreich zu absolvieren. Jedoch ist in diesem Profil nur das Nebenfach Physik zugelassen.

3. Study track MDS "Mathematical Data Science"

In the study track MDS "Mathematical Data Science" modules have to be completed successfully according to the regulations below. In the study track "Mathematical Data Science" the study foci SP 3 or SP 4 are permitted as study focus of the Master's thesis, only.

Im forschungsorientierten Studienprofil MDS "Mathematical Data Science" sind Module nach Maßgabe der nachstehenden Bestimmungen erfolgreich zu absolvieren. Als Schwerpunkt der Masterarbeit sind im Studienprofil Mathematical Data Sience nur die Schwerpunkte SP 3 oder SP 4 zugelassen.

a. Elective compulsory modules in Mathematics (60 C)

In the study track MDS, elective compulsory modules in the subject mathematics with a total of at least 60C have to be completed successfully according to the following regulations:

Im Studienprofil MDS müssen Wahlpflichtmodule im Umfang von insgesamt mindestens 60C nach Maßgabe der folgenden Bestimmungen erfolgreich absolviert werden.

aa. Elective compulsory seminar

In the studi foci SP 3 or SP 4, at least two seminar modules (module number M.Mat.543* or M.Mat.544*) or Oberseminar modules (module number M.Mat.593* or M.Mat.594*) with a total of 6 C have to be completed successfully.

In den Schwerpunkten SP 3 oder SP 4 muss mindestens zwei Seminare (Modulgruppen M.Mat.543* oder M.Mat.544*) oder Oberseminare (Modulgruppen M.Mat.593* oder M.Mat.594*) im Gesamtumfang von 6 C erfolgreich absolviert werden.

bb. Elective compulsory modules in SP 3

In the study focus SP 3, modules with modul numbers B.Mat.4*3* or M.Mat.5*3* with a total of at least 9C have to be completed successfully.

Aus dem Schwerpunkt SP 3 müssen Module mit Modulnummern B.Mat.4*3* und M.Mat.5*3* im Gesamtumfang von mindestens 9C erfolgreich absolviert werden.

cc. Elective compulsory modules in SP 4

In the study focusSP 4, modules with modul numbers B.Mat.4*4* or M.Mat.5*4* with a total of at least 9C have to be completed successfully.

Aus dem Schwerpunkt SP 4 müssen Module mit Modulnummern B.Mat.4*4* und M.Mat.5*4* im Gesamtumfang von mindestens 9C erfolgreich absolviert werden.

dd. Practical course

One out of the following practical course modules with 10C has to be completed successfully:

Eines der folgenden Praktikumsmodule im Umfang von 10C muss erfolgreich absolviert werden:

M.Mat.0731: Advanced practical course in scientific computing (10 C, 4 SWS)..... 310

M.Mat.0741: Advanced practical course in stochastics (10 C, 6 SWS).....312

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ee. Computer science

In the area "Computer science", one out of the following modules has to be completed successfully.

Es muss eines der folgenden Module erfolgreich absolviert werden.

B.Inf.1236: Machine Learning (6 C, 4 SWS)..... 33

B.Inf.1237: Deep Learning for Computer Vision (6 C, 4 SWS)..... 34

B.Inf.1240: Visualization (6 C, 4 SWS)..... 35

B.Inf.1241: Computational Optimal Transport (6 C, 4 SWS)..... 36

B.Inf.1244: Data Management for Data Science (5 C, 4 SWS)..... 37

M.Inf.1112: Effiziente Algorithmen (5 C, 3 SWS)..... 285

M.Inf.1141: Semistrukturierte Daten und XML (6 C, 4 SWS)..... 286

M.Inf.1171: Cloud and Service Computing (5 C, 3 SWS)..... 287

M.Inf.1172: Using Research Infrastructures (5 C, 3 SWS)..... 289

M.Inf.1185: Sensor Data Fusion (5 C, 4 SWS)..... 291

M.Inf.1186: Seminar Hot Topics in Data Fusion and Analytics (5 C, 2 SWS)..... 293

M.Inf.1188: Mobile Robotics (5 C, 4 SWS)..... 294

M.Inf.1232: Parallel Computing (6 C, 4 SWS)..... 295

M.Inf.1244: Seminar on optimal transport (5 C, 2 SWS)..... 297

M.Inf.1802: Praktikum XML (6 C, 4 SWS)..... 298

M.Inf.1808: Practical Course on Parallel Computing (6 C, 4 SWS)..... 299

M.Inf.2102: Advanced Statistical Learning for Data Science (6 C, 4 SWS)..... 301

M.Inf.2201: Probabilistic Machine Learning (9 C, 6 SWS)..... 303

M.Inf.2203: Interpretierbarkeit und Bias in Modellen des maschinellen Lernens (6 C, 4 SWS)..... 305

M.Inf.2204: Introduction to Graph Machine Learning (5 C, 2 SWS)..... 307

M.Inf.2241: Current Topics in Machine Learning (5 C, 2 SWS)..... 309

ff. Elective modules

In order to achieve 60C, modules out of the four study foci in Mathematics can be added In addition, modules with a total of at most 12C can be chosen in the subject "Computer science" as listed in No.III.4 "Computer Science". However, those listed in No.I.4.a.dd) "Computer Science" are recommended.

Zum Auffüllen auf 60C kann frei aus den angebotenen Modulen aller vier mathematischen Studienschwerpunkte gewählt werden. Weiterhin können Module im Gesamtumfang von

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maximal 12C aus dem Bereich III.4 "Computer Science" frei gewählt werden, empfohlen werden die im Abschnitt .I.4.a.dd) "Computer Science" gelisteten Module.

b. Elective compulsory modules in the section "Professionalisation"

In the study track MDS, further modules wiith a total of at least 30C have to be completed successfully in accordance with the regulations set out in section ‘III. Professionalisation’. However, in this profile, only computer science is permitted as a minor subject and those modules listed in No.I.4.a.dd) "Computer Science" are recommended.

Im Studienprofil MDS sind weitere Module im Gesamtumfang von wenigstens 30C gemäß den Regelungen im Abschnitt "III. Professionalisation" erfoglreich zu absolvieren. Jedoch ist in diesem Profil nur das Nebenfach Informatik zugelassen. Die wählbaren Module sind in Nr. III.4) "Computer science" geregelt, empfohlen werden die im Abschnitt I.4.a.dd) "Computer Science" gelisteten Module.

II. Elective courses in Mathematics (graduate studies)

1. Elective compulsory modules in study focus SP 1 "Analysis, geometry, topology"

B.Mat.3010: Analysis on manifolds (9 C, 6 SWS)..... 69

B.Mat.3011: Functional analysis and spectral theory (6 C, 4 SWS)..... 71

B.Mat.3012: Introduction to topology (6 C, 4 SWS)..... 73

B.Mat.4112: Partial differential equations (9 C, 6 SWS)..... 93

B.Mat.4113: Differential geometry I (9 C, 6 SWS)..... 95

B.Mat.4114: Algebraic topology I (9 C, 6 SWS)..... 97

B.Mat.4115: Mathematical quantum mechanics (9 C, 6 SWS)..... 99

B.Mat.4116: Lie groups and Lie algebras (9 C, 6 SWS)..... 101

B.Mat.4117: Operator algebras and K-theory (9 C, 6 SWS)..... 103

B.Mat.4215: Mathematical quantum field theory (9 C, 6 SWS)..... 139

B.Mat.4216: Higher differential geometry (9 C, 6 SWS)..... 141

B.Mat.4217: Category theory (9 C, 6 SWS)..... 143

M.Mat.5212: Nonlinear partial differential equations (9 C, 6 SWS)..... 323

M.Mat.5213: Differential geometry II (9 C, 6 SWS)..... 325

M.Mat.5214: Algebraic topology II (9 C, 6 SWS)..... 327

M.Mat.5219: Microlocal analysis (9 C, 6 SWS)..... 329

M.Mat.5413: Seminar on differential geometry (3 C, 2 SWS)..... 339

M.Mat.5414: Seminar on algebraic topology (3 C, 2 SWS)..... 340

M.Mat.5415: Seminar on mathematical methods in physics (3 C, 2 SWS)..... 341

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M.Mat.5416: Seminar on advanced Lie theory (3 C, 2 SWS)..... 342
M.Mat.5417: Seminar on non-commutative geometry (3 C, 2 SWS).....343
M.Mat.5419: Seminar on higher analysis (3 C, 2 SWS).....344
M.Mat.5613: Topics in differential geometry (6 C, 4 SWS)..... 366
M.Mat.5614: Topics in algebraic topology (6 C, 4 SWS).....367
M.Mat.5615: Topics in mathematical methods of physics (6 C, 4 SWS).....368
M.Mat.5616: Topics in advanced Lie theory (6 C, 4 SWS)..... 369
M.Mat.5617: Topics in non-commutative geometry (6 C, 4 SWS).....370
M.Mat.5619: Topics in singular analysis (6 C, 4 SWS)..... 371
M.Mat.5713: Special course in differential geometry (3 C, 2 SWS)..... 392
M.Mat.5714: Special course in algebraic topology (3 C, 2 SWS).....393
M.Mat.5715: Special course in mathematical methods in physics (3 C, 2 SWS)..... 394
M.Mat.5716: Special course in advanced Lie theory (3 C, 2 SWS)..... 395
M.Mat.5717: Special course in non-commutative geometry (3 C, 2 SWS).....396
M.Mat.5719: Special course in higher analysis (3 C, 2 SWS).....397
M.Mat.5913: Oberseminar on differential geometry (3 C, 2 SWS)..... 416
M.Mat.5914: Oberseminar on algebraic topology (3 C, 2 SWS)..... 418
M.Mat.5915: Oberseminar on mathematical methods in physics (3 C, 2 SWS).....420
M.Mat.5916: Oberseminar on Lie theory (3 C, 2 SWS).....422
M.Mat.5917: Oberseminar on non-commutative geometry (3 C, 2 SWS)..... 424
M.Mat.5919: Oberseminar on higher analysis (3 C, 2 SWS).....426

2. Elective compulsory modules in study focus SP 2 "Algebra, geometry, number theory"

B.Mat.4121: Algebraic geometry I (9 C, 6 SWS).....105
B.Mat.4123: Algebraic structures I (9 C, 6 SWS)..... 107
B.Mat.4126: Arithmetic geometry I (9 C, 6 SWS).....109
B.Mat.4127: Primes I (9 C, 6 SWS).....111
B.Mat.4128: Additive number theory I (9 C, 6 SWS).....113
B.Mat.4221: Algebraic geometry II (9 C, 6 SWS).....145
B.Mat.4223: Algebraic structures II (9 C, 6 SWS)..... 147

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B.Mat.4226: Arithmetic geometry II (9 C, 6 SWS)..... 149
B.Mat.4227: Primes II (9 C, 6 SWS)..... 151
B.Mat.4228: Additive number theory II (9 C, 6 SWS)..... 153
M.Mat.5421: Seminar on algebraic geometry (3 C, 2 SWS)..... 345
M.Mat.5423: Seminar on algebraic structures (3 C, 2 SWS)..... 346
M.Mat.5426: Seminar on arithmetic geometry (3 C, 2 SWS)..... 347
M.Mat.5427: Seminar on primes (3 C, 2 SWS)..... 348
M.Mat.5428: Seminar on additive number theory (3 C, 2 SWS)..... 349
M.Mat.5621: Topics in algebraic geometry (6 C, 4 SWS)..... 372
M.Mat.5623: Topics in algebraic structures (6 C, 4 SWS)..... 373
M.Mat.5626: Topics in arithmetic geometry (6 C, 4 SWS)..... 374
M.Mat.5627: Topics in primes (6 C, 4 SWS)..... 375
M.Mat.5628: Topics in additive number theory (6 C, 4 SWS)..... 376
M.Mat.5721: Special course in algebraic geometry (3 C, 2 SWS)..... 398
M.Mat.5723: Special course in algebraic structures (3 C, 2 SWS)..... 399
M.Mat.5726: Special course in arithmetic geometry (3 C, 2 SWS)..... 400
M.Mat.5727: Special course in primes (3 C, 2 SWS)..... 401
M.Mat.5728: Special course in additive number theory (3 C, 2 SWS)..... 402
M.Mat.5921: Oberseminar on algebraic geometry (3 C, 2 SWS)..... 428
M.Mat.5923: Oberseminar on algebraic geometry (3 C, 2 SWS)..... 430
M.Mat.5926: Oberseminar on arithmetic geometry (3 C, 2 SWS)..... 432
M.Mat.5927: Oberseminar on primes (3 C, 2 SWS)..... 434
M.Mat.5928: Oberseminar on additive number theory (3 C, 2 SWS)..... 436

3. Elective compulsory modules in study focus SP 3 "Numerical and applied mathematics"

M.Mat.0731: Advanced practical course in scientific computing (10 C, 4 SWS)..... 310
B.Mat.3030: Numerical linear algebra for data science (9 C, 6 SWS)..... 75
B.Mat.3032: Numerics of ordinary differential equations (6 C, 4 SWS)..... 77
B.Mat.3033: Numerical and applied mathematics (6 C, 4 SWS)..... 79
B.Mat.4130: Introduction to scientific computing / applied mathematics (9 C, 6 SWS)..... 115

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B.Mat.4131: Inverse problems (9 C, 6 SWS)..... 117
B.Mat.4133: Numerics of partial differential equations I (9 C, 6 SWS).....119
B.Mat.4134: Optimisation and variational analysis I (9 C, 6 SWS).....121
B.Mat.4138: Curves and surfaces (9 C, 6 SWS).....123
B.Mat.4139: Applied Fourier analysis (9 C, 6 SWS).....125
B.Mat.4234: Optimisation and variational analysis II (9 C, 6 SWS).....159
B.Mat.4231: Regularisation of inverse problems (9 C, 6 SWS).....155
B.Mat.4233: Numerics of partial differential equations II (9 C, 6 SWS).....157
B.Mat.4235: Inverse problems in differential equations (9 C, 6 SWS).....161
B.Mat.4236: Computer tomography (9 C, 6 SWS)..... 163
B.Mat.4238: Riemannian geometry (9 C, 6 SWS).....165
B.Mat.4239: Numerical methods of signal and image processing (9 C, 6 SWS).....167
M.Mat.5430: Seminar on applied mathematics in the natural sciences (3 C, 2 SWS).....350
M.Mat.5431: Seminar on inverse problems (3 C, 2 SWS).....351
M.Mat.5432: Seminar on approximation (3 C, 2 SWS)..... 352
M.Mat.5433: Seminar on numerics of partial differential equations (3 C, 2 SWS).....353
M.Mat.5434: Seminar on optimisation (3 C, 2 SWS).....354
M.Mat.5435: Seminar on numerical analysis (3 C, 2 SWS)..... 355
M.Mat.5436: Seminar on functional analysis (3 C, 2 SWS).....356
M.Mat.5438: Seminar on discrete differential geometry (3 C, 2 SWS).....357
M.Mat.5439: Seminar on scientific computing (3 C, 2 SWS).....358
M.Mat.5630: Topics in applied mathematics in the natural sciences (6 C, 4 SWS).....377
M.Mat.5631: Topics in inverse problems (6 C, 4 SWS)..... 378
M.Mat.5632: Topics in approximation (6 C, 4 SWS)..... 379
M.Mat.5633: Topics in numerics of partial differential equations (6 C, 4 SWS).....380
M.Mat.5634: Topics in optimisation (6 C, 4 SWS).....381
M.Mat.5635: Topics in integral equations (6 C, 4 SWS)..... 382
M.Mat.5636: Topics in function spaces (6 C, 4 SWS).....383
M.Mat.5638: Topics in discrete differential geometry (6 C, 4 SWS).....384
M.Mat.5639: Topics in scientific computing (6 C, 4 SWS).....385
M.Mat.5730: Special course in applied mathematics in the natural sciences (3 C, 2 SWS).....403

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M.Mat.5731: Special course in inverse problems (3 C, 2 SWS)....404
M.Mat.5732: Special course in approximation (3 C, 2 SWS)....405
M.Mat.5733: Special course in numerics of partial differential equations (3 C, 2 SWS)....406
M.Mat.5734: Special course in optimisation (3 C, 2 SWS)....407
M.Mat.5738: Special course in discrete differential geometry (3 C, 2 SWS)....408
M.Mat.5739: Special course in scientific computing (3 C, 2 SWS)....409
M.Mat.5930: Oberseminar on applied mathematics in the natural sciences (3 C, 2 SWS)....438
M.Mat.5931: Oberseminar on inverse problems (3 C, 2 SWS)....440
M.Mat.5932: Oberseminar on approximation (3 C, 2 SWS)....442
M.Mat.5933: Oberseminar on numerics of partial differential equations (3 C, 2 SWS)....444
M.Mat.5934: Oberseminar on optimisation (3 C, 2 SWS)....446
M.Mat.5938: Oberseminar on discrete differential geometry (3 C, 2 SWS)....448
M.Mat.5939: Oberseminar on scientific computing (3 C, 2 SWS)....450

4. Elective compulsory modules in study focus SP 4 "Mathematical stochastics"

M.Mat.0741: Advanced practical course in stochastics (10 C, 6 SWS)....312
B.Mat.3040: Statistical theory of deep learning (6 C, 4 SWS)....81
B.Mat.3043: Non-life insurance mathematics (6 C, 4 SWS)....83
B.Mat.3044: Life insurance mathematics (6 C, 4 SWS)....85
B.Mat.3047: Statistical modeling and computation (9 C, 6 SWS)....87
B.Mat.3048: Selected topics in probability theory and stochastic processes (3 C, 2 SWS)....89
B.Mat.4140: Selected topics in statistics and machine learning (3 C, 2 SWS)....127
B.Mat.4141: Applied and mathematical stochastics I (9 C, 6 SWS)....129
B.Mat.4142: Introduction to stochastic processes (9 C, 6 SWS)....131
B.Mat.4144: Basics of mathematical statistics (6 C, 4 SWS)....133
B.Mat.4147: Statistical foundations of data science (9 C, 6 SWS)....135
B.Mat.4149: Introduction to stochastic methods and models (9 C, 6 SWS)....137
B.Mat.4241: Applied and mathematical stochastics II (9 C, 6 SWS)....169
B.Mat.4247: Asymptotic statistical methods for data science (9 C, 6 SWS)....171
B.Mat.4248: Stochastic processes and modelling (9 C, 6 SWS)....173

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M.Mat.5140: Statistical learning I (9 C, 6 SWS)..... 315
M.Mat.5141: Applied stochastic processes I (9 C, 6 SWS)..... 317
M.Mat.5142: Stochastic processes I (9 C, 6 SWS)..... 319
M.Mat.5144: Mathematical statistics I (9 C, 6 SWS)..... 321
M.Mat.5240: Statistical learning II (9 C, 6 SWS)..... 331
M.Mat.5241: Applied stochastic processes II (9 C, 6 SWS)..... 333
M.Mat.5242: Stochastic processes II (9 C, 6 SWS)..... 335
M.Mat.5244: Mathematical statistics II (9 C, 6 SWS)..... 337
M.Mat.5440: Seminar on statistical methods for machine learning (3 C, 2 SWS)..... 359
M.Mat.5441: Seminar on applied and mathematical stochastics (3 C, 2 SWS)..... 360
M.Mat.5442: Seminar on stochastic processes (3 C, 2 SWS)..... 361
M.Mat.5444: Seminar on mathematical statistics (3 C, 2 SWS)..... 362
M.Mat.5447: Seminar on statistical foundations of data science (3 C, 2 SWS)..... 363
M.Mat.5448: Seminar on stochastic processes and modelling (3 C, 2 SWS)..... 364
M.Mat.5449: Seminar on stochastic methods and models (3 C, 2 SWS)..... 365
M.Mat.5640: Topics in statistical methods for machine learning (6 C, 4 SWS)..... 386
M.Mat.5641: Topics in applied stochastic processes (6 C, 4 SWS)..... 387
M.Mat.5642: Topics in stochastic processes (6 C, 4 SWS)..... 388
M.Mat.5644: Topics in mathematical statistics (6 C, 4 SWS)..... 389
M.Mat.5647: Topics in statistical foundations of data science (6 C, 4 SWS)..... 390
M.Mat.5648: Topics in stochastic processes and modelling (6 C, 4 SWS)..... 391
M.Mat.5740: Special course in statistical learning (3 C, 2 SWS)..... 410
M.Mat.5741: Special course in applied stochastic processes (3 C, 2 SWS)..... 411
M.Mat.5742: Special course in applied stochastic processes (3 C, 2 SWS)..... 412
M.Mat.5744: Special course in mathematical statistics (3 C, 2 SWS)..... 413
M.Mat.5747: Special course in statistical foundations of data science (3 C, 2 SWS)..... 414
M.Mat.5748: Special course in stochastic processes and modelling (3 C, 2 SWS)..... 415
M.Mat.5940: Oberseminar on statistical learning (3 C, 2 SWS)..... 452
M.Mat.5941: Oberseminar on applied stochastic processes (3 C, 2 SWS)..... 454
M.Mat.5942: Oberseminar on stochastic processes (3 C, 2 SWS)..... 456
M.Mat.5944: Oberseminar on mathematical statistics (3 C, 2 SWS)..... 458

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M.Mat.5947: Oberseminar on statistical data science (3 C, 2 SWS).....460

M.Mat.5948: Oberseminar on stochastic processes and modelling (3 C, 2 SWS)..... 462

III. Professionalisation (graduate studies)

The area "Professionalisation" is divided into two sections "Profile" and "Key competencies":

- In the section "Profile", modules with a total of at least 18C have to be completed successfully.
- In the section "Key competencies", modules with a total of at least 12C have to be completed successfully.

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Der Bereich "Professionalisation" wird in die zwei Bereiche "Profile" und "Key competencies" aufgeteilt:

- Im Bereich "Profile" sind Module vom Gesamtumfang mindestens 18C erfolgreich zu absolvieren.
- Im Bereich "Key competencies" sind Module vom Gesamtumfang mindestens 12C erfolgreich zu absolvieren.

1. Profile

In the "Profile" section, students must successfully complete modules with a total of at least 18C in accordance with the following provisions.

- First, students must successfully complete modules with a total of at least 6C from among those listed under VI. “Minor subjects”. If 18C are earned in one of these subjects in accordance with the conditions described under VI. “Minor subjects”, this subject will be certified as minor subject on the transcript. If 18C are earned in each of several of these subjects, only one of these subjects will be certified as minor subject on the transcript.
- If certification of a minor subject is waived, students may freely choose from all modules listed under VI. “Minor subjects”. In addition, mathematics modules from the module groups B.Mat.3***, B.Mat.4***, or M.Mat.5*** may be included to bring the total to 18C.
- Enrollment in other modules (alternative modules) is also possible with the approval of the Dean of Studies at the faculty offering the module. Enrollment in an alternative module must be reported to the Student Office Mathematics in advance.

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Im Block "Anwendungsbereich" sind Module im Umfang von 18C nach Maßgabe nachfolgender Bestimmungen erfolgreich zu absolvieren.

- Zunächst sind von den unter VI. „Anwendungsfächer“ genannten Modulen Module im Umfang von mindestens 6C erfolgreich zu absolvieren. Werden in einem dieser Fächer 18C nach Maßgabe der unter VI. „Anwendungsfächer“ beschriebenen Bedingungen erworben, so wird dieses als Nebenfach auf dem Zeugnis ausgewiesen. Werden in mehreren dieser Fächer jeweils 18C erworben, so wird dennoch nur eines dieser Fächer als Nebenfach auf dem Zeugnis ausgewiesen.
- Wird auf die Zertifizierung eines Nebenfachs verzichtet, so kann unter allen unter VI. „Minor subjects“ gelisteten Modulen frei gewählt werden. Zudem können zum Auffüllen auf 18C Mathematikmodule aus den Modulgruppen B.Mat.3***, B.Mat.4*** oder M.Mat.5*** eingebracht werden
- Die Belegung anderer Module (Alternativmodule) ist mit Zustimmung der*des Studiendekan*in der Fakultät, die das Modul anbietet, ebenfalls möglich. Die Belegung eines Alternativmoduls ist dem Studienbüro Mathematik vorab anzuzeigen.

2. Key competencies

Modules with a total of at least 12C have to be completed successfully, among them one out of the key competencies modules offered by the Unit Mathematics, according to the regulations in No. IV. "Key competencies in the graduate programme in Mathematics". The remaining modules can be chosen freely from the key competencies modules offered by the Unit Mathematics, according

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to the regulations in No. IV. "Key competencies in the graduate programme in Mathematics", or from the cross-faculty key competencies offer. The choice of other modules (alternative modules) is only possible with the approval of the dean of students of the faculty that offers the module. The choice of an alternative module has to be reported to the Study Office Mathematics in advance.

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Es sind Module im Gesamtumfang von wenigstens 12 C erfolgreich zu absolvieren, darunter eines der Schlüsselkompetenzmodule aus dem Angebot der Lehreinheit Mathematik nach "IV. Key competencies in the graduate programme in Mathematics". Die übrigen Module können frei aus den unter IV. "Key competencies in the graduate programme in Mathematics" genannten Wahlmodulen aus dem Angebot der Lehreinheit Mathematik oder aus dem universitätsweiten Schlüsselkompetenzangebot gewählt werden. Die Belegung anderer Module (Alternativmodule) ist mit Zustimmung der Studiendekanin oder des Studiendekans der Fakultät, die das Modul anbietet, ebenfalls möglich. Die Belegung eines Alternativmoduls ist dem Studienbüro Mathematik vorab anzuzeigen.

IV. Minor subjects in the graduate programme in Mathematics

1. Business Administration

In "Business Administration" as a minor subject the following modules may be chosen.

Im Nebenfach "Betriebswirtschaftslehre" stehen folgende Module zur Auswahl:

B.WIWI-WIN.0001: Enterprise Architecture und Prozessmodellierung (6 C, 4 SWS)....272

B.WIWI-WIN.0002: Strategisches IS- und Daten-Management (6 C, 4 SWS).... 274

B.WIWI-WIN.0007: SAP-Blockschulung (3 C, 1 SWS)....276

B.WIWI-WIN.0027: Seminar zu Themen der Wirtschaftsinformatik (6 C, 2 SWS)....278

B.WIWI-BWL.0006: Finanzmärkte und Bewertung (6 C, 4 SWS).... 220

B.WIWI-BWL.0023: Grundlagen der Versicherungstechnik (6 C, 2 SWS).... 222

B.WIWI-BWL.0038: Supply Chain Management (6 C, 2 SWS).... 224

B.WIWI-BWL.0087: International Marketing (6 C, 2 SWS).... 226

B.WIWI-BWL.0111: Jahresabschluss (6 C, 4 SWS).... 228

B.WIWI-BWL.0112: Finanzwirtschaft des Unternehmens (6 C, 4 SWS).... 230

B.WIWI-ECON.0005: Recht für Wirtschaftswissenschaften (6 C, 4 SWS).... 232

M.WIWI-BWL.0002: Rechnungslegung nach IFRS (6 C, 4 SWS).... 486

M.WIWI-BWL.0003: Unternehmensbesteuerung (6 C, 4 SWS).... 488

M.WIWI-BWL.0004: Financial Risk Management (6 C, 4 SWS).... 490

M.WIWI-BWL.0006: Seminar in Finanzwirtschaft (6 C, 2 SWS).... 492

M.WIWI-BWL.0020: Risk Management and Solvency (6 C, 2 SWS).... 493

M.WIWI-BWL.0023: Performance Management (6 C, 4 SWS).... 494

M.WIWI-BWL.0133: Banking Supervision (6 C, 2 SWS).... 496

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M.WIWI-BWL.0134: Panel Data Analysis in Marketing (6 C, 2 SWS)....498

M.WIWI-QMW.0001: Generalized Regression (6 C, 4 SWS)....499

M.WIWI-QMW.0002: Advanced Statistical Inference (Likelihood & Bayes) (6 C, 4 SWS)....501

M.WIWI-QMW.0009: Introduction to Time Series Analysis (6 C, 4 SWS)....506

M.WIWI-QMW.0011: Advanced Statistical Programming with R (9 C, 2 SWS)....508

M.WIWI-QMW.0012: Multivariate Time Series Analysis (6 C, 4 SWS)....510

M.WIWI-QMW.0042: Computational Statistics (6 C, 4 SWS)....513

2. Chemistry

In "Chemistry" as a minor subject the following module may be chosen. Furthermore all modules in Chemistry out of the graduate programm in Chemistry (module number M.Che.****) can be chosen. Selection of modules out of the undergraduate programme in Chemistry may be selected provided approval through the dean of studies of the Faculty of Chemistry. In this case the Study Office Mathematics must be informed beforehand.

Im Nebenfach "Chemie" stehen folgende Module zur Auswahl. Darüber hinaus können alle Chemie-Module aus dem Master-Studiengang "Chemie" (Modul-Nummern M.Che.****) gewählt werden. Die Belegung von Chemie-Modulen aus dem Bachelor-Studiengang "Chemie" ist mit Zustimmung durch die Studiendekanin oder den Studiendekan der Fakultät für Chemie zulässig. Die Belegung eines solchen Moduls ist dem Studienbüro vorab anzuzeigen.

M.Che.1311: Schwingungsspektroskopie und zwischenmolekulare Dynamik (6 C, 5 SWS)....280

M.Che.1313: Elektronische Spektroskopie und Reaktionsdynamik (6 C, 5 SWS)....282

M.Che.1314: Biophysikalische Chemie (6 C, 5 SWS)....283

M.Che.1315: Chemical Dynamics at Surfaces (6 C, 5 SWS)....284

3. Computer Science

a.

In "Computer Science" as a minor subject all the modules with module number B.Inf.**** or M.Inf.**** can be chosen with the exception of the following modules.

Im Nebenfach „Informatik“ stehen alle Module mit den Modul-Nummern B.Inf.**** und M.Inf.**** zur Auswahl. Davon abweichend können folgende Module nicht eingebracht werden.

- B.Inf.1101: Grundlagen der Informatik und Programmierung
- B.Inf.1102: Grundlagen der Praktischen Informatik
- B.Inf.1801: Programmierkurs

b.

In addition, following modules may be chosen.

Weiterhin können folgende Module eingebracht werden.

B.Phy.5601: Theoretical and Computational Neuroscience I (3 C, 2 SWS)....207

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B.Phy.5602: Theoretical and Computational Neuroscience II (3 C, 2 SWS)..... 208

B.Phy.5651: Advanced Computational Neuroscience (3 C, 2 SWS)..... 211

B.Phy.5652: Advanced Computational Neuroscience II (3 C, 2 SWS)..... 212

B.Phy.5676: Computer Vision and Robotics (9 C, 6 SWS)..... 215

M.Phy.5601: Seminar Computational Neuroscience/Neuroinformatik (4 C, 2 SWS)..... 483

4. Philosophy

In "Philosophy" as a minor subject the following modules can be chosen; for at least one of the selected modules a term paper has to be prepared. Advanced studies modules may be chosen after the respective basic studies module has successfully been completed, only.

Im Nebenfach "Philosophie" stehen folgende Module zur Auswahl; in einem der gewählten Module muss eine Hausarbeit angefertigt werden. Aufbaumodule dürfen nur belegt werden, wenn zuvor die entsprechenden Basismodule erfolgreich abgeschlossen wurden.

B.Phi.01: Basismodul Theoretische Philosophie (9 C, 4 SWS)..... 175

B.Phi.02: Basismodul Praktische Philosophie (9 C, 4 SWS)..... 177

B.Phi.03: Basismodul Geschichte der Philosophie (9 C, 4 SWS)..... 179

B.Phi.05: Aufbaumodul Theoretische Philosophie (10 C, 4 SWS)..... 181

B.Phi.06: Aufbaumodul Praktische Philosophie (10 C, 4 SWS)..... 183

B.Phi.07: Aufbaumodul Geschichte der Philosophie (10 C, 4 SWS)..... 185

B.Phi.18a: Vertiefte Bearbeitung philosophischer Themen für Studierende aller Fächer (6 C, 2 SWS)..... 187

B.Phi.19a: Spezielle Themen der Philosophie für Studierende aller Fächer (3 C, 2 SWS)..... 189

M.Phi.101: Ausgewählte Themen der Theoretischen Philosophie (9 C, 4 SWS)..... 464

M.Phi.102: Ausgewählte Themen der Praktischen Philosophie (9 C, 4 SWS)..... 466

M.Phi.103: Ausgewählte Themen der Geschichte der Philosophie (9 C, 4 SWS)..... 468

5. Physics

In "Physics" as a minor subject all modules listed below can be chosen.

Im Nebenfach "Physik" stehen die nachfolgenden Module zur Auswahl.

B.Phy.1201: Analytische Mechanik (8 C, 6 SWS)..... 190

B.Phy.1202: Klassische Feldtheorie (8 C, 6 SWS)..... 191

B.Phy.1203: Quantenmechanik I (8 C, 6 SWS)..... 192

B.Phy.1204: Statistische Physik (8 C, 6 SWS)..... 193

B.Phy.1511: Einführung in die Kern- und Teilchenphysik (8 C, 6 SWS)..... 194

B.Phy.1521: Einführung in die Festkörperphysik (8 C, 6 SWS)..... 195

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B.Phy.1531: Introduction to Materials Physics (4 C, 4 SWS)..... 196
B.Phy.1541: Einführung in die Geophysik (4 C, 3 SWS)..... 197
B.Phy.1551: Introduction to Astrophysics (8 C, 6 SWS)..... 198
B.Phy.1561: Introduction to Physics of Complex Systems (6 C, 6 SWS)..... 199
B.Phy.1571: Introduction to Biophysics (6 C, 6 SWS)..... 200
B.Phy.5402: Advanced Quantum Mechanics (6 C, 6 SWS)..... 201
B.Phy.5513: Numerical fluid dynamics (6 C, 4 SWS)..... 202
B.Phy.5516: Physik der Galaxien (3 C, 2 SWS)..... 203
B.Phy.5517: Physics of the Sun, Heliosphere and Space Weather: Key Knowledge (3 C, 2 SWS)... 204
B.Phy.5518: Physics of the Sun, Heliosphere and Space Weather: Space Weather Applications (3 C, 2 SWS)..... 205
B.Phy.5523: General Relativity (6 C, 6 SWS)..... 206
B.Phy.5601: Theoretical and Computational Neuroscience I (3 C, 2 SWS)..... 207
B.Phy.5602: Theoretical and Computational Neuroscience II (3 C, 2 SWS)..... 208
B.Phy.5605: Computational Neuroscience: Basics (3 C, 2 SWS)..... 209
B.Phy.5624: Introduction to Theoretical Neuroscience (4 C, 2 SWS)..... 210
B.Phy.5651: Advanced Computational Neuroscience (3 C, 2 SWS)..... 211
B.Phy.5652: Advanced Computational Neuroscience II (3 C, 2 SWS)..... 212
B.Phy.5665: Processing of Signals and Measured Data (3 C, 2 SWS)..... 213
B.Phy.5670: Grundlagen der Magnetresonanztomographie (6 C, 4 SWS)..... 214
B.Phy.5676: Computer Vision and Robotics (9 C, 6 SWS)..... 215
B.Phy.5725: Renormalization group theory and applications (6 C, 6 SWS)..... 217
B.Phy.5805: Quantum field theory I (6 C, 6 SWS)..... 218
B.Phy.5810: Physics of the Higgs boson (3 C, 3 SWS)..... 219
M.Phy.409: Research Seminar Astro-/Geophysics (4 C, 2 SWS)..... 470
M.Phy.410: Research Seminar Biophysics/Physics of Complex Systems (4 C, 2 SWS)..... 471
M.Phy.411: Research Seminar Solid State/Materials Physics (4 C, 2 SWS)..... 472
M.Phy.412: Research Seminar Particle Physics (4 C, 2 SWS)..... 473
M.Phy.413: General Seminar (4 C, 2 SWS)..... 474
M.Phy.415: Research Seminar Theoretical Physics (4 C, 2 SWS)..... 475
M.Phy.5401: Advanced Statistical Physics (6 C, 6 SWS)..... 476

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M.Phy.541: Advanced Topics in Classical Theoretical Physics I (6 C, 6 SWS)..... 477
M.Phy.542: Advanced Topics in Classical Theoretical Physics II (6 C, 4 SWS)..... 478
M.Phy.543: Advanced Topics in Theoretical Quantum Physics I (6 C, 6 SWS)..... 479
M.Phy.544: Advanced Topics in Theoretical Quantum Physics II (6 C, 4 SWS)..... 480
M.Phy.551: Advanced Topics in Astro-/Geophysics I (6 C, 6 SWS)..... 481
M.Phy.552: Advanced Topics in Astro-/Geophysics II (6 C, 4 SWS)..... 482
M.Phy.571: Advanced Topics in Solid State/Materials Physics I (6 C, 6 SWS)..... 484
M.Phy.572: Advanced Topics in Solid State/Materials Physics II (6 C, 4 SWS)..... 485

6. Economics

In "Economics" as a minor subject the following modules can be chosen:
Im Nebenfach "Volkswirtschaftslehre" stehen folgende Module zur Auswahl:

B.WIWI-BWL.0023: Grundlagen der Versicherungstechnik (6 C, 2 SWS)..... 222
B.WIWI-ECON.0005: Recht für Wirtschaftswissenschaften (6 C, 4 SWS)..... 232
B.WIWI-QMW.0001: Linear Models (6 C, 4 SWS)..... 234
B.WIWI-QMW.0009: Seminar in Angewandter Ökonometrie (6 C, 3 SWS)..... 236
B.WIWI-VWL.0001: Mikroökonomik II (6 C, 5 SWS)..... 238
B.WIWI-VWL.0002: Makroökonomik II (6 C, 4 SWS)..... 240
B.WIWI-VWL.0004: Finanzwissenschaft (6 C, 4 SWS)..... 242
B.WIWI-VWL.0005: Internationale Wirtschaftsbeziehungen (6 C, 4 SWS)..... 244
B.WIWI-VWL.0006: Wachstum und Entwicklung (6 C, 4 SWS)..... 246
B.WIWI-VWL.0007: Ökonometrie (6 C, 6 SWS)..... 248
B.WIWI-VWL.0008: Geldtheorie und Geldpolitik (6 C, 4 SWS)..... 250
B.WIWI-VWL.0009: Labor Economics (6 C, 3 SWS)..... 252
B.WIWI-VWL.0010: Institutionenökonomik (6 C, 2 SWS)..... 254
B.WIWI-VWL.0011: Finanz- und Steuerpolitik der EU (6 C, 3 SWS)..... 256
B.WIWI-VWL.0028: Spieltheorie (6 C, 4 SWS)..... 258
B.WIWI-VWL.0038: Ausgewählte Fragestellungen der Volkswirtschaftslehre (6 C, 2 SWS)..... 260
B.WIWI-VWL.0059: Internationale Finanzmärkte (6 C, 4 SWS)..... 262
B.WIWI-VWL.0084: Introduction to Global Health (6 C, 3 SWS)..... 264
B.WIWI-VWL.0113: Mikroökonomik I (6 C, 5 SWS)..... 266
B.WIWI-VWL.0114: Makroökonomik I (6 C, 4 SWS)..... 269

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B.WIWI-WB.0006: Kritische Ökonomik (6 C, 2 SWS)..... 271

M.WIWI-BWL.0134: Panel Data Analysis in Marketing (6 C, 2 SWS).....498

M.WIWI-QMW.0001: Generalized Regression (6 C, 4 SWS).....499

M.WIWI-QMW.0002: Advanced Statistical Inference (Likelihood & Bayes) (6 C, 4 SWS).....501

M.WIWI-QMW.0004: Econometrics I (6 C, 6 SWS).....503

M.WIWI-QMW.0005: Econometrics II (6 C, 4 SWS).....505

M.WIWI-QMW.0009: Introduction to Time Series Analysis (6 C, 4 SWS).....506

M.WIWI-QMW.0011: Advanced Statistical Programming with R (9 C, 2 SWS).....508

M.WIWI-QMW.0012: Multivariate Time Series Analysis (6 C, 4 SWS).....510

M.WIWI-QMW.0041: Stochastic Processes (6 C, 4 SWS).....512

M.WIWI-QMW.0042: Computational Statistics (6 C, 4 SWS).....513

M.WIWI-VWL.0001: Advanced Microeconomics (6 C, 4 SWS).....515

M.WIWI-VWL.0041: Panel Data Econometrics (6 C, 4 SWS).....517

M.WIWI-VWL.0092: International Trade (6 C, 4 SWS).....519

M.WIWI-VWL.0099: Poverty & Inequality (6 C, 3 SWS).....521

M.WIWI-VWL.0128: Deep Determinants of Growth and Development (6 C, 2 SWS)..... 523

V. Key competencies in the graduate programme in Mathematics

Within the graduate programme in Mathematics, the Unit Mathematics offers the following modules.

Die Lehreinheit Mathematik bietet im Master-Studiengang "Mathematik" folgende Schlüsselkompetenzmodule an.

B.Mat.0732: Practical course in scientific computing: Basics (3 C, 2 SWS).....41

B.Mat.0733: Practical course in scientific computing: Extensions (3 C, 2 SWS).....43

B.Mat.0736: Practical course in scientific computing: Advanced extensions (6 C, 2 SWS).....45

B.Mat.0739: Practical course in scientific computing in the context of a research project or a business project (9 C, 2 SWS).....47

B.Mat.0721: Mathematisch orientiertes Programmieren (6 C, 4 SWS)..... 39

M.Mat.0731: Advanced practical course in scientific computing (10 C, 4 SWS)..... 310

M.Mat.0741: Advanced practical course in stochastics (10 C, 6 SWS).....312

B.Mat.0743: Stochastisches Praktikum: Einführung (3 C, 2 SWS).....49

B.Mat.0746: Practical course in stochastics: advanced course (6 C, 4 SWS).....50

B.Mat.0921: Einführung in TeX/LaTeX und praktische Anwendungen (3 C, 2 SWS).....52

B.Mat.0922: Mathematics information services and electronic publishing (3 C, 2 SWS).....54

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B.Mat.0923: Scientific Writing (3 C, 2 SWS)..... 56

B.Mat.0931: Tutorentraining (4 C, 2 SWS)..... 58

B.Mat.0932: Vermittlung mathematischer Inhalte an ein Fachpublikum (3 C, 2 SWS)..... 60

B.Mat.0935: Historische, museumspädagogische und technische Aspekte für den Aufbau, Erhalt und die Nutzung wissenschaftlicher Modellsammlungen (4 C, 2 SWS)..... 61

B.Mat.0936: Medienbildung zu mathematischen Objekten und Problemen (4 C, 2 SWS)..... 62

B.Mat.0940: Mathematik in der Welt, in der wir leben (3 C, 2 SWS)..... 63

B.Mat.0950: Mitgliedschaft in der studentischen oder akademischen Selbstverwaltung (3 C, 1 SWS)..... 65

B.Mat.0951: Ehrenamtliches Engagement in einem mathematischen Umfeld (3 C, 1 SWS)..... 66

B.Mat.0952: Organisation einer mathematischen Veranstaltung (3 C, 2 SWS)..... 67

B.Mat.0970: Betriebspraktikum (8 C)..... 68

M.Mat.0971: Internship (10 C)..... 314

B.Mat.3099: Abschlussarbeitseminar und gute wissenschaftliche Praxis (6 C, 3 SWS)..... 91

VI. Master's thesis

By successfully completing a Master's thesis students earn 30 C.

VII. Modulpakete "Mathematik" im Umfang von 36C oder 18C (belegbar ausschließlich im Rahmen eines anderen geeigneten Master-Studiengangs)

This paragraph is addressed to students in non-mathematics M.A. graduate programmes, only.

Die Lehreinheit Mathematik bietet folgende Modulpakete für Studierende in M.A.-Masterstudiengängen an.

1. Zugangsvoraussetzungen

Für die Modulpakete „Mathematik“ im Umfang von 36C bzw. 18C gelten folgende gemeinsame Zugangsvoraussetzungen:

- Nachweis von Leistungen aus Grundlagen der Mathematik im Umfang von insgesamt wenigstens 33C, darunter Grundlagen der Analysis im Umfang von insgesamt wenigstens 18C (z.B. durch die Module B.Mat.0011 und B.Mat.0021) sowie der Analytischen Geometrie und Linearen Algebra im Umfang von insgesamt wenigstens 15C (z.B. durch die Module B.Mat.0012 und B.Mat.0026).
- Ferner der Nachweis weiterführender Leistungen der reinen oder angewandten Mathematik im Umfang von insgesamt wenigstens 21C, empfohlen werden die Module B.Mat.10**.

2. Modulpaket "Mathematik" im Umfang von 36C

Es müssen Module im Umfang von insgesamt wenigstens 36C erfolgreich absolviert werden. Es können alle weiterführenden mathematischen Module des Bachelor-Studiengangs „Mathematik“ der Georg-August-Universität Göttingen (Modulnummern B.Mat.2**** oder B.Mat.3*** oder B.Mat.4***) oder des Master-Studiengangs „Mathematik“ der Georg-August-Universität Göttingen (Modulnummern M.Mat.5***) absolviert werden. Empfohlen werden die Module des Bachelorstudiengangs.

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3. Modulpaket "Mathematik" im Umfang von 18C

Es müssen Module im Umfang von insgesamt wenigstens 18C erfolgreich absolviert werden. Es können alle weiterführenden mathematischen Module des Bachelor-Studiengangs „Mathematik“ der Georg-August-Universität Göttingen (Modulnummern B.Mat.2**** oder B.Mat.3*** oder B.Mat.4***) oder des Master-Studiengangs „Mathematik“ der Georg-August-Universität Göttingen (Modulnummern M.Mat.5***) absolviert werden. Empfohlen werden die Module des Bachelorstudiengangs.

VIII. Methods of examination and glossary

Methods of examination

As far as in this directory of modules a module description is published in the English language the following mapping applies:

Soweit in diesem Modulverzeichnis Modulbeschreibungen in englischer Sprache veröffentlicht werden, gilt für die verwendeten Prüfungsformen nachfolgende Zuordnung:

- Oral examination = mündliche Prüfung [§ 15 Abs. 8 APO]
- Written examination = Klausur [§ 15 Abs. 9 APO]
- Term paper = Hausarbeit [§ 15 Abs. 11 APO]
- Presentation = Präsentation [§ 15 Abs. 12 APO]
- Presentation and written report = Präsentation mit schriftlicher Ausarbeitung [§ 15 Abs. 12 APO]

Glossary

APO = Allgemeinen Prüfungsordnung für Bachelor- und Master-Studiengänge sowie sonstige Studienangebote an der Universität Göttingen

PStO = Prüfungs- und Studienordnung für den Bachelor/Master-Studiengang "Mathematik"

WLH = Weekly lecture hours = SWS

Programme coordinator = Studiengangsbeauftrage/r

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Inf.1236: Machine Learning**	6 C 4 WLH

Learning outcome, core skills: Students • learn concepts and techniques of machine learning and understand their advantages and disadvantages compared with alternative approaches • learn techniques of supervised learning for classification and regression • learn techniques of unsupervised learning for density estimation, dimensionality reduction and clustering • implement machine learning algorithms like linear regression, logistic regression, kernel methods, tree-based methods, neural networks, principal component analysis, k-means and Gaussian mixture models • solve practical data science problems using machine learning methods	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Machine Learning (Lecture) Bishop: Pattern recognition and machine learning. https://cs.ugoe.de/prml	2 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** B.Inf.1236.Ex: At least 50% of homework exercises solved and N-1 attempts presented to tutors **Examination requirements:** Knowledge of the working principles, advantages and disadvantages of the machine learning methods covered in the lecture	6 C

Course: Machine Learning - Exercise (Exercise) *Contents*: Students present their solutions of the homework exercises to tutors and discuss them with their tutors.	2 WLH

Admission requirements: none	**Recommended previous knowledge:** Knowledge of basic linear algebra and probability English language proficiency at level B2 (CEFR)
Language: English	**Person responsible for module:** Prof. Dr. Alexander Ecker
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 4
Maximum number of students: 100	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Inf.1237: Deep Learning for Computer Vision**	6 C 4 WLH

Learning outcome, core skills: Students • learn concepts and techniques of deep learning and understand their advantages and disadvantages compared to alternative approaches • learn to solve practical data science problems using deep learning • implement deep learning techniques like multi-layer perceptrons, convolutional neural networks and other modern deep learning architectures • learn techniques for optimization and regularization of deep neural networks • learn applications of deep neural networks for computer vision tasks such as segmentation and object detection	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Deep Learning for Computer Vision (Lecture) Goodfellow, Bengio, Courville: Deep Learning. https://www.deeplearningbook.org Bishop: Pattern Recognition and Machine Learning. https://cs.ugoe.de/prml	2 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** B.Inf.1237.Ex: At least 50% of homework exercises solved and N-1 attempts presented to tutors **Examination requirements:** Knowledge of basic deep learning techniques, their advantages and disadvantages and approaches to optimization and regularization. Ability to implement these techniques.	6 C

Course: Deep Learning for Computer Vision - Exercise (Exercise) *Contents*: Students present their solutions of the homework exercises to tutors and discuss them with their tutors.	2 WLH

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of linear algebra and probability Completion of B.Inf.1236 Machine Learning or equivalent
Language: English	**Person responsible for module:** Prof. Dr. Constantin Pape Prof. Dr. Alexander Ecker
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 5
Maximum number of students: 100	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Inf.1240: Visualization**	6 C 4 WLH

Learning outcome, core skills: Knowledge of • the potentials and limitations of data visualization • the fundamentals of visual perception and cognition and their implications for data visualization. Students can apply these to the design of visualizations and detect manipulative design choices • a broad variety of techniques for visual representation of data, including abstract and high-dimensional data. Students can select appropriate methods on new problems • integration of visualization into the data analysis process, algorithmic generation and interactive methods	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Visualization (Lecture,Exercise) *Course frequency:* once a year	4 WLH
Examination: Practical project (2-3 weeks) with presentation and questions during oral exam in groups (approx. 20 minutes per examinee). **Examination prerequisites:** At least 50% of homework exercises solved. **Examination requirements:** Knowledge of potentials and limitations of data visualization, fundamentals of visual perception and their implications for good design choices, techniques for visual representation and how to use them.	6 C

Admission requirements: none	**Recommended previous knowledge:** Foundations of linear algebra and analysis (e.g. B.Mat.0841 and B.Mat.0842) and programming skills (e.g. B.Inf.1842).
Language: English	**Person responsible for module:** Prof. Dr. Bernhard Schmitzer
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 3 - 6
Maximum number of students: 50	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Inf.1241: Computational Optimal Transport**	6 C 4 WLH

Learning outcome, core skills: Knowledge of • the fundamental notions of optimal transport, and its strengths and limitations as a data analysis tool • the discrete Kantorovich formulation, its convex duality, and Wasserstein distances • classical numerical algorithms, entropic regularization, and their scopes of applicability • examples for data analysis applications. Students can transfer these to new potential applications	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Computational Optimal Transport (Lecture,Exercise) *Course frequency:* once a year	4 WLH
Examination: Written exam (90 minutes) or oral exam (approx. 20 minutes) **Examination prerequisites:** At least 50% of homework exercises solved. **Examination requirements:** Knowledge of Kantorovich duality, Wasserstein distances, standard algorithms and implications for data analysis applications.	6 C

Admission requirements: none	**Recommended previous knowledge:** Foundations of linear algebra and analysis (e.g. B.Mat.0841 and B.Mat.0842) and programming skills (e.g. B.Inf.1842).
Language: English	**Person responsible for module:** Prof. Dr. Bernhard Schmitzer
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 4 - 6
Maximum number of students: 50	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Inf.1244: Data Management for Data Science**	5 C 4 WLH

Learning outcome, core skills: The module provides the fundamental conceptual, systemic and application-related aspects of the sustainable utilization of data from its creation and publication to its sustainable storage. Organized handling of data includes the processes of archiving and re-using data. This covers the strategic planning of research projects (research data management), the management of the technical foundations and the recording, organization, and linking of metadata. The participants will learn approaches to handle big data, including all facets of heterogenous or fast streaming data. We will also work on the concepts of (web) APIs in order to empower the participants to collect and combine their own data sets. The latter requires an understanding of standard processes such as Extract-Transform-Load (ETL). Data integration and interoperability of different data sources is the central challenge. The learned concepts will be tested and applied using advanced solutions. We will investigate the current market of data management tools, warehouse solutions or data processing platforms. The students develop the ability to think in systems and processes. The students are able to transfer their acquired knowledge and skills for problem solving to new areas of responsibility, to work together in groups and to work on new issues together.	**Workload:** Attendance time: 56 h Self-study time: 94 h

Course: Data Management for Data Science (Lecture,Exercise) *Contents*: • Data management processes in the context of the data life cycle • Tools for data management • Provision of data for data science processes • Data quality and data security • Data handling in the context of IoT • ETL/ELT processes • Stream & batch processing • Read-only-data structures • Data Lakes vs Data Warehouse • Event-driven data architectures *Course frequency:* each winter semester	4 WLH
Examination: Written examination (120 minutes) **Examination requirements:** • Describing the data lifecycle • Understanding different approaches for data archiving • Explaining the structure, functionality and use of practice-relevant data management, storage and archiving systems • Understanding the ETL/ELT processes for data handling • Describing the concepts of data warehousing and data lakes • Describing the concepts and challenges for Big Data and data at scale	5 C

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- Understanding the read only data store architecture

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dr. Sven Bingert
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: not limited	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Mat.0721: Mathematisch orientiertes Programmieren** *English title: Mathematics related programming*	6 C 4 SWS

Lernziele/Kompetenzen: **Lernziele:** Das erfolgreiche Absolvieren des Moduls ermöglicht den Studierenden den sicheren Umgang mit mathematischen Anwendersystemen. Die Studierenden • erwerben die Befähigung zum sicheren Umgang mit mathematischen Anwendersystemen; • erfassen die Grundprinzipien der Programmierung; • sammeln Erfahrungen mit elementaren Algorithmen und deren Anwendungen; • verstehen die Grundlagen der Programmierung in der Programmiersprache Python; • lernen Kontroll- und Datenstrukturen kennen; • erlernen die Grundzüge des imperativen und funktionalen Programmierens; • setzen Bibliotheken zur Lösung naturwissenschaftlicher Fragestellungen ein; • erlernen verschiedene Methoden der Visualisierung; • beherrschen die Grundtechniken der Projektverwaltung (Versionskontrolle, Arbeiten im Team). **Kompetenzen:** Nach erfolgreichem Absolvieren des Moduls haben die Studierenden grundlegende Techniken für das Lösen mathematisch/physikalischer Problemstellungen mit der Hilfe der Programmiersprache Python erlernt.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Semesterbegleitender Kurs *Inhalte*: Semesterbegleitender Kurs bestehend aus Vorlesung (2V) mit Übungen (2Ü), z.B. "Mathematisch orientiertes Programmieren"	4 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: Nachweis über den Erwerb der folgenden Kenntnisse und Fähigkeiten. Die Teilnehmer/innen weisen grundlegende Techniken für das Lösen mathematisch/physikalischer Problemstellungen mit der Hilfe der Programmiersprache Python nach.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.Mat.0011, B.Mat.0012
Sprache: Deutsch	**Modulverantwortliche[r]:** Studiendekan*in Mathematik
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit:	**Empfohlenes Fachsemester:**

nicht-amtliche Fassung

dreimalig	Bachelor: 1 - 6; Master: 1 - 4
Maximale Studierendenzahl: 120	

Bemerkungen:

Dozent*in: Lehrpersonen des Instituts für Numerische und Angewandte Mathematik

Bei ausreichender Lehrkapazität kann dieser Kurs zusätzlich in der vorlesungsfreien Zeit als Blockveranstaltung bestehend aus Vorlesung, Übungen und Tutorium im Umfang von insgesamt 3SWS angeboten werden. Der verringerte SWS-Umfang bei gleichem Credit-Volument bedingt einen entsprechend höheren Umfang des Selbststudiums.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.0732: Practical course in scientific computing: Basics**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** After successfully completing the module, students have basic practical experience in scientific computing. They • are able to carry out programming projects in individual and group work; • have solid programming skills; • are proficient in the use of an integrated development environment; • are able to version projects using a version control system; • have mastered some basic procedures for the numerical solution of mathematical problems. **Core skills:** After successfully completing the module, students will be able to • structure programming tasks in such a way that they can be completed efficiently in group work; • develop and document a programming project in an understandable way; • use a version control system; • implement mathematical algorithms and procedures in a programming language or user system	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Practical course in scientific computing: Basics (Course)	2 WLH
Examination: Portfolio as a versioned programming project (max. 15 pages without attachments)	3 C

Examination requirements: Students are able to apply mathematical knowledge to programming tasks. They can structure these programming tasks in such a way that efficient collaboration in groups is established. They will be able to develop and document these programming tasks in a structured manner, including with the help of version control systems.	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1013
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 3 - 6; Master: 1 - 4
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.0733: Practical course in scientific computing: Extensions**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** This module builds on the course B.Mat.0732 "Practical course in scientific computing: Basics", in which practical foundations of scientific computing are laid. After successfully completing the module, students have basic practical experience in scientific computing. They • are able to create programming projects in individual and group work; • have solid programming skills; • are proficient in the use of an integrated development environment; • are able to version projects using a version control system; • have mastered some basic procedures for the numerical solution of mathematical problems; • are able to ensure the quality and reliability of code through testing; • are proficient in working with environments to develop and deploy applications consistently. • have basic knowledge of automation in software development. **Core skills:** After successfully completing the module, students will be able to • structure programming tasks in such a way that they can be completed efficiently in group work; • develop and document a programming project in an understandable way; • use a version control system; • implement mathematical algorithms and procedures in a programming language or user system; • ensure the reliability of code in an automated way; • provide a programming project in an efficient and user-friendly way.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Practical course in scientific computing: Basics and extensions (Course)	2 WLH
Examination: Portfolio as a versioned programming project (max. 35 pages without attachments)	3 C

Examination requirements: Students are able to apply the mathematical knowledge they have acquired during their studies to practical tasks. They can design programming tasks in such a way that efficient and structured processing is established. They can develop and document their own project and manage it using version control systems. In addition, they are able to implement mathematical algorithms and procedures in code and critically reflect on the results in terms of subject content.	

Admission requirements:	**Recommended previous knowledge:**

nicht-amtliche Fassung

none	B.Mat.0732, B.Mat.1013
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 4 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:

- **Instructor:** Lecturers at the Institute of Numerical and Applied Mathematics
- **Exclusions:** Only one of the courses B.Mat.0733, B.Mat.0736 and B.Mat.0739 can be taken.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.0736: Practical course in scientific computing: Advanced extensions**	6 C 2 WLH

Learning outcome, core skills:
Learning outcome:

This module builds on the course B.Mat.0732 "Practical course in scientific computing: Basics", in which practical foundations of scientific computing are laid. After successfully completing the module, students have basic practical experience in scientific computing. They

- are able to create programming projects in individual and group work;
- have solid programming skills;
- are proficient in the use of an integrated development environment;
- are able to version projects using a version control system;
- have mastered some basic procedures for the numerical solution of mathematical problems.
- are able to ensure the quality and reliability of code through testing;
- are proficient in working with environments to develop and deploy applications consistently;
- have basic knowledge of automation in software development;
- are able to apply techniques to parallelise tasks or use GPU computing to accelerate calculations;
- can carry out performance profiling and implement strategies to optimise memory consumption;
- master the optimisation of algorithms to improve efficiency in software development.

Core skills:

After successfully completing the module, students will be able to

- structure programming tasks in such a way that they can be completed efficiently in group work;
- develop and document a programming project in an understandable way;
- use a version control system;
- implement mathematical algorithms and procedures in a programming language or user system;
- ensure the reliability of code in an automated way;
- provide a programming project in an efficient and user-friendly way;
- identify mathematical problems in application questions independently and convert them into a mathematical model;
- convert complex mathematical problems into a series of simple programming tasks in order to solve them independently;
- independently analyse and present questions in the field of scientific computing.

Workload:
Attendance time: 28 h
Self-study time: 152 h

Course: Practical course in scientific computing: Basics and advanced extensions (Course)	2 WLH

nicht-amtliche Fassung

Examination: Portfolio as a versioned programming project (max. 45 pages without attachments) **Examination prerequisites:** Oral presentation (approx. 45 minutes)	6 C

Examination requirements: Students are able to apply the mathematical knowledge they have acquired during their studies to complex practical tasks. They can design programming tasks in such a way that efficient and structured processing is guaranteed. They can develop and document their own project and manage it using version control systems. In addition, they are able to implement mathematical algorithms and procedures in code and critically reflect on their approach. Students will also be able to present the methods and tools used in an understandable and structured way.

Admission requirements: none	**Recommended previous knowledge:** B.Mat.0732, B.Mat.1013
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 4 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:

- **Instructor:** Lecturers at the Institute of Numerical and Applied Mathematics
- **Exclusions:** Only one of the courses B.Mat.0733, B.Mat.0736 and B.Mat.0739 can be taken.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.0739: Practical course in scientific computing in the context of a research project or a business project**	9 C 2 WLH

Learning outcome, core skills:
Learning outcome:

This module builds on the course B.Mat.0732 "Practical course in scientific computing: Basics", in which practical foundations of scientific computing are laid. An integral part of the module is an (external) internship in the context of mathematical research. After successfully completing the module, students have expanded their practical experience in scientific computing. They

- are able to create programming projects in group work;
- have solid programming skills;
- are proficient in the use of an integrated development environment;
- are able to version projects using a version control system;
- have mastered some basic procedures for the numerical solution of mathematical problems.
- are able to ensure the quality and reliability of code through testing;
- are proficient in working with environments to develop and deploy applications consistently;
- have basic knowledge of automation in software development;
- are able to apply techniques to parallelise tasks or use GPU computing to accelerate calculations;
- can carry out performance profiling and implement strategies to optimise memory consumption;
- master the optimisation of algorithms to improve efficiency in software development;
- they are familiar with mathematical procedures, tools and processes as well as the organisational and social environment of the practice.

Core skills:

After successfully completing the module, students will be able to

- structure programming tasks in such a way that they can be completed efficiently in group work;
- develop and document a programming project in an understandable way;
- use a version control system;
- implement mathematical algorithms and procedures in a programming language or user system;
- ensure the reliability of code;
- provide a programming project in an efficient and user-friendly way;
- identify mathematical problems in application questions independently and convert them into a mathematical model;
- convert complex mathematical problems into a series of simple programming tasks in order to solve them independently;
- independently analyse and present questions in the field of scientific computing;

Workload:
Attendance time:
28 h
Self-study time:
242 h

nicht-amtliche Fassung

• acquire skills in project-related and research-orientated teamwork and project management.	

Course: Practical course in scientific computing in the context of a research project or a business project (Course)	2 WLH
Examination: Portfolio as a versioned programming project (max. 45 pages without attachments) **Examination prerequisites:** Oral presentation (approx. 45 minutes)	9 C

Examination requirements: Students are able to apply the mathematical knowledge they have acquired during their studies to complex practical tasks in the context of a research project or a business project. They can design programming tasks in such a way that efficient and structured processing is guaranteed. They can develop and document a research project or a business project and manage it using version control systems. In addition, they are able to implement mathematical algorithms and procedures in code and critically reflect on their approach. Students will also be able to present the methods and tools used in an understandable and structured way.	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.0732, B.Mat.1013
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 4 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:

- **Instructor:** Lecturers at the Institute of Numerical and Applied Mathematics
- **Exclusions:** Only one of the courses B.Mat.0733, B.Mat.0736 and B.Mat.0739 can be taken.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Mat.0743: Stochastisches Praktikum: Einführung** *English title: Practical course in stochastics: Introduction*	3 C 2 SWS

Lernziele/Kompetenzen: **Lernziele:** Nach erfolgreichem Absolvieren des Moduls sind die Studierenden mit den grundlegenden Eigenschaften und Methoden einer statistischen Simulations- und Analyse-Software (z.B. “R” oder Python) vertraut. Sie • implementieren einfache stochastische Modelle und interpretieren selbstständig einfache entsprechende Problemstellungen in einer geeigneten Software; • führen einfache statistische Simulationen durch und lernen diese grafisch darzustellen; • beherrschen einige grundlegende Techniken der deskriptiven Statistik und können diese in konkreten Datenprojekten anwenden. **Kompetenzen:** Nach erfolgreichem Absolvieren des Moduls sind die Studierenden in der Lage • eine stochastische Simulations- und Analyse-Software auf konkrete stochastische Problemstellungen anzuwenden und die erhaltenen Resultate von grundlegenden Methoden fachgerecht zu präsentieren; • statistische Daten und ihre wichtige Eigenschaften adäquat zu visualisieren und interpretieren.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 62 Stunden

Lehrveranstaltung: Stochastisches Praktikum: Einführung (Blockveranstaltung)	2 SWS
Prüfung: Portfolio (max. 15 Seiten ohne Anhänge), unbenotet	3 C

Prüfungsanforderungen: Grundlegende Kenntnisse in praktischer Stochastik.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.Mat.0024
Sprache: Deutsch	**Modulverantwortliche[r]:** Studiendekan*in Mathematik
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** 2 - 6
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen: Dozent*in: Lehrpersonen des Instituts für Mathematische Stochastik

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.0746: Practical course in stochastics: advanced course**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** This module builds on the course B.Mat.0743 "Practical course in stochastics: Introduction", in which practical foundations of stochastics are laid. After successfully completing the module, students are familiar with the basic properties and methods of statistical simulation and analysis software (e.g. "R" or Python). They • are proficient in some basic estimation techniques such as the maximum likelihood estimation method and its simulation of the associated statistical risk and their simulation in advanced statistical models, such as linear, non-linear and logistic regression methods and elementary methods for cluster analysis; • are proficient in techniques for simulating stochastic models and algorithms and apply them; • are proficient in basic methods of inferential statistics and their simulation, in particular confidence intervals and test procedures; • are able to apply these methods to data projects and to interpret and visualise their results. **Core skills:** After successfully completing the module, students will be able to • apply estimation techniques and evaluate them on the basis of statistical risk; • apply stochastic simulation techniques; • apply methods of inferential statistics to data projects; • adequately visualise and interpret statistical data and present results of their project.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Practical course in stochastics: Basics and extensions (Course)	4 WLH
Examination: Portfolio (maximum 35 pages, without attachments)	3 C
Examination: Oral examination (approximately 20 minutes)	3 C

Examination requirements: In-depth knowledge of practical stochastics.	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.0721, B.Mat.0743 It is recommended that participants have knowledge in statistics beyond B.Mat.0024 (e.g. B.Mat.4147).
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: each winter semester	**Duration:** 1 semester[s]

nicht-amtliche Fassung

Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Mat.0921: Einführung in TeX/LaTeX und praktische Anwendungen** *English title: Introduction to TeX/LaTeX with applications*	3 C (Anteil SK: 3 C) 2 SWS

Lernziele/Kompetenzen: **Lernziele:** Nach erfolgreichem Absolvieren des Moduls sind die Studierenden mit dem Einsatz von TeX oder LaTeX zur Erstellung von wissenschaftlichen Texten und Vorträgen vertraut. Sie • sind vertraut mit ordentlicher Dokumentengliederung; • erstellen Literaturangaben und Querverweise; • erzeugen mathematische Formeln; • erzeugen Grafiken und binden sie ein. **Kompetenzen:** Nach erfolgreichem Absolvieren des Moduls sind die Studierenden in der Lage, • einfache Dokumente mit LaTeX zu erstellen; • ansprechende Vortragsfolien mit LaTeX zu erzeugen.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 62 Stunden

Lehrveranstaltung: Blockkurs *Inhalte*: Einwöchige Blockveranstaltung mit Praktikum	
Prüfung: Hausarbeit (max. 10 Seiten), unbenotet **Prüfungsvorleistungen:** Regelmäßige Teilnahme an der Veranstaltung **Prüfungsanforderungen:** Erstellung eines wissenschaftlichen Portfolios mit TeX/LaTeX und der Folien für eine Präsentation mit Beamer-TeX.	3 C

Prüfungsanforderungen: Sicherer Umgang mit den grundlegenden Funktionen von LaTeX und Bearmer-TeX	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Grundkenntnisse im Umgang mit einem Computer.
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Studiendekan*in Mathematik
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Bachelor: 1 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Bemerkungen:
Dozent*in: Lehrpersonen des Mathematischen Instituts

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.0922: Mathematics information services and electronic publishing**	3 C (incl. key comp.: 3 C) 2 WLH

Learning outcome, core skills: **Learning outcome:** After having successfully completed the module, students are familiar with the basics of mathematics information services and electronic publishing. They • work with popular information services in mathematics and with conventional, non-electronic as well as electronic media; • know a broad spectrum of mathematical information sources including classification principles and the role of meta data; • are familiar with current development in the area of electronic publishing in the subject mathematics. **Core skills:** After successfull completion of the module students have acquired subject-specific information competencies. They • have suitable research skills; • are familiar with different information and specific publication services.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Lecture course (Lecture) *Contents*: Lecture course with project report	
Examination: Written examination (90 minutes), not graded **Examination prerequisites:** Regular participation in the course	3 C

Examination requirements: Application of the acquired skills in individual projects in the area of mathematical information services and electronic publishing	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 1 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

nicht-amtliche Fassung

Instructors: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.0923: Scientific Writing**	3 C (incl. key comp.: 3 C) 2 WLH

Learning outcome, core skills:
Learning outcome:

After having successfully completed the module, students are familiar with the basics of scientific writing.

Objectives:

- How to start; motivation for writing a paper (thesis, term paper, seminar presentation, conference talk); choice of language (German/English/?); when to start; support resources.
- Different text types in the professional carreer, e.g. motivation letter, research report, technical report, proposal etc.
- Plagiarism; different types of plagiarism, unintentional and intentional plagiarism; how to avoid and recognise plagiarism? How to avoid being accused of plagiarism?
- Planning and execution, structure, overall style of language, clear and concise writing, writing problems and how to avoid them, cultural sensitivity, cultural transferability.
- Discussion; purpose, content, tense, structure; introducing tense, voice and mood; introducing modular writing and why it helps.
- Methods; purpose, content (Bishop report implications), tense, structure.
- Results; purpose, content, tense, structure; what goes in figures, images and tables; effective placing and citation of figures, images, tables; warning on image manipulation.
- Introduction; purpose, content, tense, structure.
- Title, abstract, key words, search engine optimisation, list of references, acknowledgements.
- Optionally, choosing a journal, text matching, predatory & trick journals, your audience, factors affecting choice, scope, impact factors, open access.
- Optionally, ethics of publication, COPE, Vancouver rules and other bodies, authorship, author order, contributorship statements, coauthors, corresponding authors, chaperones, grievance procedures.

Core skills:

After successfull completion of the module students have acquired subject-specific competencies in scientific writing. They

- have suitable research skills;
- are familiar with how to find and discuss a topic academically and using academic terms and methodology.

Workload:
Attendance time:
28 h
Self-study time:
62 h

Course: Lecture course (Lecture) *Contents*: Lecture course with project report	2 WLH

nicht-amtliche Fassung

Examination: Term Paper (max. 15 pages), not graded	3 C

Examination requirements: Application of the acquired skills in individual projects in the area of mathematical information services and electronic publishing	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 1 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructors: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Mat.0931: Tutorentraining** *English title: Coaching of teaching assistants*	4 C (Anteil SK: 4 C) 2 SWS

Lernziele/Kompetenzen: **Lernziele:** Nach erfolgreichem Absolvieren des Moduls sind die Studierenden mit theoretischen und praktischen Fragestellungen der Vermittlung mathematischen Wissens vertraut. Sie werden befähigt, • mathematische Inhalte an Studierende im ersten Semester zu vermitteln; • eine heterogene Übungsgruppe zu leiten. • verschiedene Lehrmethoden und Visualisierungstechniken einzusetzen; • souverän aufzutreten. **Kompetenzen:** Nach erfolgreichem Absolvieren des Moduls sind die Studierenden in der Lage, • Rhetorik- und Präsentationstechniken einzusetzen; • Teamkompetenzen (insb. Motivationsfähigkeit und sicherer Umgang mit Konfliktsituationen) einzusetzen; • Methoden des Zeitmanagements zu verwenden; • interkulturelle Kompetenzen, insbesondere interkulturelle Kommunikationswege einzusetzen.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 92 Stunden

Lehrveranstaltung: Integratives Projekt *Inhalte*: Neben dem Leiten einer Übungsgruppe während des gesamten Semesters oder einer Blockveranstaltung beinhaltet das Projekt ein Vorbereitungsseminar und ein Abschlussseminar sowie begleitende Kurzveranstaltungen. *Angebotshäufigkeit:* jedes Wintersemester	
Prüfung: Präsentation [Übungsstunde] (ca. 45 Minuten) und schriftliche Ausarbeitung (max. 5 Seiten), unbenotet **Prüfungsvorleistungen:** Teilnahme an der Veranstaltung	4 C

Prüfungsanforderungen: Nachweis des Erreichens der Lernziele und Erwerbs der Kompetenzen durch Umsetzung in einer Übungsstunde	

Zugangsvoraussetzungen: Übertragung der Leitung einer Übungsgruppe zu einer Lehrveranstaltung der Fakultät für Mathematik und Informatik im gleichen Semester	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Studiendekan*in Mathematik

nicht-amtliche Fassung

Angebotshäufigkeit: keine Angabe	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Bachelor: 3 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:
Dozent*in: Lehrpersonen des Mathematischen Instituts

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Mat.0932: Vermittlung mathematischer Inhalte an ein Fachpublikum** *English title: Communicating mathematical topics to a professional audience*	3 C (Anteil SK: 3 C) 2 SWS

Lernziele/Kompetenzen: **Lernziele:** Nach erfolgreichem Absolvieren des Moduls sind die Studierenden mit theoretischen und praktischen Grundlagen der Vermittlung mathematischen Wissens vertraut. Sie • schätzen das Niveaus der Zielgruppe einer mathematischen Darbietung ein; • strukturieren Präsentationen gut; • beherrschen sicher stilistische und technische Aspekte der Darbietung; • wählen adäquate Hilfsmittel (z.B. zur Visualisierung); • steuern die Diskussion mit dem Publikum. **Kompetenzen:** Nach erfolgreichem Absolvieren des Moduls verfügen die Studierenden über je nach Veranstaltung verschiedene Kommunikations- und Vermittlungskompetenzen sowie ggf. Fremdsprachenkompetenzen.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 62 Stunden

Lehrveranstaltung: Veranstaltung mit theoretischem und praktischem Anteil, kann ggf. als Blockveranstaltung angeboten werden oder als Teil eines mathematischen Seminars. (Seminar)	
Prüfung: Präsentation (45 Minuten), unbenotet **Prüfungsvorleistungen:** Teilnahme an der Veranstaltung	3 C

Prüfungsanforderungen: Nachweis des Erreichens der Lernziele durch Anfertigen einer Darbietung zur Vermittlung mathematischer Inhalte (Format der Darbietung je nach Veranstaltung)	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Studiendekan*in Mathematik
Angebotshäufigkeit: keine Angabe	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Bachelor: 3 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen: Dozent*in: Lehrpersonen der Lehreinheit Mathematik

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Mat.0935: Historische, museumspädagogische und technische Aspekte für den Aufbau, Erhalt und die Nutzung wissenschaftlicher Modellsammlungen** *English title: Historical, museum-related, and technical aspects of the building-up, the maintenance and the use of scientific collections*	4 C (Anteil SK: 4 C) 2 SWS

Lernziele/Kompetenzen: **Lernziele:** Nach erfolgreichem Absolvieren des Moduls verfügen die Studierenden über Kenntnisse des Planens und Gestaltens von Mathematikunterricht und mathematikdidaktischen Forschungsprojekten **Kompetenzen:** Nach erfolgreichem Absolvieren des Moduls nutzen die Studierenden Kenntnisse der mathematischen Wissensvermittlung. Sie • ordnen wissenschaftliche Modellsammlungen in ihren historischen Kontext ein, • nutzen museumspädagogische Ansätze für die Vermittlung mit Hilfe von Objekten, • kennen Beispiele für Techniken, die für den Aufbau und Erhalt von Objekten in Modellsammlungen erforderlich sind.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 92 Stunden

Lehrveranstaltung: Seminar	2 SWS
Prüfung: Portfolio (max. 5000 Zeichen), unbenotet	4 C

Prüfungsanforderungen: Erarbeitung historischer, museumspädagogischer und technischer Aspekte eines Modells oder mehrerer Modelle in Kontexten von Sammlungen.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Studiendekan*in Mathematik
Angebotshäufigkeit: keine Angabe	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Master: 1 - 4
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:
Dozent*in: Lehrpersonen des Mathematischen Instituts

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Mat.0936: Medienbildung zu mathematischen Objekten und Problemen** *English title: Media education for mathematical objects and problems*	4 C (Anteil SK: 4 C) 2 SWS

Lernziele/Kompetenzen: **Lernziele:** Nach erfolgreichem Absolvieren des Moduls verfügen die Studierenden über Kenntnisse des Medienunterstützen Lehrens und Lernens zu mathematischen Objekten und Problemen. **Kompetenzen:** Nach erfolgreichem Absolvieren des Moduls ordnen die Studierenden wissenschaftliche Modellsammlungen in ihren historischen Kontext ein. Sie • nutzen Kenntnisse der Medienbildung zur mathematischen Wissensvermittlung, • vergleichen unterschiedliche Designs für die Illustration mathematischer Objekte und Probleme, • implementieren beispielhaft unterschiedliche medientechnische Realisierungen mathematischer • Objekte.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 92 Stunden

Lehrveranstaltung: Seminar	2 SWS
Prüfung: Portfolio (max. 5000 Zeichen), unbenotet	4 C

Prüfungsanforderungen: Erarbeitung medienbezogener Aspekte eines Modells oder mehrerer Modelle in Kontexten von Sammlungen.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Studiendekan*in Mathematik
Angebotshäufigkeit: keine Angabe	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Master: 1 - 4
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:
Dozent*in: Lehrpersonen des Mathematischen Instituts

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Mat.0940: Mathematik in der Welt, in der wir leben** *English title: The mathematical nature of the world we are living in*	3 C (Anteil SK: 3 C) 2 SWS

Lernziele/Kompetenzen: **Lernziele:** Nach erfolgreichem Absolvieren des Moduls sind die Studierenden mit der Rolle der Mathematik in unserer Gesellschaft vertraut, wobei die Schwerpunktsetzung je nach Veranstaltung ausgestaltet wird. Die Studierenden • entwickeln ein stärkeres Bewusstsein für die Rolle der Mathematik in anderen Fachdisziplinen; • erwerben ein tieferes Verständnis für die Bedeutung der Mathematik für den (technologischen) Fortschritt; • erkennen die Bedeutung der Mathematik für das Verständnis von Vorgängen und Erscheinungen in der Natur; • verstehen die Rolle der Mathematik in der Gesellschaft. **Kompetenzen:** Nach erfolgreichem Absolvieren des Moduls verfügen die Studierenden über verschiedene Kompetenzen, je nach Ausgestaltung der Lehrveranstaltung haben sie • ihre Befähigung zum Logischen Denken ausgebaut; • das mathematische Interpretieren von Observationen und Daten in einem außermathematischem Kontext erlernt; • die Transferfähigkeit von abstraktem Wissen auf reelle Situationen erworben; • ihre Methodenkompetenz im mathematischen Bereich gestärkt.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 62 Stunden

Lehrveranstaltung: Vorlesung oder Seminar	
Prüfung: Klausur (90 Minuten) oder Hausarbeit (max. 10 Seiten), unbenotet	3 C

Prüfungsanforderungen: Nachweis des Erreichens der Lernziele durch Anwendung auf ausgewählte Problemstellungen	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Studiendekan*in Mathematik
Angebotshäufigkeit: jährlich	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Bachelor: 1 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Bemerkungen:
Dozent*in: Lehrpersonen der Lehreinheit Mathematik

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Mat.0950: Mitgliedschaft in der studentischen oder akademischen Selbstverwaltung** *English title: Membership in the student or academic self-government*	3 C (Anteil SK: 3 C) 1 SWS

Lernziele/Kompetenzen: Die Studierenden erwerben zentrale Kompetenzen der Planung, Organisation, Präsentation sowie Grundkenntnisse in der Projektplanung. Sie erwerben Kompetenzen in Rhetorik, in Selbstpräsentation und in freier Rede. Im Praxisteil erlangen die Studierenden vertiefte Kenntnisse in den Bereichen Moderationstechniken, Gesprächsführung sowie Entscheidungs- und Konfliktlösungsverhalten in Gruppen.	**Arbeitsaufwand:** Präsenzzeit: 14 Stunden Selbststudium: 76 Stunden

Lehrveranstaltung: Gremienveranstaltung	
Prüfung: Hausarbeit (max. 5 Seiten), unbenotet	3 C

Prüfungsanforderungen: Die Studierenden erbringen den Nachweis der Befähigung, dass sie Erfahrungen aus der Praxis mit theoretischen Wissen verknüpfen und Methoden der Reflektion anwenden können.	

Zugangsvoraussetzungen: Mitgliedschaft in mindestens einem der folgenden Gremien: 1. Fakultätsrat der Fakultät für Mathematik und Informatik oder eine seiner Kommissionen 2. Senat der Universität oder einer seiner Kommissionen 3. Vorstand des Studentenwerks 4. Vorstand eines Instituts des Bereichs Mathematik oder Tätigkeit als Gleichstellungsbeauftragte der Fakultät für Mathematik und Informatik.	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Studiendekan*in Mathematik
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Bachelor: 1 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen: Dozent*in: Studiendekan*in Mathematik oder Studienreferent*in Mathematik

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Mat.0951: Ehrenamtliches Engagement in einem mathematischen Umfeld** *English title: Civic engagement in a mathematical environment*	3 C (Anteil SK: 3 C) 1 SWS

Lernziele/Kompetenzen: Die Studierenden erwerben zentrale Kompetenzen der Planung, Organisation, Präsentation sowie Grundkenntnisse in der Projektplanung. Sie erwerben Kompetenzen in Rhetorik, in Selbstpräsentation und in freier Rede. Im Praxisteil erlangen die Studierenden vertiefte Kenntnisse in mathematischer Wissensvermittlung sowie in mindestens einem der folgenden Bereichen: • Moderationstechniken, • Gesprächsführung • Entscheidungs- und Konfliktlösungsverhalten in Gruppen.	**Arbeitsaufwand:** Präsenzzeit: 14 Stunden Selbststudium: 76 Stunden

Lehrveranstaltung: Projektarbeit	
Prüfung: Portfolio (max. 5 Seiten), unbenotet	3 C

Prüfungsanforderungen: Die Studierenden erbringen den Nachweis der Befähigung, dass sie Erfahrungen aus der Praxis mit theoretischen Wissen verknüpfen und Methoden der Reflektion anwenden können.	

Zugangsvoraussetzungen: Ehrenamtliche Tätigkeit ohne Entgelt oder Aufwandsentschädigung, z.B. 1. bei der Durchführung der Mathematik-Olympiade oder dem Bundeswettbewerb Mathematik 2. Nachhilfe im Rahmen von sozialen Projekten 3. Mathematisches Korrespondenz-Zirkel 4. MatheCamp	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Studiendekan*in Mathematik
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Bachelor: 1 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen: Dozent*in: Studiendekan*in Mathematik oder Studienreferent*in Mathematik

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Mat.0952: Organisation einer mathematischen Veranstaltung** *English title: Event management in mathematics*	3 C (Anteil SK: 3 C) 2 SWS

Lernziele/Kompetenzen: **Lernziele:** Nach erfolgreichem Absolvieren des Moduls sind die Studierenden mit Problemen, die bei der Organisation einer mathematischen Veranstaltung entstehen, vertraut. Dabei wird die Schwerpunktsetzung je nach dem zu organisierenden Veranstaltungsprojekt ausgestaltet, zu dem die Studierenden einen abgegrenzten, aktiven Beitrag leisten. **Kompetenzen:** Nach erfolgreichem Absolvieren des Moduls verfügen die Studierenden über verschiedene Kompetenzen, je nach Ausgestaltung des Veranstaltungsprojekts erwerben sie • Organisations- und Managementkompetenzen; • Kompetenzen im Informations- und Zeitmanagement; • Teamkompetenz.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 62 Stunden

Lehrveranstaltung: Integratives Projekt *Inhalte*: *Angebotshäufigkeit:* jährlich	
Prüfung: Projektpräsentation (ca. 20 Minuten) oder Hausarbeit (max. 5 Seiten), unbenotet	3 C

Prüfungsanforderungen: Nachweis der Kompetenzen und Fähigkeiten durch einen abgegrenzten, aktiven Beitrag zu einem Veranstaltungsprojekt.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Studiendekan*in Mathematik
Angebotshäufigkeit: keine Angabe	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Bachelor: 1 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen: Dozent*in: Lehrpersonen der Lehreinheit Mathematik

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Mat.0970: Betriebspraktikum** *English title: Internship*	8 C (Anteil SK: 8 C)

Lernziele/Kompetenzen: Nach erfolgreichem Absolvieren des Moduls besitzen die Studierenden Kompetenzen in projektbezogener und forschungsorientierter Teamarbeit sowie im Projektmanagement. Sie sind mit Verfahren, Werkzeugen und Prozessen der Mathematik sowie dem organisatorischen und sozialen Umfeld der Praxis vertraut.	**Arbeitsaufwand:** Präsenzzeit: 0 Stunden Selbststudium: 240 Stunden

Lehrveranstaltung: Prüfungskolloquium (Kolloquium)	
Prüfung: Präsentation (ca. 20 Minuten) mit schriftlicher Ausarbeitung (max. 10 Seiten), unbenotet **Prüfungsvorleistungen:** Bescheinigung über die erfolgreiche Erfüllung der gestellten Aufgaben gemäß Praktikumsplan	8 C

Prüfungsanforderungen: Erfolgreiche Bearbeitung der gestellten Aufgaben gemäß zwischen dem oder der Studierenden, der Lehrperson und dem Betrieb zu vereinbarendem Praktikumsplan	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Studiendekan*in Mathematik
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Bachelor: 4 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen: Dozent*in: Lehrpersonen der Lehreinheit Mathematik

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.3010: Analysis on manifolds**	9 C 6 WLH

Learning outcome, core skills: **Learning outcome:** Upon successful completion of the module, students will be familiar with the following fundamental concepts and methods of analysis on manifolds: • Tangent space, vector field (also time-dependent), integral curve, commutator of vector fields, vector bundle; • ocal existence and uniqueness theorem, continuous and C^k-dependence on initial value for ordinary differential equations, flow of a vector field; • Algebra of differential forms and graded commutativity, pullback and its properties, integral of a differential form, de Rham differential, Lie derivative; • Manifolds, tangent and cotangent bundle, submanifolds, distributions and Frobenius' Theorem; • Orientation, Stokes' Theorem, classical 2- and 3-dimensional integral theorems, de Rham cohomology; • Critical points, Sard's Theorem, Morse theory; • Decomposition of the unit, vector bundle; • Introduction to Lie groups and Lie algebras, examples, group actions; • Transversality, mapping degree, intersection index. **Core skills:** Upon successful completion of the module, students will be able to: • Master the ways of thinking and proof techniques of the theory, apply theorems; • Solve examples of ordinary differential equations (linear systems with constant coefficients, etc.); • Handle calculations with differential forms and vector fields (properties of the de Rham differential, Cartan formula, Lie derivative of vector fields and commutator, etc.); • Use examples of manifolds (real and complex Grassmannians, 2-dimensional, etc.), define submanifolds by regular value theorem; • Find critical points with their invariants; • Recognize and analyze the actions of matrix Lie groups (fundamental vector field, stabilizers, etc.).	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Analysis on manifolds (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.3010.Ue: Achievement of at least 50% of the exercise points as well as committed participation, presentation of solutions	9 C

Course: Analysis on manifolds - exercises (Exercise)	2 WLH

Examination requirements:	

nicht-amtliche Fassung

Proof of knowledge of analysis on manifolds	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.0021, B.Mat.0022
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.3011: Functional analysis and spectral theory**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** After successfully completing the module, students are familiar with functional-analytic thinking and know the central concepts and results of the field. They have the relevant knowledge on the following topics: • Banach algebras and spectral theory: Banach-Mazur Theorem, maximal ideal space, Gelfand representation theorem, spectrum, holomorphic functional calculus; • C*-algebras: C*-norms, Gelfand-Naimark theorem, GNS construction, positivity, automatic continuity; • Spectral theorem for (unbounded) normal operators on Hilbert space, three variants: via spectral measures, functional calculus, and multiplication operators, proof for selfadjoint operators, applications in mathematical physics; • Fréchet spaces, the basic functional-analytic principles continue to hold in them; • Distributions and the Fourier transform: tempered distributions, operations on distributions, homogeneous distributions, the Fourier transform, convolutions, fundamental solutions for constant-coefficient differential operators, Laplace, Cauchy-Riemann, heat, and wave operators as examples. **Core skills:** After successfully completing the module, students are able to • work in infinite-dimensional spaces and argue geometrically there; • reduce or translate problems from other areas of mathematics into functional-analytic ones; • understand the importance and use of functional-analytic concepts such as completeness, boundedness, and compactness.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Functional analysis and spectral theory (Lecture)	3 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.3011.Ue: Achievement of at least 50% of the exercise points as well as committed participation, presentation of solutions	6 C

Course: Functional analysis and spectral theory - exercises (Exercise)	1 WLH

Examination requirements: Proof of knowledge in functional analysis and spectral theory.	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.0021, B.Mat.0022, B.Mat.1021
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency:	**Duration:**

nicht-amtliche Fassung

each winter semester	1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.3012: Introduction to topology**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** After successfully passing the module the students are familiar with topological ways of thinking and know the central concepts and results of the area. They know the basics of (set theoretic) topology, in particular they • have fully grasped the concept of topological spaces; • know basic constructions like quotient topologies; • use topological constructions like simplicial complexes; • are familiar with concept of homotopy and its applications; • have a working knowledge of (co)homology of simplicial complexes; • use concrete and abstract models of covering theory and the fundamental group; • are familiar with the basic ideas of topological data analysis. **Core skills:** After successfully passing the module the students are capable to • compute and apply topological invariants like the fundamental groups; • analyze mathematical problems and argue using a topological way of thinking; • model geometric situations with topological tools like simplicial complexes; • can formulate problems using appropriate topological language and analyze and solve them with topological methods.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Introduction to topology (Lecture)	3 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.3012.Ue: Achievement of at least 50% of the exercise points as well as committed participation, presentation of solutions	6 C

Course: Introduction to topology - exercises (Exercise)	1 WLH

Examination requirements: Proof of basic knowledge in algebraic topology	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.0021, B.Mat.0022, B.Mat.1021
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students:	

nicht-amtliche Fassung

not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.3030: Numerical linear algebra for data science**	9 C 6 WLH

Learning outcome, core skills: **Learning outcome:** After successfully completing the module, students will be familiar with analysing numerical methods of linear algebra, in particular with regard to stability, efficiency and applicability to data science problems. The module builds on the courses "Numerics and optimisation I/II", whose first part already covers linear systems of equations and direct solution methods. The focus of this module is on advanced topics and their applications in data science. Following the course students • will have a better understanding of the importance of eigenvalues and singular values of linear mappings, especially in the context of data science; • know efficient numerical methods for the numerical calculation of these and can apply and analyse them; • know how to solve large linear least squares problems efficiently. **Core skills:** Students will develop fundamental skills in numerical linear algebra and its application in data science. They • are able to identify problems from data science as problems of (numerical) linear algebra and apply tools of numerical analysis to them; • are able to apply numerical methods to solve linear systems of equations, fitting problems or eigenvalue problems; • analyse their computational complexity, stability and suitability for large data sets.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Numerical linear algebra for data science (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.3030.Ue: Achievement of at least 50% of the exercise points as well as committed participation, presentation of solutions	9 C

Course: Numerical linear algebra for data science - exercises (Exercise)	2 WLH

Examination requirements: Proof of advanced knowledge in numerical linear algebra for data science	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1023
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency:	**Duration:**

nicht-amtliche Fassung

each winter semester	1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.3032: Numerics of ordinary differential equations**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** After successfully completing the module, students are familiar with analysing ordinary differential equations, in particular with regard to the existence, uniqueness and stability of solutions and basic numerical methods for solving them. They • learn the basics of the theory of initial value problems;become familiar with numerical methods for the numerical solution of initial value problems and deal with the error analysis of the methods; • know the concept of stiffness as well as the necessity and examples of implicit integrators; • analyse geometric integrators and their properties; • discuss the theory of boundary value problems in one space dimension and analyse their solution with finite differences. **Core skills:** Students develop basic competences in the numerics of differential equations. They: • analyse the well-posedness of differential equations and systems of differential equations; • analyse errors in numerical integrators; in particular, they can analyse the consistency and stability of these; • are able to apply numerical differential equation solvers to differential equations and systems of differential equations; • analyse numerical methods in terms of their complexity and suitability for different types of differential equations; • implement and analyse numerical algorithms for selected problems.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Numerics of ordinary differential equations (Lecture)	3 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.3032.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise session	6 C

Course: Numerics of ordinary differential equations - exercises (Exercise)	1 WLH

Examination requirements: Proof of knowledge of numerics of ordinary differential equations	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1023
Language:	**Person responsible for module:**

nicht-amtliche Fassung

English	Dean of studies mathematics
Course frequency: every 4th semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.3033: Numerical and applied mathematics**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** After successfully completing the module, students are familiar with advanced concepts of numerical and applied mathematics. They • acquire sound knowledge of mathematical modelling of real problems, the development of numerical algorithms and their theoretical and practical analysis, in particular they • learn methods for modelling complex systems and their numerical solution techniques; • analyse the efficiency, stability and convergence of numerical methods; • know modern algorithms and analyse their application to current problems in science and technology **Core skills:** Students develop essential skills in numerical and applied mathematics. They: • master advanced techniques of mathematical modelling and their implementation in numerical methods; • analyse numerical algorithms with regard to their accuracy, stability and computational complexity; • evaluate and optimise numerical methods for real applications; • implement numerical algorithms and test their performance on practical problems.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Numerical and applied mathematics (Lecture)	3 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.3033.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise session	6 C

Course: Numerical and applied mathematics - exercises (Exercise)	1 WLH

Examination requirements: Proof of knowledge of numerical and applied mathematics	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1023
Language: English	**Person responsible for module:** Dead of studies mathematics
Course frequency: every 4th semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

nicht-amtliche Fassung

three times	Bachelor: 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.3040: Statistical theory of deep learning**	6 C 4 WLH

Learning outcome, core skills: This course deals with the statistical foundations of the theory of neural networks including basic concepts of deep neural networks and statistical techniques of deep learning. **Learning outcome:** The aim of the module is to equip students with knowledge in the following areas: • basics of neural networks; • approximation properties of neural networks; • complexity of neural networks; • risk bounds of deep neural networks; • training of neural networks; • random forests. **Core skills:** After having successfully completed the module, students are familiar with fundamental terms and statistical foundations of deep learning. They • know concepts and techniques of deep learning and understand their advantages and disadvantages compared to alternative approaches; • are familiar with approximation properties and complexity of neural networks; • acquire knowledge about robustness and risk bounds of neural networks; • master the process of training neural networks; • understand ensemble methods such as random decision forests and are able to apply them to machine learning tasks.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Statistical theory of deep learning - lectures (Lecture)	2 WLH
Examination: Oral examination (approximately 20 minutes)	6 C

Course: Statistical theory of deep learning - exercises (Exercise)	2 WLH

Examination requirements: Knowledge of • statistical foundations of deep learning techniques; • concepts of neural networks; • properties and complexity of neural networks; • robustness and risk bounds of neural networks; • ensemble methods, in particular, random decision forests and their application to machine learning tasks.	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1024
Language:	**Person responsible for module:**

nicht-amtliche Fassung

English	Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 4 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.3043: Non-life insurance mathematics**	6 C 4 WLH

Learning outcome, core skills:

Non-life insurance mathematics deals with models and methods of quantifying risks with both, the occurrence of the loss and its amount showing random patterns. In particular the following problems are to be solved:

- determing appropriate insurance premiums,
- calculate adequate loss reserves,
- determine how to allocate risk between policyholder and insurer resp. insurer and reinsurers.

The German Actuarial Association (Deutsche Aktuarvereinigung e. V.) has certified this module as element of the training as an actuary („Aktuar DAV“ / „Aktuarin DAV“, cf. www.aktuar.de). To this end, the course is designed in view of current legislative and regulatory provisions of the Federal Republic of Germany.

Learning Outcomes

The aim of the module is to equip students with knowledge in four areas:

1. risk models,
2. pricing,
3. reserving,
4. risk sharing.

After completion of the module students are familiar with fundamental terms and methods of non-life insurance mathematics. They

- are familiar with and able to handle essential definitions and terms within non-life insurance mathematics;
- have an overview of the most valuables problem statements of non-life insurance;
- understand central aspects of risk theory;
- know substantial pricing and reserving methods,
- estimate ruin probabilities;
- are acquainted with the most important reinsurance forms and reinsurance pricing methods.

Competencies

After successful completion of the module students have acquired fundamental competencies within non-life insurance. They are able to

- evaluate and quantify fundamental risks,
- model the aggregate loss with individual or collective model,
- apply a basic reserve of solving approaches,
- analyse and develop pricing models which mathematically are state of the art,
- apply different reserving methods and calculate outstanding losses,
- assess reinsurance contracts.

Workload:

Attendance time: 56 h

Self-study time: 124 h

Course: Lecture course with exercise session	4 WLH

nicht-amtliche Fassung

Examination: Written examination (120 minutes)	6 C

Examination requirements: Basic knowledge of non-life insurance mathematics	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1014
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 4 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: External lecturers at the Institute of Mathematical Stochastics

Accreditation: This course is accredited by the German Actuarial Association (Deutsche Aktuarvereinigung e. V.).

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.3044: Life insurance mathematics**	6 C 4 WLH

Learning outcome, core skills:
This module deals with the basics of the different branches in life insurance mathematics.In particular, the students get to know both the classical deterministic model and the stochastic model as well as how to apply them to problems relevant in the respective branch. On this base the students describe essential notions of present values, premiums and their present values as well as the actuarial reserve.

The German Actuarial Association (Deutsche Aktuarvereinigung e. V.) has certified this module as element of the training as an actuary („Aktuar DAV“ / „Aktuarin DAV“, cf. www.aktuar.de). To this end, the course is designed in view of current legislative and regulatory provisions of the Federal Republic of Germany.

Learning outcomes:
After successfully completing this module students are familiar with fundamental terms and methods of life insurance mathematics. In particular they

- assess cashflows within financial and insurance mathematics,
- apply methods of life insurance mathematics to problems from theory and practise.
- characterise financial secutiries and insurance contracts in terms of cashflows,
- have an overview of the most valuables problem statements of life insurance,
- understand the stochastic interest structure,
- master fundamental terms and notions of life insurance mathematics,
- get an overwiew of most important problems in life insurance mathematics,
- understand mortality tables and leaving orders within pension insurance,
- know substantial pricing and reserving methods,
- know the economic and legal requirements of private health insurance in Germany,
- are acquainted with per-head loss statistics, present value factor calculation and biometric accounting priciples.

Competencies:
A student who completes this module successfully should have acquired fundamental competencies within life insurance. The student should be able to

- assess cashflows with respect to both collateral and risk under deterministic interest structure,
- calculating premiums and provisions in life -, health- and pension-insurance,
- understand the actuarial equivalence principle as base of actuarial valuation in life insurance,
- apply and understand the actuarial equivalence principle for calculating premiums, actuarial reserves and ageing provisions,
- calculate profit participation in life insurance,
- master premium calculation in health-insurance,
- calculate present value and settlement value of pension obligations,
- find mathematical solutions to practical questions in life, health and pension insurance.

Workload:
Attendance time:
56 h
Self-study time:
124 h

nicht-amtliche Fassung

Course: Lecture course with exercises	4 WLH
Examination: Written examination (120 minutes)	6 C

Examination requirements: Basic knowledge of life insurance mathematics

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1014
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 4 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: External lecturers at the Institute of Mathematical Stochastics

Accreditation: This course is accredited by the German Actuarial Association (Deutsche Aktuarvereinigung e. V.).

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.3047: Statistical modeling and computation**	9 C 6 WLH

Learning outcome, core skills: This course deals with the statistical foundations of the theory of neural networks including basic concepts of deep neural networks and statistical techniques of deep learning. **Learning outcome:** The aim of the module is to equip students with knowledge in the following areas: • basics of neural networks; • approximation properties of neural networks; • complexity of neural networks; • risk bounds of deep neural networks; • training of neural networks; • random forests. **Core skills:** After having successfully completed the module, students are familiar with fundamental terms and statistical foundations of deep learning. They • know concepts and techniques of deep learning and understand their advantages and disadvantages compared to alternative approaches; • are familiar with approximation properties and complexity of neural networks; • acquire knowledge about robustness and risk bounds of neural networks; • master the process of training neural networks; • understand ensemble methods such as random decision forests and are able to apply them to machine learning tasks.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Statistical modeling and computation (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.3047.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Examination: oral examination (approximately 20 minutes) (alternative) **Examination prerequisites:** B.Mat.3047.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Statistical modeling and computation - exercises (Exercise)	2 WLH

Examination requirements: Knowledge of • statistical foundations of deep learning techniques; • concepts of neural networks; • properties and complexity of neural networks;	

nicht-amtliche Fassung

- robustness and risk bounds of neural networks;
- ensemble methods, in particular, random decision forests and their application to machine learning tasks.

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Institute of Mathematical Stochastics

Examination: The default format for the examination is a written examination. Alternatively, the examination may be conducted as an oral examination; this will be decided upon and announced no later than the start of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.3048: Selected topics in probability theory and stochastic processes**	3 C 2 WLH

Learning outcome, core skills: In this course selected topics of probability theory and stochastic processes will be discussed. **Learning outcome:** The aim of the module is to equip students with deeper knowledge in modern areas of probability theory and stochastic processes, e.g. • random geometry and spatial stochastics; • Markov chain theory, convergence and MCMC techniques; • stochastic interacting particle systems; • approximation of stochastic processes and systems; • asymptotic analysis of stochastic systems. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics **Core skills:** After having successfully completed the module, students are familiar with selected topics in probability theory and stochastic processes. They • know concepts and techniques of advanced probability theory and stochastic processes and understand how to apply these to concrete problems; • are familiar with random graphs and networks; • acquire knowledge about interacting stochastic systems; • are familiar with techniques for the analysis and approximation of stochastic systems; • understand asymptotic behaviors of stochastic systems.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Selected topics in probability theory and stochastic processes (Lecture)	2 WLH
Examination: Oral examination (approximately 20 minutes)	3 C

Examination requirements: Knowledge of fundamental terms and statistical foundations of deep learning, in partticular • concepts and techniques of advanced probability theory and stochastic processes; • random graphs and networks; • interacting stochastic systems; • techniques for the analysis and approximation of stochastic systems; • asymptotic behaviors of stochastic systems.	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1024
Language:	**Person responsible for module:**

nicht-amtliche Fassung

English	Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Mat.3099: Abschlussarbeitseminar und gute wissenschaftliche Praxis** *English title: Thesis project seminar and good scientific practise*	6 C (Anteil SK: 3 C) 3 SWS

Lernziele/Kompetenzen: **Lernziele:** Nach erfolgreichem Absolvieren des Moduls sind die Studierenden mit Grundlagen guter wissenschaftlicher Praxis in folgenden Bereichen vertraut: • Ehrlichkeit und Transparenz; • Nachvollziehbarkeit und Reproduzierbarkeit; • Autoren- und Urheberschaft sowie Zitationspraxis; • wissenschaftliche Sorgfalt und Umgang mit Fehlern; • Unabhängigkeit und Objektivität; • Publikationsethik; • Befangenheiten und Umgang mit anderen Wissenschaftlerinnen und Wissenschaftlern. In dem Modul werden folgende Tätigkeiten verfolgt: • sich in ein mathematisches Gebiet einarbeiten; • Aspekte guter wissenschaftlicher Praxis in einem mathematischen Fachgebiet berücksichtigen; • fachwissenschaftlich präsentieren; • wissenschaftlich Schreiben. **Kompetenzen:** Nach erfolgreichem Absolvieren des Moduls haben die Studierenden grundlegende Kompetenzen für gute wissenschaftliche Praxis erworben, indem sie • über einen Überblick über einschlägige Veröffentlichungen verfügen; • eine Ausarbeitung zu einem wissenschaftlichen Thema nach den Gepflogenheiten guter wissenschaftlicher Praxis erstellen; • sich kritisch mit mathematischen Veröffentlichungen auseinandersetzen.	**Arbeitsaufwand:** Präsenzzeit: 42 Stunden Selbststudium: 138 Stunden

Lehrveranstaltung: Fachwissenschaftliches Proseminar oder Seminar	2 SWS
Prüfung: Präsentation (ca. 75 Minuten, bei Durchführung als Blockseminar ca. 45 Minuten) **Prüfungsanforderungen:** Selbständige Durchdringung und Darstellung mathematischer Sachverhalte.	3 C

Lehrveranstaltung: Onlinekurs zu guter wissenschaftlicher Praxis in der Mathematik https://www.uni-goettingen.de/de/482590.html	1 SWS

Prüfung: Hausarbeit (max. 12000 Zeichen) **Prüfungsanforderungen:**	3 C

nichtamtliche Fassung

Hausarbeit zu einem Thema des (Pro-)Seminars unter besonderer Berücksichtigung guter wissenschaftlicher Praxis.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Mathematische Grundlagen aus den ersten zwei Studienjahren des Bachelorstudiengangs Mathematik (B.Sc.)
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Studiendekan*in Mathematik
Angebotshäufigkeit: jedes Semester	**Dauer:**
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** Bachelor: 5 - 6; Master: 1 - 4
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:
Dozent*in: Lehrpersonen der Lehreinheit Mathematik

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4112: Partial differential equations**	9 C 6 WLH

Learning outcome, core skills: The successful completion of this introductory module in the area "Partial different equations" enables students to learn basics concepts, methods, theories and applications in the area "Partial different equations". In the subsequent modules, they build on what they have learnt in this course to develop a deeper understanding of this subject. **Learning outcome:** After completing the module, students will be able to discuss partial differential equations for their solvability and properties of their solutions. They: • are familiar with the notion of partial differential equations and the principal symbol; • are familiar with the classification of partial differential equations into linear, semilinear, and quasilinear partial differential equations; • know solutions of partial differential equations, in particular, classical solutions, weak solutions, singularities of solutions, (higher) regularity and asymptotiv behavior of solutions; • master the Fourier transform and constant-coefficient partial differential equations and are familier with tempered distributions, the Plancherel theorem, convolutions, Sobolev spaces and fundamental solutions; • master elliptic boundary problems and are familiar with interior elliptic regularity, the Shapiro-Lopatinskii condition, elliptic regularity up to the boundary, and the Fredholm property as well as the maximum principle for second-order equations; • master evolution equations and are familiar with maximal dissipative operators, strongly continuous contraction semigroups, the heat equation and the wave equation as examples, and with applications to semilinear problems. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of the area "Partial different equations"; • explain basic ideas of proof in the area "Partial different equations"; • illustrate typical applications in the area "Partial different equations".	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Partial differential equations (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4112.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Examination: oral examination (appr. 20 minutes) (alternative) **Examination prerequisites:**	9 C

nicht-amtliche Fassung

B.Mat.4112.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	

Course: Partial differential equations - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Partial differential equations"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024, B.Mat.3011
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Mathematical Institute

Examination: The default format for the examination is a written examination. Alternatively, the examination may be conducted as an oral examination; this will be decided upon and announced no later than the start of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4113: Differential geometry I**	9 C 6 WLH

Learning outcome, core skills: The successful completion of this introductory module in the area "Differential geometry" enables students to learn basics concepts, methods, theories and applications in the area "Differential geometry". In the subsequent modules, they build on what they have learnt in this course to develop a deeper understanding of this subject. **Learning outcome:** Depending on the current course offer the following content-related competencies may be pursued. Students • master the basic concepts of differential geometry, in particular Riemannian metric, length and area; • are familiar with the geometry of embedding and inner geometry, first and second fundamental forms, principal and mean curvatures; • are familiar with the notions of Gauss curvature, isometries, spaces of constant curvature, parallel translation and connections, geodesics; • know the Gauss-Bonnet theorem; • are familiar with Lie groups and Lie algebras and their correspondence, examples such as classical Lie groups as stabilisers, Exp map and its properties, Ad and ad, Maurer-Cartan form, Killing forms, as well as Lie group actions and fundamental vector fields; • are familiar with representations of Lie groups, in particular the examples for S^1 and SU(2); • are familiar with principal bundels and the associated vector bundles as well as differential forms on principal bundles, connections (various definitions: splitting of exact sequences), covariant derivative and the connection operator; • know properties and the geometric meaning of curvature incl. deviation from a complex or from a Lie algebra homomorphism; • know the Bianchi identities and the Ambrose-Singer theorem, and are familiar with parallel translation, holonomy and holonomy groups. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of the area "Differential geometry"; • explain basic ideas of proof in the area "Differential geometry"; • illustrate typical applications in the area "Differential geometry".	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Differential geometry I (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4113.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Examination: oral examination (approximately 20 minutes) (alternative)	9 C

nicht-amtliche Fassung

Examination prerequisites: B.Mat.4113.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	

Course: Differential geometry I - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Differential geometry"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024, B.Mat.3010
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Mathematical Institute

Examination: The default format for the examination is a written examination. Alternatively, the examination may be conducted as an oral examination; this will be decided upon and announced no later than the start of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4114: Algebraic topology I**	9 C 6 WLH

Learning outcome, core skills: The successful completion of this introductory module in the area "Algebraic topology" enables students to learn basics concepts, methods, theories and applications in the area "Algebraic topology". In the subsequent modules, they build on what they have learnt in this course to develop a deeper understanding of this subject. **Learning outcome:** In the modules in the area "Algebraic topology" students get to know the most important classes of topological spaces as well as algebraic and analytical tools for studying these spaces and the mappings between them. The students use these tools in geometry, mathematical physics, algebra and group theory. Algebraic topology uses concepts and tools of algebra, geometry and analysis and can be applied to these areas. The following content-related competencies are pursued. Students • know special classes of topological spaces and their special characteristics like CW complexes, simplicial complexes and manifolds; • apply basic concepts of category theory to topological spaces; • know basic homological algebra (chain complexes, exact sequences, chain homology); • know axioms of homology with elementary computations and applications; • know homology (fundamental properties and computational tools); • are familiar with the concept of Euler characteristic and Lefschetz number; • prove fixed point theorems like the Lefschetz fixed-point theorem. **Core skills:** Students develop fundamental skills in algebraic topology. They • use concepts of functors to obtain algebraic invariants of topological spaces and mappings; • can prove existence of fixed points and non-existence of mappings with topological methods; • calculate homology groups in meaningful situations; • carry out homological calculations with the aid of chain complexes and exact sequences; • apply the principles of diagram chases.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Algebraic topology I (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4114.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Examination: oral examination (approximately 20 minutes) (alternative) **Examination prerequisites:**	9 C

nicht-amtliche Fassung

B.Mat.4114.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	

Course: Algebraic topology I - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Algebraic topology"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Mathematical Institute

Examination: The default format for the examination is a written examination. Alternatively, the examination may be conducted as an oral examination; this will be decided upon and announced no later than the start of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4115: Mathematical quantum mechanics**	9 C 6 WLH

Learning outcome, core skills: The successful completion of this introductory module in the area "Mathematical methods of physics" enables students to learn basics concepts, methods, theories and applications in the area "Mathematical methods of physics". In the subsequent modules, they build on what they have learnt in this course to develop a deeper understanding of this subject. **Learning outcome:** In the modules in the area "Mathematical methods of physics" students get to know different mathematical methods and techniques that play a role in modern physics. One of the aims is that a connection to physical problems is visible, at least in the motivation of the covered topics. After completion of this course, students • know about spectral theory of unbounded operators, defect indices and Fredholm operators; • understand the concept of selfadjoint extensions and boundary conditions; • are familiar with perturbation theory, in particular, Kato theorem; • know about time evolution, Stone-von-Neumann theorem and stationary states; • handle multi particle quantum mechanics, the density matrix and entropy: • are familiar with scattering theory and the RAGE theorem (Theorem of Ruelle, Amrein-Georgescu and Enss). **Core skills:** After having successfully completed the module, students will be able to • understand the mathematical foundations of quantum mechanics, understand how quantum mechanics inspired mathematics and vice versa; • relate physics formulations to mathematics (e.g. "improper eigenvectors" to spectral theory of unbounded operators, or the bracket formalism to the representation lemma of Riesz, or boundary conditions to a choice of a self-adjoint extension); • discuss basic concepts of the area "Mathematical quantum mechanics"; • explain basic ideas of proof in the area "Mathematical quantum mechanics"; • illustrate typical applications in the area "Mathematical quantum mechanics".	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Mathematical quantum mechanics (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4115.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Examination: oral examination (approximately 20 minutes) (alternative) **Examination prerequisites:** B.Mat.4115.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

nicht-amtliche Fassung

Course: Mathematical quantum mechanics - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Mathematical quantum mechanics"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024, B.Mat.3011
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Mathematical Institute

Examination: The default format for the examination is a written examination. Alternatively, the examination may be conducted as an oral examination; this will be decided upon and announced no later than the start of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4116: Lie groups and Lie algebras**	9 C 6 WLH

Learning outcome, core skills: In this course students develop a deeper mathematical understanding in the area "Lie groups and Lie algebras". They are enabled to carry out independent contributions to research, e. g. within the scope of a thesis project. **Learning outcome:** Lie groups are of great importance in modern theoretical physic, and Lie algebras and their representations are used extensively in physics, notably in quantum mechanics and particle physics. In the modules in the area "Lie groups and Lie algebras" students get to know the concept of Lie groups and Lie algebra including some applications in mathematics and physics. • are familiar with Lie groups and Lie algebras and know examples, e.g. classical Lie groups as stabilisers; • know the Exp map and its properties, the Ad and the ad map as well as the Maurer-Cartan form; • understand the Lie correspondence, that closed subgroups are Lie subgroups and that quotients are manifolds; • know Killing forms; • understand Lie group actions and the fundamental vector fields; • understand representations of Lie groups incl. examples e.g.for S^1 and SU(2); • are familiar with representations and the notions of reducibility, weights and characters incl. the Peter-Weyl theorem; • know Young diagrams; • use root systems, Weyl chambers and Dynkin diagrams in classification of Lie algebras. **Core skills:** After having successfully completed the module, students will be able to • study Lie groups and Lie algebras using basic concepts of the area "Lie groups and Lie algebras"; • explain basic ideas of proof in the area "Lie groups and Lie algebras"; • illustrate typical applications in the area "Lie groups and Lie algebras".	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Lie groups and Lie algebras (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4116.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Examination: oral examination (approximately 20 minutes) (alternative) **Examination prerequisites:** B.Mat.4116.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

nichtamtliche Fassung

Course: Lie groups and Lie algebras - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Lie groups and Lie algebras"

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024, B.Mat.3010
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Mathematical Institute

Examination: The default format for the examination is a written examination. Alternatively, the examination may be conducted as an oral examination; this will be decided upon and announced no later than the start of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4117: Operator algebras and K-theory**	9 C 6 WLH

Learning outcome, core skills:
The successful completion of this introductory module in the area "Non-commutative geometry" enables students to learn basics concepts, methods, theories and applications in the area "Non-commutative geometry". In the subsequent modules, they build on what they have learnt in this course to develop a deeper understanding of this subject.

Learning outcome:

Non-commutative geometry uses concepts of analysis, algebra, geometry and mathematical physics and can be applied to these areas. In the modules in the area "Non-commutative geometry" students get to know the conception of space of non-commutative geometry and some of its applications in geometry, topology, mathematical physics and the theory of dynamical systems.

- able to use C*-algebras as a tool to study Hilbert space operators and representations, and they know basic invariants to distinguish C*-algebras;
- are familiar with ideals, hereditary subalgebras, and quotients of C*-algebras and their representations;
- are familiar with weak and strong operator topologies, double commutant theorem and the Kaplansky density theorem;
- know Borel functional calculus and polar decomposition;
- know irreducible representations, Kadison's transitivity theorem, and pure states;
- understand the concepts of group C*-algebras and crossed products for discrete groups as well as Toeplitz C*-algebra;
- know projections, partial isometries and unitaries, Murray-von Neumann equivalence of projections, Swan's Theorem about vector bundles and projections in matrices over C(X);
- understand the definition of K-theory;
- understand the concepts of functoriality, stability, homotopy invariance as well as mapping cone, suspension and, K-theory exact sequence;
- are familiar with split exactness, quasi-homomorphisms;
- use Toeplitz C*-algebra extension to prove Bott periodicity.

Core skills:

After having successfully completed the module, students will be able to

- define C*-algebras out of other algebraic objects using universal properties;
- dstinguish C*-algebras using invariants such as K-theory or representation theory;
- study C*-algebras using concrete representationsdiscuss basic concepts of the area "Non-commutative geometry";
- explain basic ideas of proof in the area "Non-commutative geometry";
- illustrate typical applications in the area "Non-commutative geometry".

Workload:
Attendance time: 84 h
Self-study time: 186 h

Course: Operator algebras and K-theory (Lecture)	4 WLH

nicht-amtliche Fassung

Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4117.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Examination: oral examination (approximately 20 minutes) (alternative) **Examination prerequisites:** B.Mat.4117.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Operator algebras and K-theory - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Operator Algebras and K-Theory"

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024, B.Mat.3011
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Mathematical Institute

Examination: The default format for the examination is a written examination. Alternatively, the examination may be conducted as an oral examination; this will be decided upon and announced no later than the start of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4121: Algebraic geometry I**	9 C 6 WLH

Learning outcome, core skills: Algebraic geometry uses and connects concepts of algebra and geometry and can be used widely. In the modules in the area "Algebraic geometry" students get to know the most important classes of algebraic varieties and schemes as well as the tools for studying these objects and the mappings between them. They are introduced to current research questions and enabled to carry out independent contributions to research, e. g. within the scope of a Master's thesis. **Learning outcome:** The following content-related competencies are pursued. Students • are familiar with commutative algebra; • know first concepts of dimension theory; • are familiar with the concept of regular local rings; • know first concepts of the language of schemes; • can recognize singularities; • have seen basic constructions in homological algebra; • are familiar with algorithmic aspects. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of the area "Algebraic geometry"; • explain basic ideas of proof in the area "Algebraic geometry"; • illustrate typical applications in the area "Algebraic geometry".	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Algebraic geometry I (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4121.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Algebraic geometry I - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Algebraic geometry"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

nicht-amtliche Fassung

three times	Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4123: Algebraic structures I**	9 C 6 WLH

Learning outcome, core skills: Algebraic structures use concepts and tools of algebra, geometry and analysis and can be applied to these areas. In the modules in the area "Algebraic structures" students get to know different algebraic structures, amongst others Lie algebras, Lie groups, analytical groups, associative algebras as well as the tools from algebra, geometry and category theory that are necessary for their study and applications. They are introduced to current research questions and enabled to carry out independent contributions to research, e. g. within the scope of a Master's thesis **Learning outcome:** The following content-related competencies are pursued. Students • know basic concepts like rings, modules, algebras and Lie algebras; • know important examples of Lie algebras and algebras; • know special classes of Lie groups and their special characteristics; • know classification theorems for finite-dimensional algebras; • apply basic concepts of category theory to algebras and modules; • know group actions and their basic classifications; • apply the enveloping algebra of Lie algebras; • apply ring and module theory to basic constructs of algebraic geometry; • use combinatorial tools for the study of associative algebras and Lie algebras; • acquire solid knowledge of the representation theory of Lie algebras, finite groups and compact Lie groups as well as the representation theory of semisimple Lie groups; • know Hopf algebras as well as their deformation and representation theory. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of the area "Algebraic structures"; • explain basic ideas of proof in the area "Algebraic structures"; • illustrate typical applications in the area "Algebraic structures".	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Algebraic structures I (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4123.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Course: Algebraic structures I - exercises (Exercise)	2 WLH
Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Algebraic structures"	

nicht-amtliche Fassung

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4126: Arithmetic geometry I**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area "Arithmetic Geometry" enables students to learn methods, concepts, theories and applications in the areas "Algebraic number theory" and "Diophantine geometry". During the course students will be successively introduced to current theoretical and/or applied research topics and able to carry out independent contributions to research (e. g. within the scope of a Master's thesis). **Learning outcome:** Depending on the current course offer the following content-related competencies may be pursued in relation to algebra. Students • know basics concepts of commutative algebra; • are familiar with working in number fields; • have a first understanding of Algebraic number theory like Valuations and primes; • are familiar with lattices and techniques from the geometry of numbers; • know concepts from the theory of Diophantine approximation; **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of the area "Algebraic number theory" and "Diophantine geometry"; • explain basic ideas of proof in the area "Algebraic number theory" and "Diophantine geometry"; • illustrate typical applications in the area "Algebraic number theory" and "Diophantine geometry".	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Arithmetic geometry I (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4126.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Arithmetic geometry I - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Arithmetic geometry"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024, B.Mat.3011
Language: English	**Person responsible for module:** Dean of studies mathematics

nicht-amtliche Fassung

Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4127: Primes I**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area ”Primes” enables students to learn methods, concepts, theories and applications connected to the study of primes and their distribution within the area of "Analytic Number Theory"', "Algebraic Number Theory" or "Additive Combinatorics". During the course students will be successively introduced to current research topics and will be able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis). **Learning outcome:** Depending on the current course offer the following content-related competencies may be pursued. Students • are familiar with results and methods of prime number theory; • know basic methods for studying distributional aspects of prime numbers, and apply them to problems of number theory; • know basic methods for studying distributional aspects of prime ideals in number fields, and apply them to problems of number theory; • know basic methods and results from the ramification theory in Galois extensions and can apply them; • solve arithmetical problems with basic, complex-analytical, and Fourier-analytical methods; • know characteristics of the Riemann zeta function and more general L-functions, and apply them to problems of number theory; • know basic sieving methods and apply them to the problems of number theory; • know techniques used to estimate character sums and exponential sums; • know basic methods from additive combinatorics and apply them to the problems from number theory; • master computation with asymptotic formulas, asymptotic analysis, and asymptotic distribution in number theory. **Core skills:** After having successfully completed the module, students will be able to • handle methods and concepts of the area ”Analytic number theory” confidently; • explain complex issues of the area ”Analytic number theory”; • apply methods of the area ”Analytic number theory” to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Primes I (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4127.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

nicht-amtliche Fassung

Course: Primes I - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Primes"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024, B.Mat.3011
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4128: Additive number theory I**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area ”Additive Number Theory” enables students to learn methods, concepts, theories and applications connected to additive problems within the areas of "Additive Combinatorics", "Analytic Number Theory" or "Algebraic Number Theory". During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis). **Learning outcome:** Depending on the current course offer the following content-related competencies may be pursued. Students • solve arithmetical problems with basic, complex-analytical, and Fourier-analytical methods; • know basic methods from additive combinatorics and apply them to the problems from number theory; • know basic methods from higher-order Fourier analysis and apply them to the problems from number theory; • know basic methods from probabilistic number theory and apply them to the problems from number theory; • know basic sieving methods and apply them to the problems of number theory; • know techniques used to estimate character sums and exponential sums; • know characteristics of the Riemann zeta function and more general L-functions, and apply them to problems of number theory; • analyse the distribution of rational points on suitable algebraic varieties using analytical techniques; • acquire knowledge in arithmetical and analytical theory of automorphic forms, and its application in number theory. **Core skills:** After having successfully completed the module, students will be able to • handle methods and concepts of the area ”Additive Number Theory” confidently; • explain complex issues of the area ”Additive Number Theory”; • apply methods of the area ”Additive Number Theory” to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Additive number theory I (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4128.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Additive number theory I - exercises (Exercise)	2 WLH

Examination requirements:	

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Proof of knowledge and mastery of basic competencies in the area "Additive number theory"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024, B.Mat.3011
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4130: Introduction to scientific computing / applied mathematics**	9 C 6 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Scientific computing / applied mathematics" enables students to learn and apply methods, concepts, theories and applications in the area of "Scientific computing / Applied mathematics". During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a practical course in scientific computing or a Master's thesis). Depending on the current course offer the following content-related competencies may be pursued. Students • are familiar with the theory of basic mathematical models of the corresponding subject area, especially about the existence and uniqueness of solutions; • know basic methods for the numerical solution of these models; • analyse stability, convergence and efficiency of numerical solution strategies; • apply available software for the solution of the corresponding numerical methods and evaluate the results sceptically; • evaluate different numerical methods on the basis of the quality of the solutions, the complexity and their computing time; • are informed about current developments of scientific computing, like e. g. GPU computing and use available soft- and hardware; • use methods of scientific computing for solving application problems, like e. g. of natural and business sciences. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of the area "Scientific computing / applied mathematics"; • explain basic ideas of proof in the area "Scientific computing / applied mathematics"; • illustrate typical applications in the area "Scientific computing / applied mathematics".	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Introduction to scientific computing / applied mathematics (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4130.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Examination: Written examination(alternative) (120 minutes) **Examination prerequisites:** B.Mat.4130.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

nicht-amtliche Fassung

Course: Introduction to scientific computing / applied mathematics - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Scientific computing / applied mathematics"

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

Examination: The default format for the examination is an oral examination. Alternatively, the examination may be conducted as a written examination; this will be decided upon and announced no later than the start of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4131: Inverse problems**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area ”Inverse problems” enables students to learn methods, concepts, theories and applications within the area of "Inverse problems'. During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis). **Learning outcome:** After completing the module, students are familiar with typical examples of ill-posed inverse problems and regularisation methods for their stable numerical solution. • Understanding the phenomenon of ill-posedness based on typical examples of inverse problems; • Fundamental approaches to regularisation such as penalisation, filters, Bayesian approaches, iterative methods, and restriction to stable subsets; • Methods for data-driven selection of regularisation parameters or stopping indices; • Possibilities and potential of using machine learning methods; • Foundations of convergence analysis for regularisation methods; • Algorithmic aspects of the implementation of regularisation methods. **Core skills:** Students develop fundamental competencies in the regularisation of inverse problems. They • Quantify the degree of ill-posedness of inverse problems; • Prove the regularising property of various approaches; • Analyze the convergence speed of regularisation methods; • Apply various regularisation methods to concrete inverse problems and analyze their behavior; • handle methods and concepts of the area ”Inverse problems” confidently; • explain complex issues of the area ”Inverse problems”; • apply methods of the area ”Inverse problems” to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Inverse problems (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4131.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Inverse problems - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Inverse problems"	

nicht-amtliche Fassung

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4133: Numerics of partial differential equations I**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area ”Numerics of partial differential equations" enables students to learn methods, concepts, theories and applications within the area of "Numerics of partial differential equations". During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis). **Learning outcome:** After completing the module, students are familiar with the theoretical and practical foundations of numerical discretisation of partial differential equations (PDEs), particularly the Finite Element Method (FEM) for elliptic problems: • fundamentals of mathematical modeling with PDEs and their classification (elliptic, parabolic, hyperbolic); • variational formulations in Hilbert spaces and the theory for coercive and inf-sup stable problems; • theory of Sobolev spaces (generalised derivatives, embedding and trace theorems) as a functional analytic basis; • construction, implementation, and mathematical analysis (a-priori and a-posteriori error estimates) of the Finite Element Method; • efficient solution methods for the resulting linear systems and their preconditioning. **Core skills:** Students develop fundamental competencies in the numerical treatment of partial differential equations. They: • analyze the existence, uniqueness, and stability of variational formulations for elliptic PDEs; • derive discretisations using the Finite Element Method and perform error analyses; • are able to implement Finite Element procedures (e.g., system assembly and error estimators); • evaluate the efficiency and convergence properties of various numerical solution approaches and preconditioners; • handle methods and concepts of the area ”Numerics of partial differential equations” confidently; • explain complex issues of the area ”Numerics of partial differential equations”; • apply methods of the area ”Numerics of partial differential equations” to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Numerics of partial differential equations I (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:**	9 C

nicht-amtliche Fassung

B.Mat.4133.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	

Course: Numerics of partial differential equations I - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Numerics of partial differential equations"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4134: Optimisation and variational analysis I**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area ”Optimisation and variational analysis" enables students to learn methods, concepts, theories and applications within the area of "Optimisation and variational analysis". During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis). **Learning outcome:** After completing the module, students are familiar with the analysis of sequences generated by numerical algorithms for solving optimisation problems in general metric spaces and in finite-dimensional linear spaces: • fundamentals of optimisation in nonlinear metric spaces; • operations on sets and set-valued mappings; fundamental regularity of extended functions (pointwise Lipschitz continuity, geodesic convexity, coercivity); • regularity of set-valued mappings and their properties; • theory of convergence for the corresponding fixed-point sequences. **Core skills:** Students develop fundamental competencies in optimisation and variational analysis. They • analyze set-valued mappings and fixed-point algorithms to solve associated problems; • analyze approximate methods and relaxations; • handle methods and concepts of the area ”Optimisation and variational analysis” confidently; • explain complex issues of the area ”Optimisation and variational analysis”; • apply methods of the area ”Optimisation and variational analysis” to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Optimisation and variational analysis I (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4134.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Optimisation and variational analysis I - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Optimisation and variational analysis"	

Admission requirements:	**Recommended previous knowledge:**
none	B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024

nicht-amtliche Fassung

Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4138: Curves and surfaces**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area ”Differential geometry" enables students to learn methods, concepts, theories and applications within the area of "Differential geometry". During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis). **Learning outcome:** After completing the module, students are familiar with: • understand and precisely formulate the fundamental concepts of the differential geometry of curves and surfaces; • analyze planar and spatial curves using appropriate parametric representations and determine their geometric properties (e.g., curvature and torsion); • describe surfaces in R^3 and investigate them using the first and second fundamental forms; • calculate and geometrically interpret central curvature concepts, such as mean curvature and Gaussian curvature; • understand and apply the statement and significance of the Theorema Egregium and the Gauss–Bonnet Theorem. **Core skills:** Students develop fundamental competencies in the field of applied Fourier analysis. They: • reliably apply the methods of classical differential geometry; • distinguish between intrinsic and extrinsic concepts of curvature; • identify fundamental relationships between curvature and global topology; • reconstruct and independently develop proofs for central theorems in classical differential geometry; • handle methods and concepts of the area ”Differential geometry” confidently; • explain complex issues of the area ”Differential geometry”; • apply methods of the area ”Differential geometry” to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Curves and surfaces (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4138.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Curves and surfaces - exercises (Exercise)	2 WLH

Examination requirements:	

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Proof of knowledge and mastery of basic competencies in the area "Curves and surfaces"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4139: Applied Fourier analysis**	9 C 6 WLH

Learning outcome, core skills:
The successful completion of modules in the area ”Fourier analysis” enables students to learn methods, concepts, theories and applications within the area of "Applied Fourier analysis'. During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis).

Learning outcome:

After completing the module, students are familiar with

- the calculation and application of Fourier series for the analysis of periodic functions;
- necessary and sufficient conditions for the convergence of Fourier series in the Hilbert space of square-integrable periodic functions and in the Banach space of continuous functions;
- linear time-invariant filters and their application to signal analysis, as well as the construction of filters with specific properties using Fourier analysis;
- the Fourier transform for functions on the real line in L1 and L2, including its properties and eigenfunctions of the Fourier operator;
- the application of the Heisenberg uncertainty principle and the Shannon sampling theorem to signals;
- efficient calculation of Fourier coefficients and the Fourier transform using the Discrete Fourier Transform (DFT) and various fast algorithms (FFT);
- the construction of wavelet bases for improved time-frequency analysis of signals and the design and application of wavelet filter banks.

Core skills:

Students develop fundamental competencies in the field of applied Fourier analysis. They

- analyze periodic and non-periodic signals using Fourier and wavelet methods;
- analyze the convergence of Fourier series and signal representations based on the Shannon sampling theorem;
- are able to construct low-pass and high-pass filters with specific properties;
- calculate Fourier coefficients and the Fourier transform both analytically and numerically;
- implement and apply the Fast Fourier Transform (FFT);
- handle methods and concepts of the area ”Applied Fourier analysis” confidently;
- explain complex issues of the area ”Applied Fourier analysis”;
- apply methods of the area ”Applied Fourier analysis” to new problems in this area.

Workload:
Attendance time: 84 h
Self-study time: 186 h

Course: Applied Fourier analysis (Lecture)	4 WLH
Examination: Written examination (120 minutes)	9 C

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Examination prerequisites: B.Mat.4139.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	

Course: Applied Fourier analysis - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and mastery of basic competencies in the area "Applied Fourier analysis"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4140: Selected topics in statistics and machine learning**	3 C 2 WLH

Learning outcome, core skills: In this course selected topics of statistical and machine learning theory and methodology will be discussed. **Learning outcome:** The aim of the module is to equip students with deeper knowledge in modern areas of statistics and data science, e.g. • Bootstrap and resampling techniques; • statistical properties of deep neural networks; • random forests and other methods for classification; • high dimensional statistics; • Statistical optimal transport. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics **Core skills:** After having successfully completed the module, students are familiar with selected topics in advanced statistical methods and theory. They • know concepts and techniques of advanced statistics and understand how to apply these for concrete problems; • are familiar with statistical and mathematical techniques such as different bootstrap schemes or the approximation properties of neural networks; • acquire knowledge about risk bounds; • are familiar with techniques for dimension reduction; • understand ensemble methods such as random decision forests and are able to apply them to machine learning tasks.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Selected topics in statistics and machine learning (Lecture)	2 WLH
Examination: Oral examination (approximately 20 minutes)	3 C

Examination requirements: Proof of knowledge basic competencies in selected topics in the area "Statistics and machine learning"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

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three times	Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4141: Applied and mathematical stochastics I**	9 C 6 WLH

Learning outcome, core skills: The successful completion of this course enables students to learn methods, concepts, theories and proof techniques in the area of applied and mathematical stochastics and use these for the modelling and statistical analysis of stochastic systems. During the course students will be enabled to carry out a Bachelor's thesis in this area. **Learning outcome:** In this course, students • learn about fundamental concepts of probability theory established on measure theory and apply them independently; • understand advanced concepts and approaches of probabilistic modelling and inferential statistics; • study basic characteristics of stochastic processes and random geometric objects as well as conditions for their existence and uniqueness; • get to know and characterise a pool of different stochastic processes in time and space; • analyse the convergence characteristics of stochastic processes and limits of random geometric objects; • analyse regularity characteristics of the paths of stochastic processes and structures of random geometric objects; • adequately model temporal and spatial phenomena in natural and economic sciences as stochastic processes or random geometric objects; • analyse probabilistic and statistical models regarding their typical characteristics, estimate unknown parameters and make predictions for their evolution and structure. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of "Introduction to applied and mathematical stochastics"; • explain basic ideas of proof in this area; • illustrate typical applications in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Applied and mathematical stochastics I (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4141.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Applied and mathematical stochastics I - exercises	2 WLH

Examination requirements: Proof of knowledge basic competencies in selected topics in the area "Applied and mathematical stochastics".	

nicht-amtliche Fassung

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4142: Introduction to stochastic processes**	9 C 6 WLH

Learning outcome, core skills: The successful completion of this course enables students to learn methods, concepts, theories and proof techniques in the area of stochastic processes and use these for the modelling and analysis of stochastic systems. During the course students will be enabled to carry out a Bachelor's thesis in this area. **Learning outcome:** In this course, students • learn about advanced concepts of probability theory established on measure theory and apply them independently; • learn about basic characteristics as well as existence and uniqueness results for stochastic processes; • understand the relevance of the concepts of filtration, conditional expectation and stopping times for the theory of stochastic processes; • construct and analyse Markov chains with discrete (and more general) state spaces in discrete (and continuous) time; • analyse martingales in discrete (and continuous) time using the corresponding martingale theory; • learn about fundamental classes of stochastic processes as well as their construction, characterisation and analysis; • model stochastic systems from different application areas in natural sciences, technology and finance with the aid of suitable stochastic processes. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of "Stochastic processes"; • explain basic ideas of proof in "Stochastic processes"; • illustrate typical applications in "Stochastic processes".	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Introduction to stochastic processes (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4142.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Introduction to stochastic processes - exercises	2 WLH

Examination requirements: Proof of knowledge basic competencies in selected topics in the area "Stochastic processes".	

Admission requirements:	**Recommended previous knowledge:**
none	B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024

nichtamtliche Fassung

Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4144: Basics of mathematical statistics**	6 C 4 WLH

Learning outcome, core skills: The successful completion of the course "Basics of mathematical statistics" enables students to learn methods, concepts, theories and applications in this area. During the course students will be prepared to carry out a Bachelor's thesis. **Learning outcome:** In this course, students • are familiar with the most important methods of mathematical statistics like estimates, testing, confidence statements and classification and use them in simple models of mathematical statistics; • evaluate statistical methods mathematically precisely via suitable risk and loss concepts; • analyse optimality characteristics of statistical estimate methods via simple lower bounds; • analyse the error rates of statistical testing and classification methods based on the Neyman Pearson theory; • are familiar with basic statistical distribution models; • are able to mathematically analyse and apply basic computational methods for statistical estimation: **Core skills:** After having successfully completed the module, students will be able to • discuss advanced concepts of "Mathematical Statistics"; • explain ideas of proof in this area; • illustrate typical applications in this area.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Basics of mathematical statistics (Lecture)	2 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4144.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	6 C
Examination: Written examination (alternative) (120 minutes) **Examination prerequisites:** B.Mat.4144.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	6 C

Course: Basics of mathematical statistics - exercises	2 WLH

Examination requirements: Proof of knowledge basic competencies in selected topics in the area “Mathematical Statistics".	

nicht-amtliche Fassung

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Institute of Mathematical Stochastics

Examination: The default format for the examination is an oral examination. Alternatively, the examination may be conducted as a written examination; this will be decided upon and announced no later than the start of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4147: Statistical foundations of data science**	9 C 6 WLH

Learning outcome, core skills: The successful completion of the module "Statistical foundations of data science" enables students to learn methods, concepts, theories and applications in this area. During the course students will be prepared to carry out a Bachelor's thesis. **Learning outcome:** In this course, students • investigate in detail uni- and multivariate distributions, quantiles; • learn about multivariate characteristic functions, moments, density transformation formula; • learn how to use and model with multivariate normal distributions; • learn about conditional expectations and densities, and their applications to real-world data analysis; • learn about basic principles of estimation and their statistical risk bounds, such as maximum likelihood, Bayesian and projection estimators; • learn about simple regression analysis, and confidence regions; • learn basic testing theory, ANOVA techniques and their related distributions; • learn about principles of multiple testing. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of "Statistical foundations of data science"; • explain basic ideas of proof in "Statistical foundations of data science"; • illustrate typical applications in "Statistical foundations of data science".	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Statistical foundations of data science (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4147.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Statistical foundations of data science - exercises	2 WLH

Examination requirements: Proof of knowledge basic competencies in selected topics in the area "Statistical foundations of data science".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency:	**Duration:**

nicht-amtliche Fassung

at least once every three years	1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4149: Introduction to stochastic methods and models**	9 C 6 WLH

Learning outcome, core skills: The successful completion of the module "Stochastic methods and models" enables students to learn methods, concepts, theories and applications in this area. During the course students will be prepared to carry out a Bachelor's thesis. **Learning outcome:** In this course, students • learn about fundamental stochastic methods based on measure theory and apply them independently; • gain insight into the connection of mathematics and the natural, social and economic sciences via stochastic models; • understand the use of stochastic methods for the analysis of stochastic models and their connections; • get to know possible applications in theory and practice. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of "Stochastic methods and models"; • explain basic ideas of proof in this area; • illustrate typical applications in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Introduction to stochastic methods and models (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4149.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Introduction to stochastic methods and models - exercises	2 WLH

Examination requirements: Proof of knowledge basic competencies in selected topics in the area "Stochastic methods and models".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students:	

nicht-amtliche Fassung

not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4215: Mathematical quantum field theory**	9 C 6 WLH

Learning outcome, core skills: In this course students develop a deeper mathematical understanding in the area "Mathematical methods of physics". They are enabled to carry out independent contributions to research, e. g. within the scope of a thesis project. **Learning outcome:** In the modules in the area "Mathematical methods of physics" students get to know different mathematical methods and techniques that play a role in modern physics. One of the aims is that a connection to physical problems is visible, at least in the motivation of the covered topics. After completion of this course on "Mathematical quantum field theory", students • have mastered the axiomatic setting such as Wightman axioms and Haag-Kastler axiomatic framework; • have understood the Haag-Ruelle scattering theory; • became familiar with differerent approaches to perturbation "theory", in particular Yang-Feldman equation and Bogoliubov recursion; • got to know elements of perturbative algebraic quantum field theory; • are familiar with renormalisation formulated in terms of micro local analysis; • got to know the concept of resurgence. **Core skills:** After having successfully completed the module, students will be able to • relate calculational tool box of particle physics (Feynman graphs) to mathematical approaches; • understand where fundamental problems in QFT still lay; • handle methods and concepts of the area "Mathematical quantum field theory" confidently; • explain complex issues of the area "Mathematical quantum field theory"; • apply methods of the area "Mathematical quantum field theory" to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Mathematical quantum field theory (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) (20 minutes) **Examination prerequisites:** B.Mat.4215.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Mathematical quantum field theory - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Mathematical quantum field theory"	

nicht-amtliche Fassung

Admission requirements: none	**Recommended previous knowledge:** B.Mat.3011
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4216: Higher differential geometry**	9 C 6 WLH

Learning outcome, core skills: In this course students develop a deeper mathematical understanding in the area "Higher / derived differential geometry". They are enabled to carry out independent contributions to research, e. g. within the scope of a thesis project. **Learning outcome:** In the modules in the area "Higher / derived differential geometry" students get to know the concept of Lie groups and Lie algebra including advanced topics such as Lie groupoids and Lie algebroids. After completion of the course, students • understand the concepts of differential manifolds and vector bundles; • are familiar with Lie groups and Lie algebras and know examples, e.g. classical Lie groups as stabilisers; • understand the concepts of Lie groupoids and Lie algebroids; • know derived manifolds; • understand higher Lie groupoids, e.g. manifolds. **Core skills:** After having successfully completed the module, students will be able to • handle methods and concepts of the area "Higher / derived differential geometry" confidently; • explain complex issues of the area "Higher / derived differential geometry"; • apply methods of the area "Higher / derived differential geometry" to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Higher differential geometry (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination prerequisites:** B.Mat.4216.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Examination: oral examination (approximately 20 minutes) (alternative) **Examination prerequisites:** B.Mat.4216.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Higher differential geometry - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Higher / derived differential geometry"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language:	**Person responsible for module:**

nicht-amtliche Fassung

English	Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Mathematical Institute

Examination: The default format for the examination is a written examination. Alternatively, the examination may be conducted as an oral examination; this will be decided upon and announced no later than the start of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4217: Category theory**	9 C 6 WLH

Learning outcome, core skills:
In this course students develop a deeper mathematical understanding in the area "Category theory". They are enabled to carry out independent contributions to research, e. g. within the scope of a thesis project.

Learning outcome:

After successfully completing this course, the students are familiar with important concepts from category theory and can apply them to problems in algebra, topology, or functional analysis. They

- fluently use categories, functors, natural transformations;
- understand the difference between isomorphism and equivalence of categories;
- define objects using universal properties and apply the Yoneda lemma to establish properties of represented functors;
- recognize that important constructions in algebra and topology are instances of limits and colimits;
- know special kinds of limits and colimits such as products, coproducts, pushouts, equalisers, coequalisers, pullbacks, and inductive and projective limits;
- prove that functors preserve, respect or create limits, and know examples of these behaviours;
- know some important categories that are complete and cocomplete;
- know the two descriptions of adjunctions and adjoint functors using Hom functors and using unit and counit and understand the equivalence between them;
- are familiar with sufficient and necessary criteria for a functor to have a left or right adjoint, in particular, preservation of limits or colimits, and they know important examples of adjoint pairs of functors;
- are familiar with the concept of a monad, how an adjunctions lead to a monad and how a monad leads to adjunctions via the category of algebras over a monad and the Kleisli category;
- know some further topics in category theory, such as the monadicity theorem or Kan extensions.

Core skills:

After successfully completing this course, the students are able to create category theoretical arguments and apply them to problems from other areas that the are studying. They

- understand and create diagram chase arguments;
- can abstract the category theoretical results underlying general properties of constructions with sets or groups;
- apply abstract arguments fro category theory to concrete situations in other areas of study;
- recognize category theoretical concepts such as limits and adjoint functors when they arise in other areas they are studying.

Workload:
Attendance time: 84 h
Self-study time: 186 h

nicht-amtliche Fassung

Course: Category theory (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4217.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Category theory - exercises (Exercise)	2 WLH

Examination requirements: Proof of knowledge and competencies acquired in the area "Category theory".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024 B.Mat.3011 or B.Mat.3012
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4221: Algebraic geometry II**	9 C 6 WLH

Learning outcome, core skills: Algebraic geometry uses and connects concepts of algebra and geometry and can be used versatilely. In the modules in the area "Algebraic geometry" students get to know the most important classes of algebraic varieties and schemes as well as the tools for studying these objects and the mappings between them. They are introduced to current research questions and enabled to carry out independent contributions to research, e. g. within the scope of a Master's thesis. **Learning outcome:** The following content-related competencies are pursued. Students • examine important examples like elliptic curves and abelian varieties; • get to know basic parameter spaces like the Grassmannias; • use divisors for classification questions; • study algebraic curves; • prove the Riemann-Roch theorem and apply it; • use cohomological concepts like sheaf cohomology or Chow rings; • apply methods of algebraic geometry to arithmetical questions, e. g. finiteness principles for rational points or real algebraic geometry; • get to know connections to complex analysis and geometry. **Core skills:** After having successfully completed the module, students will be able to • handle methods and concepts of the area "Algebraic geometry" confidently; • explain complex issues of the area "Algebraic geometry"; • apply methods of the area "Algebraic geometry" to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Algebraic geometry II (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4221.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Algebraic geometry II - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Algebraic geometry"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4121
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency:	**Duration:**

nicht-amtliche Fassung

at least once every three years	1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4223: Algebraic structures II**	9 C 6 WLH

Learning outcome, core skills: Algebraic structures use concepts and tools of algebra, geometry and analysis and can be applied to these areas. In the modules in the area "Algebraic structures" students get to know different algebraic structures, amongst others Lie algebras, Lie groups, analytical groups, associative algebras as well as the tools from algebra, geometry and category theory that are necessary for their study and applications. They are introduced to current research questions and enabled to carry out independent contributions to research, e. g. within the scope of a Master's thesis. **Learning outcome:** The following content-related competencies are pursued. Students • know basic concepts like rings, modules, algebras and Lie algebras; • know important examples of Lie algebras and algebras; • know special classes of Lie groups and their special characteristics; • know classification theorems for finite-dimensional algebras; • apply basic concepts of category theory to algebras and modules; • know group actions and their basic classifications; • apply the enveloping algebra of Lie algebras; • apply ring and module theory to basic constructs of algebraic geometry; • use combinatorial tools for the study of associative algebras and Lie algebras; • acquire solid knowledge of the representation theory of Lie algebras, finite groups and compact Lie groups as well as the representation theory of semisimple Lie groups; • know Hopf algebras as well as their deformation and representation theory. **Core skills:** After having successfully completed the module, students will be able to • handle methods and concepts of the area "Algebraic structures" confidently; • explain complex issues of the area "Algebraic structures"; • apply methods of the area "Algebraic structures" to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Algebraic structures II (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4223.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Examination: Written examination(alternative) (120 minutes) **Examination prerequisites:** B.Mat.4223.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Algebraic structures II - exercises (Exercise)	2 WLH

nicht-amtliche Fassung

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Algebraic structures"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4123
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Mathematical Institute

Examination: The default format for the examination is an oral examination. Alternatively, the examination may be conducted as a written examination; this will be decided upon and announced no later than the start of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4226: Arithmetic geometry II**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area "Arithmetic Geometry" enables students to learn methods, concepts, theories and applications in the areas "Algebraic number theory" and "Diophantine geometry". During the course students will be successively introduced to current theoretical and/or applied research topics and able to carry out independent contributions to research (e. g. within the scope of a Master's thesis). **Learning outcome:** Depending on the current course offer the following content-related competencies may be pursued in relation to algebra. Students • know results in Diophantine approximation like Dirichlet's approximation Theorem or Minkowski theorems; • are familiar with the geometry of curves; • are familiar with elliptic curves; • know concepts of height functions; • know the Mordell theorem and can apply it. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of the area "Algebraic number theory" and "Diophantine geometry"; • explain basic ideas of proof in the area "Algebraic number theory" and "Diophantine geometry"; • illustrate typical applications in the area "Algebraic number theory" and "Diophantine geometry".	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Arithmetic geometry II (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4226.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Arithmetic geometry II - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Arithmetic geometry"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4126
Language: English	**Person responsible for module:** Dean of studies mathematics

nichtamtliche Fassung

Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4227: Primes II**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area ”Primes” enables students to learn methods, concepts, theories and applications connected to the study of primes and their distribution within the area of "Analytic Number Theory", "Algebraic Number Theory" or "Additive Combinatorics". During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis). **Learning outcome:** Depending on the current course offer the following content-related competencies may be pursued. Building on the background established in the course "Primes I", this course will consider topics of current relevance to research within number theoretic areas connected to the topics mentioned in "Primes I". **Core skills:** After having successfully completed the module, students will be able to • handle methods and concepts of the area ”Primes” confidently; • explain complex issues of the area ”Primes”; • apply methods of the area ”Primes” to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Primes II (Lecture)	4 WLH
Examination: oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4227.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Examination: Written examination(alternative) (120 minutes) **Examination prerequisites:** B.Mat.4227.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Primes II - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Primes"	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]

nicht-amtliche Fassung

Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Mathematical Institute

Examination: The default format for the examination is an oral examination. Alternatively, the examination may be conducted as a written examination; this will be decided upon and announced no later than the start of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4228: Additive number theory II**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area ”Additive Number Theory” enables students to learn methods, concepts, theories and applications connected to additive problems within the areas of "Additive Combinatorics", "Analytic Number Theory" or "Algebraic Number Theory". During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis). **Learning outcome:** Depending on the current course offer the following content-related competencies may be pursued. Building on the background established in the course "Additive Number Theory I", this course will consider topics of current relevance to research within number theoretic areas connected to the material presented in "Additive Number Theory I". **Core skills:** After having successfully completed the module, students will be able to • handle methods and concepts of the area ”Additive Number Theory” confidently; • explain complex issues of the area ”Additive Number Theory”; • apply methods of the area ”Additive Number Theory” to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Additive number theory II (Lecture)	4 WLH
Examination: oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4228.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Examination: Written examination(alternative) (120 minutes) **Examination prerequisites:** B.Mat.4228.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Additive number theory II - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Additive number theory"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4128
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]

nicht-amtliche Fassung

Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Mathematical Institute

Examination: The default format for the examination is an oral examination. Alternatively, the examination may be conducted as a written examination; this will be decided upon and announced no later than the start of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4231: Regularisation of inverse problems**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area ”Inverse problems” enables students to learn methods, concepts, theories and applications within the area of "Inverse problems'. During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis). **Learning outcome:** After completing the module, students are familiar with advanced aspects of the theory and numerics of regularisation methods for inverse problems: • variational regularisation theory of inverse problems; • statistical error models; • spatio-temporal regularisation methods; • iterative regularisation methods; • optimal experimental design; • numerical minimisation of (convex) Tikhonov functionals, e.g., using accelerated gradient methods, primal-dual methods, or augmented Lagrangian methods. **Core skills:** Students develop advanced competencies in the regularisation of inverse problems. They • evaluate the advantages and disadvantages of different data and penalty functionals for specific inverse problems and analyze the corresponding convergence properties; • model statistical data errors, derive appropriate data functionals, and analyse the resulting convergence behavior; • choose problem-specific function space settings and adapted regularisation methods (e.g., spatio-temporal regularisation in Lebesgue-Bochner spaces); • apply iterative regularisation methods with data-driven stopping conditions and analyse their convergence behavior; • evaluate the applicability of standard convex analysis methods for concrete problems and implement them; • use and analyze methods of optimal experimental design for inverse problems; • integrate machine learning methods into regularisationzati (e.g., learned regularisers); • handle methods and concepts of the area ”Inverse problems” confidently; • explain complex issues of the area ”Inverse problems”; • apply methods of the area ”Inverse problems” to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Regularisation of inverse problems (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:**	9 C

nicht-amtliche Fassung

B.Mat.4231.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	

Course: Regularisation of inverse problems - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Inverse problems"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4131
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Institute of Numerical and Applied Mathematic

Course frequency: This course is one of two courses that follow on B.Mat.4131 "Inverse Problems". The decision on which course to offer will be made and announced well in advance of the begin of the introductory course, e.g. via the website of the Department of Mathematics.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4233: Numerics of partial differential equations II**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area ”Numerics of partial differential equations" enables students to learn methods, concepts, theories and applications within the area of "Numerics of partial differential equations'. During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis). **Learning outcome:** After completing the module, students are familiar with advanced techniques for the discretization and analysis of partial differential equations. The module builds on the foundations of the Finite Element Method (FEM) for elliptic problems and leads towards current research questions: • discretisation of time-dependent (parabolic) problems, particularly the separation of spatial and temporal discretisation (Rothe method vs. method of lines) and their stability analysis; • mixed variational formulations and saddle point problems (e.g., Stokes equations), including the theoretical analysis of the inf-sup condition and the construction of stable element pairs; • foundations and advantages of non-conforming discretization approaches, such as Discontinuous Galerkin (DG) methods; • insights into the numerics of PDEs in specialized application areas (e.g., convection-dominated problems). **Core skills:** Students develop advanced competencies in the numerical analysis of complex physical models. They • select and justify suitable discretisation approaches for different PDE classes; • perform stability and convergence analyses for advanced Finite Element Methods; • implement complex algorithms, such as time-stepping procedures or solvers for saddle point problems; • evaluate modern approaches to numerical PDE solutions and transfer these concepts to related problems; • handle methods and concepts of the area ”Numerics of partial differential equations” confidently; • explain complex issues of the area ”Numerics of partial differential equations”; • apply methods of the area ”Numerics of partial differential equations” to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Numerics of partial differential equations II (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:**	9 C

nichtamtliche Fassung

B.Mat.4233.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	

Course: Numerics of partial differential equations II - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Numerics of partial differential equations"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4133
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematic

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4234: Optimisation and variational analysis II**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area "Optimisation and Variational Analysis" enables students to learn methods, concepts, theories and applications in this area. Students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master's thesis). **Learning outcome:** After completing the module, students are familiar with the analysis of optimization problems involving non-smooth functions, convex duality, and optimality conditions in linear spaces: • fundamentals of non-smooth, non-linear optimization in linear spaces; • analysis of sets, normal cones, and generalized subdifferentials applied to specific problem formats; • regularity of set-valued mappings and their properties; • theory of Lagrangian duality. **Core skills:** Students develop fundamental competencies in optimization and variational analysis. They • calculate normal cones of sets and subdifferentials of non-smooth functions; • calculate the convex conjugate of functions; • calculate the Prox-operators of functions; • analyze approximate methods and relaxations; • are able to formulate optimality criteria and the associated systems of inequalities.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Optimisation and variational analysis II (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4234.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Optimisation and variational analysis II - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Optimisation and variational analysis".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4134
Language: English	**Person responsible for module:** Dean of studies mathematics

nicht-amtliche Fassung

Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematic

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4235: Inverse problems in differential equations**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area ”Inverse problems” enables students to learn methods, concepts, theories and applications within the area of "Inverse problems'. During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis). **Learning outcome:** After completing the module, students are familiar with the analysis and numerical solution of inverse problems in partial differential equations: • examples of inverse problems in PDEs, such as the identification of coefficient functions, initial or boundary conditions, right-hand sides, or the shape of a domain; • characterisation of Fréchet derivatives of data with respect to unknowns and their adjoints; • methods for proving uniqueness and conditional stability; • applications and connections to the optimal control of differential equations; • efficient numerical solution procedures. **Core skills:** Students develop fundamental competencies in inverse problems for partial differential equations. They • provide sound assessments of what type of data is required for the unique determination of various unknowns in specific Partial differential equations; • prove the Fréchet differentiability of forward operators and characterise the adjoints of the derivatives; • analyze the stability of certain inverse problems under a-priori assumptions about the solution; • implement general or problem-specific regularisation methods; • handle methods and concepts of the area ”Inverse problems” confidently; • explain complex issues of the area ”Inverse problems”; • apply methods of the area ”Inverse problems” to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Inverse problems in differential equations (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4235.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Inverse problems in differential equations - exercises (Exercise)	2 WLH

Examination requirements:	

nichtamtliche Fassung

Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Inverse problems"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4131
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Institute of Numerical and Applied Mathematic

Course frequency: This course is one of two courses that follow on B.Mat.4131 "Inverse Problems". The decision on which course to offer will be made and announced well in advance of the begin of the introductory course, e.g. via the website of the Department of Mathematics.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4236: Computer tomography**	9 C 6 WLH

Learning outcome, core skills:
The successful completion of modules in the area ”Computer tomography" enables students to learn methods, concepts, theories and applications within the area of "Computer tomography'. During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis).

Learning outcome:

After completing the module, students are familiar with the analytical foundations as well as numerical methods for computer tomography, specifically

- required foundations of the Fourier transform and further transforms, such as the Mellin transform;
- the Radon transform and inversion formulas, particularly the Cormack inversion formula.tThe Fourier Slice Theorem;
- questions regarding the uniqueness of the inverse Radon transform;
- singular Value Decomposition (SVD) of the Radon transform;
- shannon's sampling theorem in the multi-dimensional case;
- numerical reconstruction methods: Filtered Backprojection, Fourier reconstruction, Kaczmarz method, and Algebraic Reconstruction Techniques (ART).

Core skills:

Students develop fundamental competencies in the area of numerical signal and image processing for solving an inverse problem. They:

- learn how to set up a model for an inverse problem from physics and treat it analytically;
- understand how various tools of analysis are used to solve this specific problem of computer tomography to correctly assess reconstruction difficulties;
- apply known techniques such as the Fourier transform to this reconstruction problem;
- learn how both iterative and direct numerical methods can be used to solve the problem;
- compare different reconstruction methods both analytically (via error estimates) and numerically.
- handle methods and concepts of the area ”Computer tomography” confidently;
- explain complex issues of the area ”Computer tomography”;
- apply methods of the area ”Computer tomography” to new problems in this area.

Workload:
Attendance time: 84 h
Self-study time: 186 h

Course: Computer tomography (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4236.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

nicht-amtliche Fassung

Course: Computer tomography - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Numerical methods and Fourier analysis"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4139
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Institute of Numerical and Applied Mathematic

Course frequency: This course is one of two courses that follow on B.Mat.4139 "Applied Fourier Analysis". The decision on which course to offer will be made and announced well in advance of the begin of the introductory course, e.g. via the website of the Department of Mathematics.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4238: Riemannian geometry**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area ”Riemannian geometry" enables students to learn methods, concepts, theories and applications within the area of "Riemannian geometry". During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis). **Learning outcome:** Upon successful completion of the course, students will be able to • internalize the intrinsic perspective of Riemannian geometry and formulate geometric problems independently of any embeddings; • confidently define Riemannian manifolds, metrics, and the Levi-Civita connection, and understand their fundamental properties; • conceptualize geodesics both as curves of minimal length and as solutions to the geodesic equation, and bridge these two perspectives; • conceptually understand and geometrically interpret the curvature tensor, sectional curvature, and Ricci curvature; • apply Jacobi fields as a tool for analyzing variations of geodesics and conjugate points; • understand the statement, prerequisites, and geometric implications of classical results such as Hadamard's Theorem, the Bonnet–Myers Theorem, and Synge's Theorem, and apply them in appropriate contexts. **Core skills:** Students will acquire the ability to: • formulate and analyze geometric problems on manifolds from an intrinsic point of view; • relate local and global properties of Riemannian manifolds to one another; • understand, structure, and independently develop complex proofs within Riemannian geometry; • translate abstract definitions and theorems into concrete geometric questions; • handle methods and concepts of the area ”Riemannian geometry” confidently; • explain complex issues of the area ”Riemannian geometry”; • apply methods of the area ”Riemannian geometry” to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Riemannian geometry (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4238.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Riemannian geometry - exercises (Exercise)	2 WLH

nichtamtliche Fassung

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Riemannian geometry"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4138
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematic

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4239: Numerical methods of signal and image processing**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area ”Numerical signal and image processing" enables students to learn methods, concepts, theories and applications within the area of "Numerical signal and image processing'. During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master’s thesis). **Learning outcome:** After completing the module, students are familiar with • criteria for image compression and data reduction; • basic ideas of data coding; • algorithms for the decorrelation of data using trigonometric transformations; • the functionality of JPEG; • algorithms for image compression using wavelet filter banks; • basic ideas for the denoising of signals and images; • algorithms for image denoising using filters based on nonlinear diffusion; • regularisation methods for signal and image denoising; • applications of machine learning in this field. **Core skills:** tudents develop fundamental competencies in the area "Numerical signal and image processing". They • apply and compare different concepts of signal compression; • understand the functioning of JPEG; • know various numerical methods for signal and image denoising; • understand that image denoising and reconstruction are inverse problems that can be treated using regularisation methods; • know basic regularisation functionals and how to apply them numerically; • apply wavelet filter banks for the compression and denoising of signals and images; • know how machine learning methods can be used for image reconstruction; • handle methods and concepts of the area ”Numerical signal and image processing” confidently; • explain complex issues of the area ”Numerical signal and image processing”; • apply methods of the area ”Numerical signal and image processing” to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Numerical methods of signal and image processing (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:**	9 C

nicht-amtliche Fassung

B.Mat.4239.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	

Course: Numerical methods of signal and image processing - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Numerical signal and image processing"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4139
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:

Instructor: Lecturers at the Institute of Numerical and Applied Mathematic

Course frequency: This course is one of two courses that follow on B.Mat.4139 "Applied Fourier Analysis". The decision on which course to offer will be made and announced well in advance of the begin of the introductory course, e.g. via the Vorlesungskommentar of the Department of Mathematics.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4241: Applied and mathematical stochastics II**	9 C 6 WLH

Learning outcome, core skills: The successful completion of this course enables students to learn methods, concepts, theories and proof techniques in the area "Applied and mathematical stochastics" and use these for the modelling and statistical analysis of stochastic systems. During the course students will be enabled to carry out a Bachelor's thesis in this area. **Learning outcome:** In this course, students • learn about advanced concepts of probability theory established on measure theory and apply them independently; • understand advanced concepts and approaches of probabilistic modelling and inferential statistics; • study basic characteristics of stochastic processes and random geometric objects as well as conditions for their existence and uniqueness; • consider stochastic models based on different stochastic processes in time and space; • analyse the convergence characteristics of stochastic processes and limits of random geometric objects; • analyse regularity characteristics of the paths of stochastic processes and structures of random geometric objects; • adequately model temporal and spatial phenomena in natural and economic sciences as stochastic processes or random geometric objects; • analyse probabilistic and statistical models regarding their typical characteristics, estimate unknown parameters and make predictions for their evolution and structure. **Core skills:** After having successfully completed the module, students will be able to • discuss advanced concepts ofin the area "Applied and mathematical stochastics"; • explain ideas of proof in this area; • illustrate typical applications in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Applied and mathematical stochastics II (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4241.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Applied and mathematical stochastics II - exercises	2 WLH

Examination requirements:	

nicht-amtliche Fassung

Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Applied and mathematical stochastics".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4141 or B.Mat.4142
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4247: Asymptotic statistical methods for data science**	9 C 6 WLH

Learning outcome, core skills: The successful completion of this course enables students to learn methods, concepts, theories and applications in the area "Asymptotic statistical methods for data science" with particular focus on asymptotic aspects. During the course students will be successively introduced to current research topics and able to carry out a Bachelor's thesis. **Learning outcome:** In this course students • investigate in detail empirical distribution functions, empirical quantiles and related quantities, its risk bounds and corresponding confidence statements; • application in survival analysis: Kaplan-Meier estimator; • investigate histogram, kernel density estimator and their statistical properties, application in hazard rate estimation; • are familiar with deviation inequalities, such as Mill's ratio, Hoeffding's and Bernstein's inequality; • learn techniques to analyze and perform computer simulations, such as quasi Monte Carlo integration; • learn about asymptotic statistical techniques, such as Portemanteau's theorem, multivariate central limit theorem, the delta method, continuous mapping theorem and its application to data analysis; • analyze practical statistical methods, such as PCA in a mathematically accurate way; • learn about asymptotic methods for testing statistical hypotheses, e.g. Pearson's chi square test. **Core skills:** After having successfully completed the module, students will be able to • handle methods and concepts of "Asymptotic statistical methods for data science" confidently; • are familiar with mathematical techniques of asymptotic statistics; • apply methods of "Asymptotic statistical methods for data science" to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Asymptotic statistical methods for data science (Lecture)	4 WLH
Examination: Oral examination (approximately 20 minutes) **Examination prerequisites:** B.Mat.4247.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Asymptotic statistical methods for data science - exercises	2 WLH

nicht-amtliche Fassung

Examination requirements: Proof of knowledge basic competencies in selected topics in the area "Statistical methods for data science" with particular focus on asymptotic aspects.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Mat.4248: Stochastic processes and modelling**	9 C 6 WLH

Learning outcome, core skills: The successful completion of the module "Stochastic processes and modelling" enables students to learn and apply methods, concepts, theories and proof techniques in the area of stochastic processes and stochastic modelling in various areas of application. During the course students will be enabled to carry out a Bachelor's thesis in this area. Depending on the current course offer the following content-related competencies may be pursued. **Learning outcome:** In this course, students • construct, characterise, and analyse special classes of stochastic processes, such as e.g. interacting particle systems, branching processes, spatial stochastic processes, coalescent and fragmentation processes, and queueing systems; • construct, characterise, and analyse related discrete random structures such as e.g. random graphs, trees and network; • know and utilise properties of stochastic processes such as the Markov and martingale property; • use these processes to model stochastic systems from different application areas in natural sciences, technology, and finance. **Core skills:** After having successfully completed the module, students will be able to • discuss advanced concepts of "Stochastic processes and modelling"; • explain ideas of proof in this area; • illustrate typical applications in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Stochastic processes and modelling (Lecture)	4 WLH
Examination: Oral examination (appr. 20 minutes) **Examination prerequisites:** B.Mat.4248.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Stochastic processes and modelling - exercises	2 WLH

Examination requirements: Proof of knowledge basic competencies in selected topics in the area "Stochastic processes and modelling".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4141 or B.Mat.4142
Language:	**Person responsible for module:**

nicht-amtliche Fassung

English	Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phi.01: Basismodul Theoretische Philosophie** *English title: Basic Studies in Theoretical Philosophy*	9 C 4 SWS

Lernziele/Kompetenzen: 1. In einem Einführungskurs (Vorlesung oder Einführungsseminar) erwerben die Studierenden Kenntnis zentraler Themen, Grundbegriffe und Theorieansätze der Theoretischen Philosophie in ihren Disziplinen Erkenntnistheorie, Wissenschaftsphilosophie, Sprachphilosophie oder Metaphysik. 2. In einem Proseminar erlangen die Studierenden grundlegende Fähigkeiten, sich mit Sachfragen der theoretischen Philosophie begrifflich präzise und argumentativ auseinanderzusetzen, insbesondere: ausgewählte Problembereiche und systematische Überlegungen der theoretischen Philosophie adäquat darzustellen, Argumentationen zu analysieren und auf elementarem Niveau in mündlicher und mindestens in Textform zu diskutieren.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 214 Stunden

Lehrveranstaltung: 1. Einführungskurs in die theoretische Philosophie (Vorlesung,Seminar) *Angebotshäufigkeit:* Einführungskurs bevorzugt im Wintersemester	2 SWS
Prüfung: Klausur (45 Minuten), unbenotet **Prüfungsanforderungen:** Verständnis zentraler Begriffe, Probleme und Theorieansätze der theoretischen Philosophie und Fähigkeit, diese auf elementarem Niveau argumentativ verständlich darzulegen.	2 C

Lehrveranstaltung: 2. Proseminar zur theoretischen Philosophie **Es muss <u>eine</u> der nachfolgenden Prüfungsformen (Klausur, Hausarbeit oder Essays) absolviert werden.**	2 SWS
Prüfung: Hausarbeit (max. 15 Seiten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Verständnis zentraler Begriffe, Probleme und Theorieansätze der theoretischen Philosophie. Darstellung und Diskussion von Themen der theoretischen Philosophie auf elementarem Niveau mindestens in Textform.	7 C
Prüfung: Essays (insgesamt max. 15 Seiten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Verständnis zentraler Begriffe, Probleme und Theorieansätze der theoretischen Philosophie. Darstellung und Diskussion von Themen der theoretischen Philosophie auf elementarem Niveau mindestens in Textform.	7 C
Prüfung: Klausur (120 Minuten) **Prüfungsvorleistungen:**	7 C

nicht-amtliche Fassung

kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Verständnis zentraler Begriffe, Probleme und Theorieansätze der theoretischen Philosophie. Darstellung und Diskussion von Themen der theoretischen Philosophie auf elementarem Niveau mindestens in Textform.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Christian Beyer
Angebotshäufigkeit: jedes Semester; Einführungskurs bevorzugt im Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 3
Maximale Studierendenzahl: 100	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phi.02: Basismodul Praktische Philosophie** *English title: Basic Studies in Practical Philosophy*	9 C 4 SWS

Lernziele/Kompetenzen: 1. In einem Einführungskurs (Vorlesung oder Einführungsseminar) erwerben die Studierenden Kenntnis zentraler Probleme, Grundbegriffe und Theorieansätze der Praktischen Philosophie. Sie überschauen die Teilgebiete, kennen typische Themen und Terminologien sowie einige der wichtigsten Theorieansätze in Grundzügen. 2. In einem Proseminar (Basisseminar) erlangen die Studierenden grundlegende Fähigkeiten, sich mit Sachfragen der Praktischen Philosophie begrifflich präzise und argumentativ auseinander zu setzen, insbesondere: Grundprobleme und -positionen adäquat darzustellen, ethische Argumentationen zu analysieren und auf elementarem Niveau in mündlicher und mindestens in Textform zu diskutieren.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 214 Stunden

Lehrveranstaltung: Einführungskurs in die Praktische Philosophie (Vorlesung,Seminar) *Angebotshäufigkeit:* jedes Semester; Einführungskurs bevorzugt im Wintersemester	2 SWS
Prüfung: Klausur (45 Minuten), unbenotet **Prüfungsanforderungen:** Verständnis zentraler Begriffe, Probleme und Theorieansätze der praktischen Philosophie und Fähigkeit, diese auf elementarem Niveau argumentativ verständlich darzulegen.	2 C

Lehrveranstaltung: Proseminar zur Praktischen Philosophie **Es muss <u>eine</u> der nachfolgenden Prüfungsformen (Klausur, Hausarbeit oder Essays) absolviert werden.**	2 SWS
Prüfung: Klausur (120 Minuten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Verständnis zentraler Begriffe, Probleme und Theorieansätze der praktischen Philosophie. Darstellung und Diskussion von Themen der praktischen Philosophie auf elementarem Niveau mindestens in Textform.	7 C
Prüfung: Hausarbeit (max. 15 Seiten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Verständnis zentraler Begriffe, Probleme und Theorieansätze der praktischen Philosophie. Darstellung und Diskussion von Themen der praktischen Philosophie auf elementarem Niveau mindestens in Textform.	7 C
Prüfung: Essays (insgesamt max. 15 Seiten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.)	7 C

nicht-amtliche Fassung

Prüfungsanforderungen: Verständnis zentraler Begriffe, Probleme und Theorieansätze der praktischen Philosophie. Darstellung und Diskussion von Themen der praktischen Philosophie auf elementarem Niveau mindestens in Textform.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Holmer Steinfath
Angebotshäufigkeit: jedes Semester, Einführungskurs bevorzugt im Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 3
Maximale Studierendenzahl: 100	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phi.03: Basismodul Geschichte der Philosophie** *English title: Basic Studies in History of Philosophy*	9 C 4 SWS

Lernziele/Kompetenzen: 1. In einem Einführungskurs (Vorlesung oder Einführungsseminar) erwerben die Studierenden einen Überblick über Epochen der Philosophiegeschichte, sie machen eine erste Bekanntschaft mit jeweils zentralen Themenbereichen und einzelnen klassischen Werken. 2. In einem Proseminar (Basisseminar) erlangen die Studierenden Verständnis klassischer Texte der Philosophie sowie Grundfertigkeiten der Analyse eines Textes unter historischen und systematischen Gesichtspunkten.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 214 Stunden

Lehrveranstaltung: 1. Einführungskurs in die Geschichte der Philosophie (Vorlesung,Seminar)	2 SWS
Prüfung: Klausur (45 Minuten), unbenotet **Prüfungsanforderungen:** Überblick über Epochen der Philosophiegeschichte und elementares Verständnis zentraler Themen und klassischer philosophischer Texte sowie Fähigkeit, diese auf elementarem Niveau argumentativ verständlich darzulegen.	2 C

Lehrveranstaltung: 2. Proseminar zur Geschichte der Philosophie **Es muss <u>eine</u> der nachfolgenden Prüfungsformen (Klausur, Hausarbeit oder Essays) absolviert werden.**	2 SWS
Prüfung: Essays (insgesamt max. 15 Seiten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Überblick über Epochen der Philosophiegeschichte, elementares Verständnis zentraler Themen und klassischer philosophischer Texte. Darstellung und Diskussion philosophiegeschichtlicher Themen auf elementarem Niveau mindestens in Textform.	7 C
Prüfung: Klausur (120 Minuten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Überblick über Epochen der Philosophiegeschichte, elementares Verständnis zentraler Themen und klassischer philosophischer Texte. Darstellung und Diskussion philosophiegeschichtlicher Themen auf elementarem Niveau mindestens in Textform.	7 C
Prüfung: Hausarbeit (max. 15 Seiten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:**	7 C

nicht-amtliche Fassung

Überblick über Epochen der Philosophiegeschichte, elementares Verständnis zentraler Themen und klassischer philosophischer Texte. Darstellung und Diskussion philosophiegeschichtlicher Themen auf elementarem Niveau mindestens in Textform.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Sebastian Bender
Angebotshäufigkeit: jedes Semester; Einführungskurs bevorzugt im SoSe	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 2 - 3
Maximale Studierendenzahl: 100	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phi.05: Aufbaumodul Theoretische Philosophie** *English title: Advanced Studies in Theoretical Philosophy*	10 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden verfügen über fortgeschrittene Kenntnisse ausgewählter Themen und Theorien der theoretischen Philosophie sowie über die Fähigkeit der Darstellung und Diskussion systematischer Positionen und Probleme in mündlicher und mindestens in Textform.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 244 Stunden

Lehrveranstaltung: 1. Vorlesung oder Seminar zur theoretischen Philosophie	2 SWS
Lehrveranstaltung: 2. Seminar zur theoretischen Philosophie **Zu beiden Lehrveranstaltungen ist je eine Prüfung zu wählen**, entweder die kleine Leistung oder **eine** Modulprüfung in Form einer Hausarbeit, von Essays oder einer Klausur. In welcher Lehrveranstaltung die Prüfung in Form einer kleinen Leistung abgelegt wird und in welcher in Form einer Hausarbeit, von Essays **oder** einer Klausur, ist frei wählbar.	2 SWS
Prüfung: Kleine Leistung (max. 2 Seiten), unbenotet **Prüfungsanforderungen:** Eingehende Kenntnis ausgewählter Probleme und Theorien der theoretischen Philosophie und Fähigkeit, diese mindestens in kurzer Textform argumentativ verständlich darzulegen.	3 C
Prüfung: Mündliche Prüfung (30 Min.) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Eingehende Kenntnis ausgewählter Probleme und Theorien der theoretischen Philosophie. Sachgemäße u. differenzierte Erörterung von Themen der theoretischen Philosophie **in** mündlicher Form.	7 C
Prüfung: Hausarbeit (max. 15 Seiten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Eingehende Kenntnis ausgewählter Probleme und Theorien der theoretischen Philosophie. Sachgemäße u. differenzierte Erörterung von Themen der theoretischen Philosophie mindestens in Textform.	7 C
Prüfung: Klausur (120 Minuten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Eingehende Kenntnis ausgewählter Probleme und Theorien der theoretischen Philosophie. Sachgemäße u. differenzierte Erörterung von Themen der theoretischen Philosophie mindestens in Textform.	7 C

nicht-amtliche Fassung

Zugangsvoraussetzungen: B.Phi.01	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Catrin Misselhorn
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 2 - 5
Maximale Studierendenzahl: 100	

Bemerkungen:

Jedes der Aufbaumodule bietet die Möglichkeit, die Modulprüfung in Form einer Hausarbeit (max. 15 Seiten), einer Klausur (120 Minuten) oder einer mündlichen Prüfung (ca. 30 Minuten) abzulegen.

Von den zwei Aufbaumodulen, die im Kernbereich des B.A. Philosophie zu wählen sind, ist eines mit einer Hausarbeit abzuschließen und eines mit einer Klausur oder einer mündlichen Prüfung. Für das dritte Aufbaumodul, welches im Professionalisierungsbereich belegt werden kann (fachwissenschaftliche Vertiefung), werden keine Vorgaben gemacht.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phi.06: Aufbaumodul Praktische Philosophie** *English title: Advanced Studies in Practical Philosophy*	10 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden verfügen über fortgeschrittene Kenntnisse ausgewählter Themen und Theorien der Praktischen Philosophie sowie über die Fähigkeit der Darstellung und Diskussion systematischer Positionen und Probleme in mündlicher und mindestens in Textform.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 244 Stunden

Lehrveranstaltung: 1. Vorlesung oder Seminar zur praktischen Philosophie	2 SWS
Lehrveranstaltung: 2. Seminar zur praktischen Philosophie **Zu beiden Lehrveranstaltungen ist je eine Prüfung zu wählen**, entweder die kleine Leistung oder **eine** Modulprüfung in Form einer Hausarbeit, von Essays oder einer Klausur. In welcher Lehrveranstaltung die Prüfung in Form einer kleinen Leistung abgelegt wird und in welcher in Form einer Hausarbeit, von Essays **oder** einer Klausur, ist frei wählbar.	2 SWS
Prüfung: Kleine Leistung (max. 2 Seiten), unbenotet **Prüfungsanforderungen:** Eingehende Kenntnis ausgewählter Probleme und Theorien der praktischen Philosophie und Fähigkeit, diese mindestens in kurzer Textform argumentativ verständlich darzulegen.	3 C
Prüfung: Mündlich (ca. 30 Minuten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Eingehende Kenntnis ausgewählter Probleme und Theorien der praktischen Philosophie. Sachgemäße u. differenzierte Erörterung von Themen der praktischen Philosophie in mündlicher Form.	7 C
Prüfung: Hausarbeit (max. 15 Seiten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Eingehende Kenntnis ausgewählter Probleme und Theorien der praktischen Philosophie. Sachgemäße u. differenzierte Erörterung von Themen der praktischen Philosophie mindestens in Textform.	7 C
Prüfung: Klausur (120 Minuten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Eingehende Kenntnis ausgewählter Probleme und Theorien der praktischen Philosophie. Sachgemäße u. differenzierte Erörterung von Themen der praktischen Philosophie mindestens in Textform.	7 C

nicht-amtliche Fassung

Zugangsvoraussetzungen: B.Phi.02	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Holmer Steinfath
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 2 - 5
Maximale Studierendenzahl: 100	

Bemerkungen:

Jedes der Aufbaumodule bietet die Möglichkeit, die Modulprüfung in Form einer Hausarbeit (max. 15 Seiten), einer Klausur (120 Minuten) oder einer mündlichen Prüfung (ca. 30 Minuten) abzulegen.

Von den zwei Aufbaumodulen, die im Kernbereich des B.A. Philosophie zu wählen sind, ist eines mit einer Hausarbeit abzuschließen und eines mit einer Klausur oder einer mündlichen Prüfung. Für das dritte Aufbaumodul, welches im Professionalisierungsbereich belegt werden kann (fachwissenschaftliche Vertiefung), werden keine Vorgaben gemacht.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phi.07: Aufbaumodul Geschichte der Philosophie** *English title: Advanced Studies in History of Philosophy*	10 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden verfügen über fortgeschrittene Kenntnisse klassischer Texte aus unterschiedlichen Epochen sowie über die Fähigkeit der Darstellung und Behandlung klassischer philosophischer Positionen und Probleme unter historischen und systematischen Gesichtspunkten in mündlicher und mindestens in Textform. Sie können philosophiehistorische Texte hinsichtlich ihrer Struktur analysieren, ihre wesentlichen Aussagen und Argumente erfassen und in ihren historischen und systematischen Interpretationsrahmen einordnen.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 244 Stunden

Lehrveranstaltung: 1. Vorlesung oder Seminar zur Geschichte der Philosophie	2 SWS
Lehrveranstaltung: 2. Seminar zur Geschichte der Philosophie **Zu beiden Lehrveranstaltungen ist je eine Prüfung zu wählen**, entweder die kleine Leistung oder **eine** Modulprüfung in Form einer Hausarbeit, von Essays oder einer Klausur. In welcher Lehrveranstaltung die Prüfung in Form einer kleinen Leistung abgelegt wird und in welcher in Form einer Hausarbeit, von Essays **oder** einer Klausur, ist frei wählbar.	2 SWS
Prüfung: Kleine Leistung (max. 2 Seiten), unbenotet **Prüfungsanforderungen:** Eingehende Kenntnisse klassischer philosophischer Texte aus unterschiedlichen Epochen und Fähigkeit, philosophiegeschichtliche Themen mindestens in kurzer Textform argumentativ verständlich darzulegen.	3 C
Prüfung: Mündlich (ca. 30 Minuten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Eingehende Kenntnisse klassischer philosophischer Texte aus unterschiedlichen Epochen. Sachgemäße u. differenzierte Erörterung von philosophiegeschichtlichen Themen in mündlicher Form.	7 C
Prüfung: Hausarbeit (max. 15 Seiten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:** Eingehende Kenntnisse klassischer philosophischer Texte aus unterschiedlichen Epochen. Sachgemäße u. differenzierte Erörterung von philosophiegeschichtlichen Themen mindestens in Textform.	7 C
Prüfung: Klausur (120 Minuten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 S.; Protokoll, Kurzreferat o.ä.) **Prüfungsanforderungen:**	7 C

nicht-amtliche Fassung

Eingehende Kenntnisse klassischer philosophischer Texte aus unterschiedlichen Epochen. Sachgemäße u. differenzierte Erörterung von philosophiegeschichtlichen Themen mindestens in Textform.	

Zugangsvoraussetzungen: B.Phi.03	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Sebastian Bender
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 2 - 5
Maximale Studierendenzahl: 100	

Bemerkungen:

Jedes der Aufbaumodule bietet die Möglichkeit, die Modulprüfung in Form einer Hausarbeit (max. 15 Seiten), einer Klausur (120 Minuten) oder einer mündlichen Prüfung (ca. 30 Minuten) abzulegen.

Von den zwei Aufbaumodulen, die im Kernbereich des B.A. Philosophie zu wählen sind, ist eines mit einer Hausarbeit abzuschließen und eines mit einer Klausur oder einer mündlichen Prüfung.

Für das dritte Aufbaumodul, welches im Professionalisierungsbereich belegt werden kann (fachwissenschaftliche Vertiefung), werden keine Vorgaben gemacht.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phi.18a: Vertiefte Bearbeitung philosophischer Themen für Studierende aller Fächer** *English title: Detailed Philosophical Studies*	6 C 2 SWS

Lernziele/Kompetenzen: Studierende aller Fächer erweitern ihre fachlichen Kompetenzen durch ausgewählte Themen mit allgemein philosophischem Charakter z.B. aus den Gebieten der Erkenntnis- und Wissenschaftstheorie, der Sprachphilosophie, der Ethik und der Politischen Philosophie. Die Studierenden besitzen die Fähigkeit, • die wesentlichen Aussagen und Argumente in philosophischen Texten zu erfassen, • über philosophische Probleme mit wissenschaftlicher Präzision nachzudenken und • philosophische Positionen auf der Basis aktueller Fachliteratur unter Abwägung der relevanten Thesen und Argumente mindestens in Textform darzustellen und zu diskutieren.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 152 Stunden

Lehrveranstaltung: Vorlesung, Proseminar, Seminar oder Hauptseminar Es muss **eine** der nachfolgenden Prüfungsformen (Hausarbeit oder Essay) absolviert werden.	
Prüfung: Essays (insgesamt max. 15 Seiten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 Seiten)	6 C
Prüfung: Hausarbeit (max. 15 Seiten) **Prüfungsvorleistungen:** kleinere Leistung mindestens in Textform (max. 2 Seiten)	6 C

Prüfungsanforderungen: Verständnis zentraler Begriffe, Probleme und Theorieansätze auf einem Gebiet der Philosophie. Darstellung und Diskussion ausgewählter Probleme mindestens in Textform.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Bei Seminaren und Hauptseminaren: hinreichende Vorkenntnisse auf dem jeweiligen Gebiet (ggf. nach Rücksprache mit den Dozierenden)
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Christian Beyer
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 6
Maximale Studierendenzahl:	

nicht-amtliche Fassung

nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phi.19a: Spezielle Themen der Philosophie für Studierende aller Fächer** *English title: Special Philosophical Topics*	3 C 2 SWS

Lernziele/Kompetenzen:	**Arbeitsaufwand:**
Studierende aller Fächer erweitern ihre fachlichen Kompetenzen durch ausgewählte Themen mit allgemein philosophischem Charakter z.B. aus den Gebieten der Erkenntnis- und Wissenschaftstheorie, der Sprachphilosophie, der Ethik und der Politischen Philosophie. Die Studierenden besitzen die Fähigkeit, • die wesentlichen Aussagen und Argumente in philosophischen Texten zu erfassen, • über philosophische Probleme mit wissenschaftlicher Präzision nachzudenken und • philosophische Positionen in knapper Form mündlich und mindestens in Textform zu präsentieren und zu diskutieren.	Präsenzzeit: 28 Stunden Selbststudium: 62 Stunden

Lehrveranstaltung: Vorlesung, Proseminar, Seminar oder Hauptseminar	
Prüfung: Referat (ca. 20 Min.) mit Ausarbeitung mindestens in Textform (max. 3 Seiten) oder Essay (max. 3 Seiten) oder Klausur (45 Minuten), unbenotet **Prüfungsanforderungen:** Verständnis zentraler Begriffe, Probleme und Theorieansätze auf einem Gebiet der Philosophie. Fähigkeit zur strukturierten Darstellung und Diskussion eines eng umgrenzten Themas.	3 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Bei Seminaren und Hauptseminaren: hinreichende Vorkenntnisse auf dem jeweiligen Gebiet (ggf. nach Rücksprache mit den Dozierenden)
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Catrin Misselhorn
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 6
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phy.1201: Analytische Mechanik** *English title: Analytical mechanics*	8 C 6 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Absolvieren des Moduls können die Studierenden... • die Begriffe und Methoden der klassischen theoretischen Mechanik anwenden; • komplexe mechanische Systeme modellieren und mit den Erlernten formalen Techniken behandeln.	**Arbeitsaufwand:** Präsenzzeit: 84 Stunden Selbststudium: 156 Stunden

Lehrveranstaltung: Vorlesung mit Übung	
Prüfung: Klausur (180 Minuten) **Prüfungsvorleistungen:** Mindestens 50% der Hausaufgaben in den Übungen müssen bestanden worden sein. **Prüfungsanforderungen:** Newton'sche Mechanik (Zentralkraftproblem, Streuquerschnitte); Lagrange-Formalismus (Variationsprinzipien, Nebenbedingungen und Zwangskräfte, Symmetrien und Erhaltungssätze); Starre Körper (Euler-Winkel, Trägheitstensor und Hauptachsentransformation, Euler-Gleichungen); Kleine Schwingungen; Hamilton-Formalismus (Legendre-Transformation, Phasenraum, Liouville'scher Satz, Poisson-Klammern).	8 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** StudiendekanIn der Fakultät für Physik
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** 2
Maximale Studierendenzahl: 180	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phy.1202: Klassische Feldtheorie** *English title: Classical Field Theory*	8 C 6 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Absolvieren des Moduls • verfügen die Studierenden über ein vertieftes Verständnis der Begriffsbildungen der Feldtheorie; • besitzen die Studierenden erweiterte Fähigkeiten im Umgang mit den wichtigsten linearen und nichtlinearen partiellen Differentialgleichungen; • können Lösungsmethoden der Elektrostatik und der Elektrodynamik kennen und anwenden; • beherrschen die wichtigsten Anwendungsbeispiele.	**Arbeitsaufwand:** Präsenzzeit: 84 Stunden Selbststudium: 156 Stunden

Lehrveranstaltung: Vorlesung mit Übung	
Prüfung: Klausur (180 Minuten) **Prüfungsvorleistungen:** Mindestens 50% der Hausaufgaben in den Übungen müssen bestanden worden sein. **Prüfungsanforderungen:** Konkrete Umsetzung der Methoden der Feldtheorie in einfachen Anwendungsbeispielen. Elementare Kontinuumsmechanik und Hydrodynamik; Elektromagnetische Felder und Maxwell'sche Gleichungen im Vakuum und in Materie; Quellen und Randbedingungen, Anfangswertproblem; Multipol-Entwicklung und elektromagnetische Strahlung; Lagrange-Formalismus der Feldtheorie; Spezielle Relativitätstheorie; Grundzüge der Allgemeinen Relativitätstheorie in der Sprache der Differentialgeometrie.	8 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Analytische Mechanik
Sprache: Deutsch	**Modulverantwortliche[r]:** StudiendekanIn der Fakultät für Physik
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** 3
Maximale Studierendenzahl: 180	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phy.1203: Quantenmechanik I** *English title: Quantum Mechanics I*	8 C 6 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Absolvieren des Moduls können die Studierenden... • die Begriffe, Interpretation und mathematischen Methoden der Quantentheorie anwenden; • einfache Potentialprobleme mit den erlernten mathematischen Techniken behandeln.	**Arbeitsaufwand:** Präsenzzeit: 84 Stunden Selbststudium: 156 Stunden

Lehrveranstaltung: Vorlesung mit Übung	
Prüfung: Klausur (180 Minuten) **Prüfungsvorleistungen:** Mindestens 50% der Hausaufgaben in den Übungen müssen bestanden worden sein. **Prüfungsanforderungen:** Kenntnis des konzeptionellen Rahmens, der Prinzipien und Methoden der Quantenmechanik: Wellenmechanik und Schrödinger-Gleichung. Statistische Interpretation von Quantensystemen; Eindimensionale Modellsysteme, gebundene Zustände und Streuzustände; Formulierung der Quantenmechanik (Hilbertraum, lineare Operatoren, unitäre Transformationen, Operatoren und Messgrößen, Symmetrie und Erhaltungsgrößen); Heisenberg-Bild; Quantisierung des Drehimpulses und Spin; Wasserstoffatom; Näherungsverfahren (Störungsrechnung, Variationsverfahren); Mehrteilchensysteme.	8 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** StudiendekanIn der Fakultät für Physik
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** 4
Maximale Studierendenzahl: 180	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phy.1204: Statistische Physik** *English title: Statistical Physics*	8 C 6 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Absolvieren des Moduls können die Studierenden... • die Konzepte und Methoden der statistischen Physik anwenden; • einfache thermodynamische Systeme modellieren und mit den erlernten mathematischen Techniken behandeln.	**Arbeitsaufwand:** Präsenzzeit: 84 Stunden Selbststudium: 156 Stunden

Lehrveranstaltung: Vorlesung mit Übung	
Prüfung: Klausur (180 Minuten) **Prüfungsvorleistungen:** Mindestens 50% der Hausaufgaben in den Übungen müssen bestanden worden sein.	8 C

Prüfungsanforderungen: Thermodynamik (Hauptsätze, Potentiale, Gleichgewichtsbedingungen, Phasenübergänge); Statistik (Wahrscheinlichkeitsverteilungen, Zentralwertsatz); Statistische Ensembles; Ergodenhypothese; Statistische Deutung der Thermodynamik; Zustandssumme; Theorie der Phasenübergänge; Quantenstatistik.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** StudiendekanIn der Fakultät für Physik
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** 5
Maximale Studierendenzahl: 180	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phy.1511: Einführung in die Kern- und Teilchenphysik** *English title: Introduction to Particle Physics*	8 C 6 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Absolvieren des Moduls kennen die Studierenden physikalische Fakten und Modellvorstellungen über den Aufbau der Atomkerne und die Eigenschaften von Elementarteilchen. Außerdem sollten sie mit den grundlegenden Begriffen und Modellen der Kern- und Teilchenphysik umgehen können.	**Arbeitsaufwand:** Präsenzzeit: 84 Stunden Selbststudium: 156 Stunden

Lehrveranstaltung: Einführung in die Kern- und Teilchenphysik	
Prüfung: Klausur (120 Min.) oder mdl. Prüfung (ca. 30 Min.) **Prüfungsvorleistungen:** Mindestens 50% der Hausaufgaben in den Übungen müssen bestanden worden sein.	8 C

Prüfungsanforderungen: Eigenschaften und Spektroskopie von stabilen und instabilen Atomkernen; Eigenschaften von Elementarteilchen und Experimente der Hochenergiephysik; Grundlagen der Teilchenbeschleunigerphysik.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** StudiendekanIn der Fakultät für Physik
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** 5 - 6
Maximale Studierendenzahl: 180	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phy.1521: Einführung in die Festkörperphysik** *English title: Introduction to Solid State Physics*	8 C 6 SWS

Lernziele/Kompetenzen:	**Arbeitsaufwand:**
Nach erfolgreichem Absolvieren des Moduls haben die Studierenden die Grundlagen und die physikalische Erscheinungen der Zusammenhalt der Ionen und Elektronen in einem Festkörper mit idealen periodischen Anordnung der konstituierenden Atomen verinnerlicht. Basierend auf der Eigenschaften freier Atomen und deren Wechselwirkung im Kristallgitter wird ein grundlegendes Verständnis verschiedener kollektiven Phänomene gewonnen. Dazu gehören beispielsweise die elektronische Bandstruktur im periodischen Gitterpotential (Dynamik der Elektronen) sowie die Gitterschwingungen (Dynamik der Ionen), die Elektrizitätsleitung - auch in niederdimensionalen Strukturen - sowie thermische Eigenschaften (spezifische Wärme).	Präsenzzeit: 84 Stunden Selbststudium: 156 Stunden

Lehrveranstaltung: Vorlesung und Übung Einführung in die Festkörperphysik	
Prüfung: Klausur (120 min.) oder mdl. Prüfung (ca. 30 min.) **Prüfungsvorleistungen:** Mindestens 50% der Hausaufgaben in den Übungen müssen bestanden worden sein. **Prüfungsanforderungen:** Grundlagen, Phänomene und Modelle für Elektronen- und Gitterdynamik in Festkörpern. Insbesondere, Chemische Bindung in Festkörpern, Atomare Kristallstruktur, Streuung an periodischen Strukturen, das Elektronengas ohne Wechselwirkung (Freie Elektronen), das Elektronengas mit Wechselwirkung (Abschirmung, Plasmonen), das periodische Potential (Bandstrukturd der Kristall-Elektronen), Gitterschwingungen (Phononen) und spezifische Wärme	8 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Angela Rizzi
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** 5 - 6
Maximale Studierendenzahl: 120	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.1531: Introduction to Materials Physics**	4 C 4 WLH

Learning outcome, core skills: This 2 week long intensive course is offered between the winter and summer semesters. It applies the knowledge obtained in the Einführung in die Festkörperphysik and Thermodynamik und statistische Physik to understanding the structure, properties and dynamic behavior of the materials we use in our everyday lives. **Learning outcomes:** crystal defects, disordered systems, impurities, crystalline mixtures and alloys, phase diagrams, phase transformations, diffusion, kinetics, materials selection, structure-property relations. **Core skills:** The students will gain an understanding of the different materials classes that we use in everyday life, including: how properties of materials are determined by their atomic scale structure, which driving forces determine the structure of equilibrium phases, and how kinetic processes control phase transformations and the dynamics of non-equilibrium processes.	**Workload:** Attendance time: 56 h Self-study time: 64 h

Course: Introduction to Materials Physics (Lecture)	2 WLH
Examination: Written or oral examWritten exam (120 minutes) or oral examination (approximately 30 minutes) **Examination prerequisites:** 50% of the homework problems must be solved successfully. **Examination requirements:** Crystal defects, disordered systems, impurities, crystalline mixtures and alloys, phase diagrams, phase transformations, diffusion, kinetics, materials selection.	4 C

Course: Introduction to Materials Physics (Exercise)	2 WLH

Admission requirements: none	**Recommended previous knowledge:** • Experimentelle Methoden der Materialphysik, • Einführung in die Festkörperphysik, • Thermodynamik und statistische Physik
Language: English	**Person responsible for module:** Prof.in Cynthia Ann Volkert
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1
Maximum number of students: 30	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phy.1541: Einführung in die Geophysik** *English title: Introduction to Geophysics*	4 C 3 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Absolvieren des Moduls können die Studierenden mit den grundlegenden Begriffen und Modellen der Geophysik umgehen: • Treibhauseffekt • Gravimetrie • Seismologie • Elektromagnetische Tiefenforschung • Altersbestimmung • Gezeiten • Konvektion • Erdmagnetfeld • Fraktale und chaotische Prozesse • Plattentektonik	**Arbeitsaufwand:** Präsenzzeit: 42 Stunden Selbststudium: 78 Stunden

Lehrveranstaltung: Vorlesung und Übung zu Einführung in die Geophysik	
Prüfung: Klausur (120 min.) oder mdl. Prüfung (ca. 30 min.) **Prüfungsvorleistungen:** Mindestens 50% der Hausaufgaben in den Übungen müssen bestanden worden sein. **Prüfungsanforderungen:** Grundlagen der Geophysik, insbes. Plattentektonik, Erdbeben	4 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Prof. Dr. Andreas Tilgner
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Bachelor: 6; Master: 1 - 2
Maximale Studierendenzahl: 120	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.1551: Introduction to Astrophysics**	8 C 6 WLH

Learning outcome, core skills: After successful completion of the module students are familiar with the basic concepts of astrophysics in observation and theory. In particular, they • have gained an overview of observational techniques in astronomy • understand the basic physics of the formation, structure and evolution of stars and planets have learned about the classification and structure of normal and active galaxies • understand the basic physics of homogeneous cosmology and cosmological structure formation	**Workload:** Attendance time: 84 h Self-study time: 156 h

Course: Lecture and exercises for introduction to astrophysics	
Examination: oral (approx. 30 minutes) or written (120 min.) exam **Examination prerequisites:** At least 50% of the homework of the excercises have to be solved successfully. **Examination requirements:** Observational techniques, Planets and exoplanets, planet formation, stellar formation, structure and evolution, galaxies, AGN and quasars, cosmology, structure formation	8 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Jens Carsten Niemeyer
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1
Maximum number of students: 120	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.1561: Introduction to Physics of Complex Systems**	6 C 6 WLH

Learning outcome, core skills: Sound knowledge of essential methods and concepts from Nonlinear Dynamics and Complex Systems Theory, including practical skills for analysis and simulation (using, for example, the programming language python) of dynamical systems.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Introduction to Physics of Complex Systems (Lecture)	4 WLH
Examination: written examination (120 Min.) or oral examination (approx. 30 Min.) **Examination prerequisites:** At least 50% of the homework of the excercises have to be solved successfully. **Examination requirements:** • Knowledge of fundamental principles and methods of Nonlinear Physics • Modern experimental techniques and theoretical models of Complex Systems theory.	6 C

Course: Introduction to Physics of Complex Systems (Exercise)	2 WLH

Admission requirements: none	**Recommended previous knowledge:** Basic programming skills (for the exercises)
Language: English, German	**Person responsible for module:** Prof. Dr. Stefan Klumpp Prof. Dr. Ulrich Parlitz
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 2
Maximum number of students: 120	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.1571: Introduction to Biophysics**	6 C 6 WLH

Learning outcome, core skills: After attending this course, students will have basic knowledge about • the build-up of cells and the function of the components • transport phenomena on small length scales, derivation and solution of the diffusion equation • laminar hydrodynamics and its application in biological systems (flow, swimming, motility) • reaction kinetics and cooperativity, including enzymes • non-covalent interaction forces • self-assembly • biological (lipid) membrane build-up and dynamics • biopolymer physics and cytoskeletal filaments, including filament and cell mechanics • neurobiophysics • experimental methods, including state-of-the-art microscopy	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Introduction to Biophysics (Lecture) *Contents*: components of the cell; diffusion, Brownian motion and random walks; low Reynolds number hydrodynamics; chemical reactions, cooperativity and enzymes; biomolecular interaction forces and self-assembly; membranes; polymer physics and mechanics of the cytoskeleton; neurobiophysics; experimental methods and microscopy	4 WLH
Examination: Written exam (120 min.) or oral exam (ca. 30 min.) **Examination prerequisites:** At least 50% of the homework problems have to be solved successfully. **Examination requirements:** Knowledge of the fundamental principles, theoretical descriptions and experimental methods of biophysics.	6 C

Course: Introduction to Biophysics (Exercise)	2 WLH

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Sarah Köster
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 2
Maximum number of students: 100	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5402: Advanced Quantum Mechanics**	6 C 6 WLH

Learning outcome, core skills: **Acquisition of knowledge:** After successful completion of the module students will be familiar with the core concepts and mathematical methods of advanced quantum mechanics and quantum many-body theory. **Competencies:** Students will be able to model and analyse single-particle and many-body quantum mechanical systems, drawing also on concepts of quantum information theory.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Advanced Quantum Mechanics (Lecture)	4 WLH
Examination: written exam (120 min.) or oral exam (approx. 30 min.) **Examination prerequisites:** At least 50% of the homework of the excercises have to be solved successfully. **Examination requirements:** Time-dependent perturbation theory, scattering, mixed states, path integrals in quantum mechanics, quantum information, entanglement as resource, many-body systems, second quantisation, basis elements of quantum field theory.	6 C

Course: Advanced Quantum Mechanics (Exercise)	2 WLH

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of 1-particle quantum mechanics
Language: English	**Person responsible for module:** Prof. Dr. Stefan Kehrein
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 3
Maximum number of students: 80	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5513: Numerical fluid dynamics**	6 C 4 WLH

Learning outcome, core skills: After completion of this module students should ... • know the basic methods for solving partial differential equations • be able to program and analyze numerical methods for the solution of partial differential equations.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Lecture with exercises	

Von den folgenden Prüfungen ist genau eine erfolgreich zu absolvieren:	
Examination: Term Paper (max. 15 pages)	6 C
Examination: Oral examination (approx. 30 minutes)	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Andreas Tilgner
Course frequency: every 4th semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: 20	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phy.5516: Physik der Galaxien** *English title: Physics of Galaxies*	3 C 2 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Absolvieren des Moduls verfügen die Studierenden über Kenntnisse zu folgenden Schwerpunkten: • Klassifizierung von Galaxien, • Helligkeitsprofile, • spektroskopische Eigenschaften, • stellare Population und interstellares Medium, • Kinematik, • Massen(bestimmungsmethoden), • Galaxienentwicklung	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 62 Stunden

Lehrveranstaltung: Vorlesung (Vorlesung)	
Prüfung: Mündlich (ca. 30 Minuten) **Prüfungsanforderungen:** • morphologische Galaxienklassifikation, • Oberflaechenhelligkeit, • Aufbau und Struktur von Galaxien, • Rotation und Dynamik, • stellare Zusammensetzung und Gaskomponenten des Interstellaren Mediums, • Galaxienmassen, • Skalierungsrelationen, • Galaxienentwicklung	3 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Wolfram Kollatschny
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Bachelor: 4 - 6; Master: 1
Maximale Studierendenzahl: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5517: Physics of the Sun, Heliosphere and Space Weather: Key Knowledge**	3 C 2 WLH

Learning outcome, core skills: After successful completion of the module the participants understand: • the elementary parameters of the Sun-Earth-System, • the origin and different forms of solar activity, • the physical processes of the heliosphere, • the exploration of space and the Sun with space missions, • the effects of the Sun on Earth and space weather.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Physics of the Sun, Heliosphere and Space Weather: Key Knowledge (Lecture) *Contents*: • Basic knowledge of the Sun-Earth-System, • Basic physics of the Sun, its outer atmosphere and its effects on interplanetary spac, • Exploration of the Sun and space with dedicated spacecraft and instruments, • Effects of the Sun on Earth, including cosmic effects, Finally, the research field of space weather, different forecast methods and new projects will be presented.	

Von den folgenden Prüfungen ist genau eine erfolgreich zu absolvieren:	
Examination: Written examinationWritten examination (120 minutes)	3 C
Examination: Oral examinationoral examination (approx. 30 minutes)	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Ansgar Reiners Contact Person: Dr. Bothmer
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 4 - 6; Master: 1
Maximum number of students: 30	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5518: Physics of the Sun, Heliosphere and Space Weather: Space Weather Applications**	3 C 2 WLH

Learning outcome, core skills: Learning outcome: Introduction into the physics processes of space weather based on applied study cases. Core skills: Knowledge about physical processes of space weather and its applications. Ability in self-organised solving of case studies.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Vorlesung (Lecture)	

Von den folgenden Prüfungen ist genau eine erfolgreich zu absolvieren:	
Examination: Written examination (120 minutes)	3 C
Examination: Oral examination (approx. 30 minutes)	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** Prof. Dr. Ansgar Reiners Contact person: Dr. Bothmer
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 4 - 6; Master: 1
Maximum number of students: 30	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5523: General Relativity**	6 C 6 WLH

Learning outcome, core skills: The students master the foundations of General Relativity mathematically and physically. They are able to perform corresponding computations in simple models.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: General Relativity (Lecture)	4 WLH
Examination: Written examination (120 minutes) **Examination requirements:** Basic structures of Differential geometry, simple examles of computations, Einstein's equation, underlying principles, Schwarzschild space-time, classical tests of General Relativity, foundations of cosmology.	6 C

Course: Excercises	2 WLH

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of Mechanics, Electrodynamics and special Relativity, Analysis of several real variables
Language: German, English	**Person responsible for module:** Prof. Laura Covi
Course frequency: Two-year as required / Winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: 60	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phy.5601: Theoretical and Computational Neuroscience I** *English title: Theoretical and Computational Neuroscience I*	3 C 2 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Absolvieren des Moduls sollten die Studierenden... • ein vertieftes Verständnis folgender Themen entwickelt haben: TCN I: biophysikalische Grundlagen neuronaler Anregbarkeit, mathematische Grundlagen neuronaler Anregbarkeit, Input-Output Beziehungen und Bifurkationen, Klassifizierung, Existenz, Stabilitaet und Koexistenz sychroner und asynchroner Zustaende in spikenden neuronalen Netzwerken; • Methoden und Methodenentwicklung für die Analyse hochdimensionaler Modelle ratenkodierter Einheiten in Feldmodellen verstehen; • die Handhabung von Bifurkationsszenarien und zugehörigen Instabilitäten verstanden haben.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 62 Stunden

Lehrveranstaltung: Collective Dynamics Biological Neural Networks I (Vorlesung)	

Von den folgenden Prüfungen ist genau eine erfolgreich zu absolvieren:	
Prüfung: Klausur (120 Minuten)	3 C
Prüfung: Mündlich Mündliche Prüfung (ca. 30 Minuten)	3 C
Prüfung: Vortrag (2 Wochen Vorbereitungszeit) (30 Minuten)	3 C

Prüfungsanforderungen: Grundlagen der Membranbiophysi;, Bifurkationen anregbarer Systeme; Verständnis der Grundlagen der Modellierungsansätze der Neurophysik; kollektive Zustände spikender neuronaler Netzwerke; insbesondere Synchonizität; Balanced State; Phase-Locking und diesen Zuständen unterliegenden lokalen und Netzwerkeigenschaften: Netzwerktopologie; Delays; inhibitorische und exzitatorische Kopplung; sparse random networks	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Fred Wolf
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Bachelor: 4 - 6; Master: 1
Maximale Studierendenzahl: 90	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.Phy.5602: Theoretical and Computational Neuroscience II** *English title: Theoretical and Computational Neuroscience II*	3 C 2 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Absolvieren des Moduls sollten Studierende... • das vertiefte Verständnis folgender Themen entwickelt haben: TCN II: Grundlagen neuronaler Anregbarkeit, Input-Output Beziehungen bei Einzelneuronen, eindimensionale Feldmodelle (Feature Selectivity, Contrastinvariance), zweidimensionale Feldmodell (Zusammenwirken von kurz- und langreichweitigen Verbindungen sowie lokaler Nichtlinearitaeten), Amplitudengleichungen und ihre Loesungen; • Methoden und Methodenentwicklung für die Analyse spikender neuronaler Netzwerke mit und ohne Delays, Handhabung von Bifurkationsszenarien und zugehörigen Instabilitäten verstehen.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 62 Stunden

Lehrveranstaltung: Collective Dynamics Biological Neural Networks II (Vorlesung)	

Von den folgenden Prüfungen ist genau eine erfolgreich zu absolvieren:	
Prüfung: Klausur (120 Minuten)	3 C
Prüfung: Mündlich (ca. 30 Minuten)	3 C
Prüfung: Seminarvortrag (2 Wochen Vorbereitungszeit) (30 Minuten)	3 C

Prüfungsanforderungen: Ratenmodelle von Einzelneuronen; Feldansatz in der theoretischen Neurophysik; Grundlagen der Bifurkationen anregbarer System; Verständnis der Grundlagen der Modellierungsansätze der Neurophysik; Zusammenhang diskrete/kontinuierliche Modelle; kollektive Zustände ein- und zweidimensionaler Feldmodelle, insbesondere ring model of feature selectivity; orientation preference maps.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch	**Modulverantwortliche[r]:** Prof. Dr. Fred Wolf
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** Bachelor: 4 - 6; Master: 1
Maximale Studierendenzahl: 90	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5605: Computational Neuroscience: Basics**	3 C 2 WLH

Learning outcome, core skills: **Goals:** Introduction to the different fields of Computational Neuroscience: • Models of single neurons, • Small networks, • Implementation of all simple as well as more complex numerical computations with few neurons. • Aspects of sensory signal processing (neurons as ‚filters'), • Development of topographic maps of sensory modalities (e.g. visual, auditory) in the brain, • First models of brain development, • Basics of adaptivity and learning, • Basic models of cognitive processing. **Kompetenzen/Competences:** On completion the students will have gained… • … overview over the different sub-fields of Computational Neuroscience; • … first insights and comprehension of the complexity of brain function ranging across all sub-fields; • … knowledge of the interrelations between mathematical/modelling methods and the to-be-modelled substrate (synapse, neuron, network, etc.); • … access to the different possible model level in Computational Neuroscience.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Computational Neuroscience: Basics (Lecture)	
Examination: Written examination (45 minutes) **Examination requirements:** Actual examination requirements: Having gained overview across the different sub-fields of Computational Neuroscience; Having acquired first insights into the complexity of across the whole bandwidth of brain function; Having learned the interrelations between mathematical/modelling methods and the to-be-modelled substrate (synapse, neuron, network, etc.) Being able to realize different level of modelling in Computational Neuroscience.	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Florentin Andreas Wörgötter
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Bachelor: 2 - 6; Master: 1 - 4

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5624: Introduction to Theoretical Neuroscience**	4 C 2 WLH

Learning outcome, core skills: After successfully completing this course, students should understand and be able to employ the fundamental concepts, model representations and mathematical methods of the theoretical physics of neuronal systems. Students learn to work independently on complex scientific questions and to present them appropriately to specialists in their own and other subjects; they also acquire the ability to engage in critical scientific discussion.	**Workload:** Attendance time: 28 h Self-study time: 92 h

Course: Seminar	
Examination: Lecture (approx. 60 minutes) **Examination prerequisites:** Active Participation **Examination requirements:** Elementary knowledge of the construction, biophysics and function of nerve cells; probabilistic analysis of sensory encoding; simple models of the dynamics and information processing in networks of biological neurons; modelling of the biophysical foundations of learning processes.	4 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Fred Wolf
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 4 - 6; Master: 1 - 4
Maximum number of students: 25	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5651: Advanced Computational Neuroscience**	3 C 2 WLH

Learning outcome, core skills: Participants in the course can explain and relate biological foundations and mathematical modelling of selected (neuronal) algorithms for learning and pattern formation. Based on the the algorithms' properties, they can discuss and derive possible technical applications (robots).	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Advanced Computational Neuroscience I (Lecture)	
Examination: Written examination (90 Min.) or oral examination (approx. 20 Min.) **Examination requirements:** Algorithms for learning: • Unsupervised Learning (Hebb, Differential Hebb), • Reinforcement Learning, • Supervised Learning Algorithms for pattern formation. Biological motivation and technical Application (robots).	3 C

Admission requirements: none	**Recommended previous knowledge:** Basics Computational Neuroscience
Language: English	**Person responsible for module:** Prof. Dr. Florentin Andreas Wörgötter
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: 50	

Additional notes and regulations:
Hinweis: Die B.Phy.5652 kann als vorlesungsbegleitendes Praktikum besucht werden.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5652: Advanced Computational Neuroscience II**	3 C 2 WLH

Learning outcome, core skills: Participants in the course can implement, test, and evaluate the properties of selected (neuronal) algorithms for learning and pattern formation.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Advanced Computational Neuroscience: Learning and Adaptive Algorithms II	
Examination: 4 Protocols (max. 3 Pages) and Presentations (ca. 10 Min.), not graded **Examination requirements:** Algorithms for learning: • Unsupervised Learning (Hebb, Differential Hebb), • Reinforcement Learning, • Supervised Learning Algorithms for pattern formation. Biological motivation and technical Application (robots). *For each of the 4 programming assignments 1 protocol (ca. 3 pages) and 1 oral presentations (demonstration and discussion of the program, ca. 10 min).*	3 C

Admission requirements: B.Phy.5651 (can be taken in parallel to B.Phy.5652)	**Recommended previous knowledge:** Programming in C++, basic numerical algorithms, Grundlagen Computational Neuroscience B.Phy.5504: Computational Physics (Scientific Computing)
Language: English	**Person responsible for module:** Prof. Dr. Florentin Andreas Wörgötter
Course frequency: unregelmäßig	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: 24	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5665: Processing of Signals and Measured Data**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome**: • Errors, e.g. systematic vs. random, static vs. dynamic, error propagation • Extraction of relevant information (separating trends, stochastic data and affecting influences, such as noise) • Stationarity, statistical quantities and functions • Characteristics of estimators (e.g., sufficiency, ergodicity, bias freeness, efficiency), Cramer-Rao bound, Bessel's correction • Sampling (equidistant and non-uniform), Possibility of reconstruction, sampling theorem, aliasing • Signal transformations (e.g. cosine, Fourier, Hilbert, Laplace, wavelet, z transform) and signal decomposition (e.g. Proper Orthogonal Decomposition, Independent Component Analysis) • Correlation functions and spectra, Wiener-Khinchin theorem • preferred acquisition, sample weighting • Window functions, moving average **Core skills**: • Specification of a measurement (sampling rate, duration, amount of data) • Bias-free and most efficient signal and data processing of measured data • Programming in Matlab or Python	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Processing of Signals and Measured Data	2 WLH
Examination: Presentation or oral exam (ca. 30 Min.) **Examination requirements:** Efficient use of signal and image processing methods as well as statistical analysis methods.	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Eberhard Bodenschatz
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: 30	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5670: Introduction to Magnetic Resonance Imaging**	6 C 4 WLH

Learning outcome, core skills: Introduction to magnetic resonance imaging. This includes basic knowledge about the underlying physics (e.g. nuclear spins, Larmor frequency, Zeeman effect, gyromagnetc ratio, Bloch equations, spin relaxation), technical details of an MRI scanner (e.g. static magnetic field, radio-frequency transmitter, magnetic gradient system, receiv- and transmitter coils), about acquisition and reconstruction methods and about specific medical applications (e.g. perfusion and diffusion imaging). The lecture is complemented by exercises and practical examples to strengthen the acquired knowledge.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Lecture: Introduction to Magnetic Resonance Imaging (Lecture)	WLH
Course: Exercises: Introduction to Magnetic Resonance Imaging (Exercise)	WLH
Examination: Written exam (120 min.), oral exam (ca. 30 min.), or practical project with presentation (ca. 20 min) and written report (10 pages max.), 4 weeks of preparation time **Examination requirements:** Basic knowledge about magnetic resonance imaging (physics, MRI scanner, data acquisition, reconstruction, and applications)	6 C

Admission requirements: none	**Recommended previous knowledge:** Electrodynamics, quantum mechanics
Language: English, German	**Person responsible for module:** Prof. Dr. Tim Salditt Prof. Dr. Uecker, Prof. Dr. Boretius
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: 50	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5676: Computer Vision and Robotics**	9 C 6 WLH

Learning outcome, core skills: After successful completion of this module, students are familiar with • the basic concepts of computer vision (CV), • low level hardware components and their functions, • building and programming a robot, and • computer vision and robotics algorithms.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Introduction to Computer Vision and Robotics (Lecture) *Contents*: On-Off Controller, PID Controller, Moving Average Filter, Exponential Moving Average Filter, Kalman Filter, A*, Dijkstra, RRT, Q-Learning , Inverse and Forward Kinematics, Movement Generation Methods, Smoothing and Median Filtering, Bilateral Filtering, Non-Local Means, Connected Components , Morphological Operators , Line Detection, Circle Detection, Feature Detection, Advanced image segmentation algorithms.	2 WLH
Course: Practical Course on Computer Vision and Robotics (Lecture) *Contents*: Building a robot, solving a graph problem using the robot and executing the found solution by the robot in a real-world scenario involving perception and navigation	2 WLH
Course: Tutorial on Computer Vision and Robotics (Tutorial) *Contents*: In the accompanying tutorial sessions students deepen and broaden their knowledge from the lectures	2 WLH
Examination: Written report (approx. 10 p.) and Oral Exam (approx. 30 minutes) **Examination requirements:** Written report requirements: The students must be able • to describe their project in a written report • to explain given problems and used solutions for navigation- and perception problems of robots Oral Examination requirements: The students must be able • to repeat and explain lecture material • to explain control algorithms for a robot, and • to identify and understand low level hardware components as robot sensors and actuators.	9 C

Admission requirements: none	**Recommended previous knowledge:** Programming in Python
Language: English	**Person responsible for module:** Prof. Dr. Florentin Andreas Wörgötter
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

nicht-amtliche Fassung

three times	Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: 24	

Additional notes and regulations:
Ausschluss: Dieses Modul darf nicht belegt werden, wenn B.Phy.5667 oder B.Phy.5668 schon belegt wurden.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5725: Renormalization group theory and applications**	6 C 6 WLH

Learning outcome, core skills: **Learning outcome:** After successful completion of the modul students will be able to understand concepts of field theory and renormalization group in classical and quantum systems. **Core skills:** Students will be able to use the basics of field theory, including perturbation theory and renormalization, and be able to apply these tools to physical problems.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Renormalization group theory and applications (Lecture)	4 WLH
Course: Renormalization group theory and applications (Exercise)	2 WLH
Examination: Written or oral examWritten exam (120 min) or oral exam (approx. 30 min) **Examination prerequisites:** None **Examination requirements:** Theoretical concepts of field theory, renormalization techniques, and their physical interpretation.	6 C

Admission requirements: none	**Recommended previous knowledge:** • Thermodynamik und statistische Mechanik • Quantenmechanik I
Language: English, German	**Person responsible for module:** Prof. Dr. Matthias Krüger
Course frequency: every 4th semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5805: Quantum field theory I**	6 C 6 WLH

Learning outcome, core skills: **Acquisition of knowledge:** Quantization of free relativistic wave equations (Klein-Gordon and Dirac); General properties of quantum fields; Interaction with external sources; Perturbation theory and basics of renormalization theory; Quantum Electro Dynamics and abelian gauge symmetry. **Competencies:** The students shall be familiar with the basic concepts and methods of Quantum Field Theory. They can apply them to explicit examples.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Quantum field theory I (Lecture)	4 WLH
Course: Quantum field theory I (Exercise)	2 WLH

Von den folgenden Prüfungen ist genau eine erfolgreich zu absolvieren:	
Examination: Written examination (120 minutes) **Examination requirements:** Solution of concrete problems treated in the lecture course. Explanation of notions and methods of Quantum Field Theory.	6 C
Examination: Oral examination (approx. 30 minutes)	6 C

Admission requirements: none	**Recommended previous knowledge:** Quantum mechanics I, II, Classical Field theory
Language: English	**Person responsible for module:** Prof. Laura Covi
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 6; Master: 1 - 2
Maximum number of students: 50	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.Phy.5810: Physics of the Higgs boson**	3 C 3 WLH

Learning outcome, core skills: After successful completion of this module, students should possess a deep understanding of the Higgs mechanism, the properties of the Higgs boson, and experimental methods (concepts and concrete examples) used in investigations of the Higgs sector.	**Workload:** Attendance time: 42 h Self-study time: 48 h

Course: Physics of the Higgs boson (Lecture)	
Examination: Oral examination (approx. 30 minutes) **Examination requirements:** Review of the Standard Model of particle physics; The Higgs mechanism and the Higgs potential; properties of the Standard Model Higgs boson; Experimental methods in the search for the Higgs boson at LEP, Tevatron and LHC; Discovery of the Higgs boson; Measurement of the Higgs boson couplings and other properties; Two Higgs Doublet Modells and extended Higgs sectors (in particular, the MSSM); Searches for Higgs bosons beyond the Standard Model.	3 C

Admission requirements: none	**Recommended previous knowledge:** Introduction to Nuclear/Particle Physics
Language: German, English	**Person responsible for module:** Prof. Dr. Arnulf Quadt
Course frequency: every 4th semester; irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: 30	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-BWL.0006: Finanzmärkte und Bewertung** *English title: Capital Markets and Valuation*	6 C 4 SWS

Lernziele/Kompetenzen: Mit dem erfolgreichen Abschluss des Moduls haben die Studierenden folgende Kompetenzen erworben: • sie kennen die Besonderheiten verschiedener Finanzinstrumente wie Anleihen, Forwards, Optionen und Aktien und können diese erklären, • sie verstehen verschiedene Verfahren zur Bewertung von Finanztiteln und können diese kritisch reflektierend beurteilen, • sie können die Implikationen der verschiedenen Bewertungsverfahren für das Asset Management und für das Verhalten von Investoren herausarbeiten und erklären, • sie können die Bedeutung von Nachhaltigkeit und nicht-finanzieller Motive für die Bewertung von Finanzinstrumenten erläutern und die diesbezüglichen Grenzen bekannter Bewertungsmodelle beurteilen, • sie können ein gegebenes Bewertungsproblem in den Kontext der in der Veranstaltung vorgestellten Verfahren einordnen und selbstständig analysieren.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Finanzmärkte und Bewertung (Vorlesung) *Inhalte*: 1. Einführung in die Bewertung von Finanzinstrumenten und grundlegende Bewertungsprinzipien 2. Bewertung von Anleihen: Statische Duplikation bei sicheren Zahlungen 3. Bewertung von Forwards und Futures: Statische Duplikation bei unsicheren Zahlungen 4. Bewertung von Optionen: Dynamische Duplikation bei unsicheren Zahlungen 5. Bewertung von Aktien: Duplikation auf Basis eines äquivalenten bewerteten Risikos 5.1. Portfoliotheorie 5.2. Capital Asset Pricing Model (CAPM)	2 SWS
Lehrveranstaltung: Finanzmärkte und Bewertung (Übung) *Inhalte*: Im Rahmen der begleitenden Übung vertiefen und erweitern die Studierenden die in der Vorlesung erworbenen Kenntnisse und Fähigkeiten.	2 SWS
Prüfung: Klausur (60 Minuten)	6 C

Prüfungsanforderungen:	

nicht-amtliche Fassung

- Nachweis von Kenntnissen über Ähnlichkeiten und Unterschiede von verschiedenen Klassen von Finanzinstrumenten, wie Anleihen, Aktien und Derivaten,
- Nachweis von Kenntnissen über die zentralen Konzepte der Bewertung von Finanzinstrumenten (Duplikationsprinzip, No-Arbitrage Bewertung, Gleichgewichtsbewertung),
- Fähigkeit zur Analyse von Finanzprodukten,
- Fähigkeit zur Umsetzung einer konkreten Bewertung von Finanzprodukten.

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-BWL.0112 Finanzwirtschaft des Unternehmens
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Olaf Korn
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 4 - 6
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-BWL.0023: Grundlagen der Versicherungstechnik** *English title: Actuarial Techniques*	6 C 2 SWS

Lernziele/Kompetenzen: Die Studierenden erwerben die folgenden Fähigkeiten und Kenntnisse: • Kenntnis und Verständnis der Funktionsweise der Versicherungsmärkte, • Kenntnis und Verständnis der Geschäftsmodelle und der technischen Grundlagen in der Lebens-, Kranken-, Schadens- und Rückversicherung sowie in der Betrieblichen Altersversorgung, • Kenntnis und Verständnis des Risikomanagements und der Solvabilitätsvorschriften incl. Methoden der Risikobewertung, • Kenntnis und Verständnis der Finanzierungsvorgänge incl. Rückstellungsbildung in der Versicherungswirtschaft, • Fähigkeit, der Bewertung der zentralen Unterschiede in den Geschäftsmodellen der privaten Versicherungswirtschaft, der gesetzlichen Versicherungssysteme und der Kreditwirtschaft, • Kenntnis des Instrumentariums der Risikopolitik eines Versicherungsunternehmens, auch anhand konkreter praktischer Beispiele, • Fähigkeit, einfache Berechnungen zur Versicherungstechnik vorzunehmen.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 152 Stunden

Lehrveranstaltung: Grundlagen der Versicherungstechnik (Vorlesung) *Inhalte*: 1. Begriffsbestimmungen, Struktur und Elemente des Risikotransfers; 2. Elemente der Risikopolitik (u.a. Grundlagen der Prämienkalkulation und -differenzierung, Risikoauslese und Underwriting, Reservierungspolitik, Schadenmanagement, Rück- und Mitversicherung,); 3. Geschäftsmodelle der Versicherungssparten (Lebensversicherung, Krankenversicherung, Schadenversicherung, Rückversicherung); 4. Risikomanagement und Solvabilitätsvorschriften, insbesondere Solvency II; 5. Finanzierung und Kapitalanlage	2 SWS
Prüfung: Klausur (120 Minuten)	6 C

Prüfungsanforderungen: • Nachweis von Kenntnissen der Funktion eines Versicherungsmarktes und seiner wesentlichen Determinanten und Begriffe, • Nachweis von Kenntnissen im Risikomanagement, der Solvabilitätsanforderungen und Risikobewertung, • Nachweis von Kenntnissen der Risikopolitik und der Geschäftsmodelle der Versicherungssparten, • Nachweis von Kenntnissen der Finanzierung des Risikotransfers, • Bewertung der Rolle der Versicherungswirtschaft zum Markt der Kreditwirtschaft und der gesetzlichen Versicherungssysteme, • Einfache Berechnungen zur Versicherungstechnik.	

nicht-amtliche Fassung

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Martin Balleer
Angebotshäufigkeit: in der Regel jedes zweite Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 4 - 6
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-BWL.0038: Supply Chain Management** *English title: Supply Chain Management*	6 C 2 SWS

Lernziele/Kompetenzen: Nach erfolgreicher Teilnahme des Moduls sind die Studierenden in der Lage, Instrumente, mit denen Distributionsaufgaben von Industrie- und Handelsunternehmen gelöst und koordiniert werden, anzuwenden, zu beurteilen und bei Bedarf anzupassen. Hierzu zählen insbesondere die gemeinsame Prognose der Nachfrage sowie die koordinierte Bestell- und Bestandspolitik von Handel und Industrie.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 152 Stunden

Lehrveranstaltung: Supply Chain Management (Vorlesung) *Inhalte*: 1. Begriffliche Grundlagen des Supply Chain Managements 2. Analyserahmen für die Ausgestaltung der Supply Chain • Der Management-Zyklus • Elemente und Strukturen des entscheidungsorientierten Ansatzes • Entscheidungsfelder des Supply Chain Managements • Zielgrößen des Supply Chain Managements • Analyse der Einflussfaktoren 3. Koordination der Supply Chain • Begriffliche Grundlagen • Transaktionale versus relationale Koordination • Supplier Relationship Management • Beziehungsstile im Business to Business Geschäft 4. Standortplanung • Ziele, Einflussfaktoren und Optionen der Lagerstruktur • Methoden zur Lösung von Standortproblemen 5. Prognose der Nachfrage • Elemente eines Prognosesystems • Regressionsanalyse im Rahmen der Kausalanalyse • Grundlagen der Zeitreihenanalyse • Exponentielle Glättung Saisonmodell 6. Bestellmengenplanung • Bestellentscheidungen bei deterministischer Nachfrage • Bestellentscheidungen bei stochastischer Nachfrage • Das Joint Economic Lot Size (JELS) Modell 7. Technologische Voraussetzungen • Elektronischer Datenaustausch • Standardisierung • RFID	2 SWS

nicht-amtliche Fassung

Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: Nachweis von Fähigkeiten, Probleme der wirtschaftsstufenübergreifenden Koordination von Beschaffungs- und Distributionsproblemen zu analysieren. Beherrschung von Instrumenten, mit denen insbesondere die Schnittstelle zwischen Industrie und Handel abgestimmt wird. Kritische Diskussion der Ergebnisse solcher Instrumente.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-BWL.0005 Marketing
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Waldemar Toporowski
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 4 - 6
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:
Je nach Kapazität findet eine zusätzliche Übung mit Fallstudien statt. Informationen dazu stehen zu Beginn des Semesters im Vorlesungsverzeichnis.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.WIWI-BWL.0087: International Marketing**	6 C 2 WLH

Learning outcome, core skills: After successful attendance the students understand the foundations of international marketing as well as the diverse environments of global markets. They are able to explain and the central elements of the international decision-making process, such as country and entry mode selection. Moreover, they are able to analyze and compare the attractiveness of different countries and recommend tailored marketing program strategies.	**Workload:** Attendance time: 28 h Self-study time: 152 h

Course: International Marketing (Lecture) *Contents*: • Introduction to international marketing • Social and cultural environments • Political, legal, and regulatory environments • Assessing global marketing opportunities • International marketing strategy (country selection, entry-modes, international marketing mix) • Branding across cultures The course conveys theoretical knowledge which is enriched by case studies. Specific contents are international trade developments, culture and values (incl. approaches by Hofstede, Inglehart, & Schwartz), political risk assessment, legal environments, international marketing research, competitive analysis and strategy (incl. Porter's Five Forces), emerging markets, entry strategy (incl. Uppsala model vs. born global approach), country selection, market entry modes, international marketing mix, and the country-of-origin effect.	2 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: The written exam assesses students' understanding of the course content as well as their ability to apply their knowledge to case studies. **Examples:** • Comparing different approaches of cultural difference assessment • Assessing a country's competitive environment • Recommending entry modes for different countries	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Yasemin Boztug
Course frequency: each winter semester	**Duration:** 1 semester[s]

nicht-amtliche Fassung

Number of repeat examinations permitted: twice	**Recommended semester:** 3 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-BWL.0111: Jahresabschluss** *English title: Financial Accounting*	6 C 4 SWS

Lernziele/Kompetenzen: Nach erfolgreicher Teilnahme am Modul sind die Studierenden in der Lage: • die Aufgaben von Buchführungs- und Bilanzdaten zur Informationsversorgung und als betriebswirtschaftliche Entscheidungsgrundlage verschiedener Adressaten (Eigentümer, Gläubiger, Staat, etc.) zu beschreiben, • die Bilanz aus der Inventur abzuleiten, • T-Konten zu eröffnen und Buchungen hierauf sachlich richtig vorzunehmen, • den Ansatz und die Bewertung ausgewählter Bilanzpositionen herzuleiten, • die vorgenommenen Buchungen unter Berücksichtigung einschlägiger gesetzlicher Vorgaben zu einem Schlussbilanzkonto abzuschließen, • die Grundlage für die externe Berichterstattung zu entwickeln.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Jahresabschluss (Vorlesung) *Inhalte*: Im Modul Jahresabschluss wird der Nutzen von Rechnungslegungsdaten zur Informationsversorgung und als betriebswirtschaftliche Entscheidungsgrundlage verschiedener Adressaten (Eigentümer, Gläubiger, Staat, etc.) dargestellt. Im Mittelpunkt steht dabei die Dokumentation von periodischen Veränderungen der Bilanzbestände im System doppelter Buchführung, ergänzt um ausgewählte Ansatz- und Bewertungsprobleme bei der Bilanzerstellung.	2 SWS
Lehrveranstaltung: Jahresabschluss (Übung) *Inhalte*: Im Rahmen der Übung vertiefen und erweitern die Studierenden die in der Vorlesung erworbenen Kenntnisse und Fähigkeiten besonders in Hinblick auf die Finanzbuchhaltung.	2 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: • Darlegung eines übergreifenden Verständnisses grundlegender buchhalterischer Fragestellungen, • Nachweis von Kenntnissen zur Buchführung durch Anwendung der Kenntnisse auf gegebene Geschäftsvorfälle, • Darlegung eines übergreifenden Verständnisses von Bilanzierung und Bewertung nach HGB, • Nachweis von Kenntnissen zur Unternehmenspublizität.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Vanessa Flagmeier

nicht-amtliche Fassung

Angebotshäufigkeit: jedes Semester*	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 2
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:

Das Modul darf nicht absolviert werden, wenn bereits das Modul B.WIWI-OPH.0005 Jahresabschluss erfolgreich absolviert wurde.

*Ab dem Wintersemester 2029/30 wird das Modul nur noch jedes Wintersemester angeboten.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-BWL.0112: Finanzwirtschaft des Unternehmens** *English title: Corporate Finance*	6 C 4 SWS

Lernziele/Kompetenzen: Mit dem erfolgreichen Abschluss des Moduls haben die Studierenden folgende Kompetenzen erworben: • sie verstehen die verschiedenen Funktionen des Finanzbereichs eines Unternehmens gemäß der traditionellen und der modernen Betrachtungsweise und können diese erklären, • sie kennen die Grundbegriffe der betrieblichen Finanzwirtschaft und können diese anwenden, • sie kennen die ökonomischen Grundlagen der Investitionstheorie und können diese kritisch reflektierend beurteilen, • sie verstehen wesentliche Verfahren der Investitionsrechnung (Amortisationsrechnung, Kapitalwertmethode, Endwertmethode, Annuitätenmethode, Methode des internen Zinsfußes) und können diese erklären und anwenden, • sie können Entscheidungsprobleme unter Unsicherheit strukturieren, • sie kennen verschiedene Finanzierungsformen, können diese voneinander abgrenzen sowie deren Vor- und Nachteile beurteilen, • sie kennen die Konzepte der Kapitalkosten sowie des Leverage und können deren Bedeutung für die Finanzierung von Unternehmen aufzeigen.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Finanzwirtschaft des Unternehmens (Vorlesung) *Inhalte*: 1. Die traditionelle Betrachtungsweise der Finanzwirtschaft 2. Die moderne Betrachtungsweise der Finanzwirtschaft 3. Grundlagen der Investitionstheorie 4. Methoden der Investitionsrechnung 5. Darstellung und Lösung von Entscheidungsproblemen unter Unsicherheit 6. Finanzierungskosten einzelner Finanzierungsarten 7. Kapitalstruktur und Kapitalkosten bei gemischter Finanzierung	2 SWS
Lehrveranstaltung: Finanzwirtschaft des Unternehmens (Tutorium) *Inhalte*: Im Rahmen der begleitenden Tutorien vertiefen und erweitern die Studierenden die in der Vorlesung erworbenen Kenntnisse und Fähigkeiten.	2 SWS
Prüfung: Klausur (60 Minuten)	6 C

Prüfungsanforderungen: • Nachweis von Kenntnissen über die Funktionen des Finanzbereichs eines Unternehmens gemäß der traditionellen und modernen Betrachtungsweise. • Nachweis der Kenntnis der finanzwirtschaftlichen Grundbegriffe und der Fähigkeit zur fachlich korrekten Verwendung dieser Grundbegriffe.	

nicht-amtliche Fassung

- Nachweis des Verständnisses der ökonomischen Grundlagen der Investitionstheorie.
- Fähigkeit zur Darstellung, inhaltlichen Abgrenzung und korrekten Anwendung der wesentlichen Verfahren der Investitionsrechnung.
- Nachweis, dass das Grundkonzept zur Strukturierung und Lösung von Entscheidungsproblemen unter Unsicherheit verstanden wurde.
- Darlegung des Verständnisses der verschiedenen Finanzierungsformen sowie der Fähigkeit zu deren Beurteilung.
- Nachweis der Kenntnis der Konzepte der Kapitalkosten sowie des Leverage und deren Bedeutung.

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Olaf Korn
Angebotshäufigkeit: jedes Semester*	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 2
Maximale Studierendenzahl: nicht begrenzt	

Bemerkungen:
Das Modul darf nicht absolviert werden, wenn bereits das Modul B.WIWI-OPH.0004 Finanzwirtschaft des Unternehmens erfolgreich absolviert wurde.

*Ab dem Wintersemester 2029/30 wird das Modul nur noch jedes Sommersemester angeboten.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-ECON.0005: Recht für Wirtschaftswissenschaften** *English title: Law for Economics*	6 C 4 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Absolvieren des Moduls: • haben die Studierenden grundlegende Kenntnisse des Bürgerlichen Rechts (BGB-Bücher 1-3) und des Handelsrechts erlangt, • kennen die Studierenden die dogmatischen Konzeptionen des Zivilrechts in ihrer systematischen, ideellen und praktischen Bedeutung, • beherrschen sie die Methoden der Gesetzesauslegung (grammatische, systematische, historische, teleologische Auslegung) und können diese anwenden, • haben die Studierenden gelernt, zwischen Verpflichtungsgeschäft und Verfügungsgeschäft sowie zwischen vertraglichen und deliktischen Ansprüchen zu differenzieren und kennen die Studierenden die wesentlichen schuldrechtlichen Vertragstypen bzw. dinglichen Rechtstypen, • sind die Studierenden in der Lage, die erworbenen Kenntnisse auch bei der Lösung einschlägiger Fälle umzusetzen und sich mit den aufgeworfenen Rechtsfragen auseinanderzusetzen.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Recht für Wirtschaftswissenschaften (Vorlesung) *Inhalte*: In dem Modul werden die für die Wirtschaftswissenschaften wesentlichen Inhalte des Bürgerlichen Rechts (Zivilrechts) und des Handelsrechts behandelt.	4 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: Durch die Modulprüfung weisen die Studierenden nach, dass sie: • grundlegende Kenntnisse im Zivil- und Handelsrecht aufweisen, • ausgewählte Tatbestände des Zivilrechts beherrschen, • die zugehörigen methodischen Grundlagen inbegriffen, • systematisch an einen zivilrechtlichen Fall herangehen und diesen in vertretbarer Weise lösen können.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Sprecher*in des zivilrechtlichen Teilgebietes
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 3

Bemerkungen:

nicht-amtliche Fassung

Das Modul darf nicht absolviert werden, wenn bereits das Modul B.WIWI-OPH.0009 Recht erfolgreich absolviert wurde.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.WIWI-QMW.0001: Linear Models**	6 C 4 WLH

Learning outcome, core skills: The students • get to know the basic concepts of statistical modelling based on linear models. • can validate the assumptions of linear models for given data and can identify and apply appropriate corrections. • are able to apply linear models in statistical software and to interpret the results achieved.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Linear Models (Lecture) *Contents*: simple linear model (assumptions, least squares estimate, tests and confidence intervals, predictions), multiple linear model (assumptions, representation in matrix notation, least quares estimate and ist properties, tests and confidence intervals), modelling continuous and categorical predictor variables (polynomials, splines, dummy coding effect coding, analysis of variance), model diagnostics, model choice, variable selection, extensions of the classical linear model (general linear models, ridge regression, LASSO)	2 WLH
Course: Linear Models (Exercise) *Contents*: simple linear model (assumptions, least squares estimate, tests and confidence intervals, predictions), multiple linear model (assumptions, representation in matrix notation, least quares estimate and ist properties, tests and confidence intervals), modelling continuous and categorical predictor variables (polynomials, splines, dummy coding effect coding, analysis of variance), model diagnostics, model choice, variable selection, extensions of the classical linear model (general linear models, ridge regression, LASSO)	2 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: The students demonstrate that they • know the basic assumptions and properties of linear models and can apply them for analysing empirical data. • can validate the assumptions oft he linear model and identify appropriate correction approaches. • can conduct practical analyses of linear models using statistical software and interpret the results achieved.	

Admission requirements: none	**Recommended previous knowledge:** B.WIWI-OPH.0006: Statistics
Language: English	**Person responsible for module:** Prof. Dr. Thomas Kneib

nicht-amtliche Fassung

Course frequency: each winter semester; every second semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 3 - 6

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-QMW.0009: Seminar in Angewandter Ökonometrie** *English title: Seminar on Applied Econometrics*	6 C 3 SWS

Lernziele/Kompetenzen: Die Studierenden sind in der Lage: • problemorientiert relevante ökonometrische Konzepte auszuwählen und anhand empirischer Daten umzusetzen, • sich eigenständig in ein ausgewähltes ökonometrisches Modell einzuarbeiten und dieses im Seminar vorzustellen, • eine empirische Analyse zu einem vorgegebenen Thema (Datenrecherche, Methodenauswahl, Softwareauswahl, Ergebnisdiskussion) selbstständig durchzuführen.	**Arbeitsaufwand:** Präsenzzeit: 42 Stunden Selbststudium: 138 Stunden

Lehrveranstaltung: Seminar in Angewandter Ökonometrie (Seminar) *Inhalte*: Die Studierenden wählen ein ökonometrisches Modell aus, in das sie sich selbstständig einarbeiten und welches sie im Rahmen des Seminars vorstellen. Mögliche Themen sind dabei: Regressionsmodelle mit Dummy Variablen; Regressionsmodelle mit diskreten Zielvariablen: Binäre, Multinomiale und Ordered Logitmodelle; Tobitmodelle; Paneldatenmodelle: Seemingly Unrelated Regression, Fixed und Random Effects Modelle, Hausman Test, Heteroskedastizität und Autokorrelation, Dynamische Paneldatenmodelle, Mean Group Modelling. In Übereinstimmung mit dem gewählten ökonometrischen Modell führen die Studierenden eine eigenständige empirische Analyse einer ökonomischen Fragestellung durch, präsentieren die Ergebnisse im Seminar und fertigen eine dazugehörige Seminararbeit an. Ökonomische Fragestellungen können dabei u.a. aus den Bereichen Gesundheitsökonomie, Mikro- und Makroökonomie sowie Wahlforschung kommen.	2 SWS
Lehrveranstaltung: Seminar in Angewandter Ökonometrie (Übung) *Inhalte*: Zu Beginn des Semesters findet eine Einführung in die Regressionsanalyse mit Hilfe des Softwareprogramms Stata statt.	1 SWS
Prüfung: Hausarbeit (max. 15 Seiten) mit Präsentation (ca. 30 Minuten) **Prüfungsvorleistungen:** Regelmäßige Teilnahme	6 C

Prüfungsanforderungen: Präsentation eines ökonometrischen Modells. Selbstständige empirische Analyse zu einer gegebenen ökonomischen Fragestellung und dazugehörige schriftliche Ausarbeitung und Präsentation des Themas	

Zugangsvoraussetzungen:	**Empfohlene Vorkenntnisse:**

nicht-amtliche Fassung

B.WIWI-ECON.0008 VWL in Aktion (verpflichtend für alle Studierenden im Mono-Bachelor-Studiengang VWL in einer Version der Prüfungs- und Studienordnung ab dem Wintersemester 2026/27)	B.WIWI-VWL.0007 Ökonometrie und allgemeine PC-Kenntnisse
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Prof. Dr. Helmut Herwartz
Angebotshäufigkeit: unregelmäßig	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 4 - 5
Maximale Studierendenzahl: 20	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0001: Mikroökonomik II** *English title: Microeconomics II*	6 C 5 SWS

Lernziele/Kompetenzen: Nach erfolgreicher Absolvierung der Veranstaltung sind Studierende in der Lage: • verschiedene Marktformen voneinander zu unterscheiden und deren Wohlfahrtseffekte zu analysieren, • zwischen der Gleichgewichtsanalyse eines einzelnen Marktes und der Analyse des allgemeinen Gleichgewichts aller Märkte zu unterscheiden und selbstständig anzuwenden, • das Prinzip intertemporaler Entscheidungen der Haushalte zu verstehen und in die optimale Entscheidung der Haushalte einzubeziehen, • die grundlegenden Zusammenhänge von Risiko und Versicherungsmärkten zu verstehen und in die optimale Entscheidung der Haushalte einzubeziehen, • die Grundlagen simultaner und sequentieller Spieltheorie zu verstehen und selbstständig anzuwenden, • die Konsequenzen asymmetrischer Informationen für das Verhalten der Marktteilnehmer zu analysieren, • die Konsequenzen externer Effekte für das Verhalten der Markteilnehmer zu analysieren.	**Arbeitsaufwand:** Präsenzzeit: 70 Stunden Selbststudium: 110 Stunden

Lehrveranstaltung: Mikroökonomik II (Vorlesung) *Inhalte*: • Marktgleichgewicht bei vollkommener Konkurrenz und im Monopol: Grafische Analyse des Marktgleichgewichts und der allgemeinen Wohlfahrt in Abhängigkeit von der Marktform. • Monopolistische Preisdifferenzierung: Analyse von Preis-, Mengen- und Wohlfahrtseffekten. • Allgemeines Gleichgewicht: Grafische Analyse des allgemeinen Marktgleichgewichts mithilfe der Edgeworth-Box. Definition des Gesetzes von Walras sowie des ersten und zweiten Satzes der Wohlfahrtsökonomik. • Ersparnis und Investition: Mathematische und grafische Abhandlung der intertemporalen Budgetgleichung der Haushalte sowie der optimalen Konsum- und Produktionsentscheidungen. • Risiko und Versicherung: Mathematische und grafische Analyse der Entscheidung von Haushalten unter Unsicherheit. Einführung der Erwartungsnutzenhypothese und der von-Neumann-Morgenstern-Nutzenfunktion. • Oligopoltheorie: Mathematische und grafische Analyse von Cournot-, Stackelberg- und Bertrand-Gleichgewicht. • Spieltheorie: Spiele in Normalform. Bestimmung dominanter Strategien und Nash-Gleichgewicht. Sequentielle Entscheidungen. Analyse sequentieller Spiele mithilfe des Entscheidungsbaumes.	3 SWS

nicht-amtliche Fassung

• Asymmetrische Information: Analyse des Verhaltens von Marktteilnehmern im Fall von asymmetrisch verteilter Information. Moralisches Risiko (Moral hazard) und adverse Selektion. • Externe Effekte: Analyse des Verhaltens von Marktteilnehmern im Fall (negativer) externer Effekte. Raucher, Wasserverschmutzung bei der Produktion und Allmendegüter.	
Lehrveranstaltung: Mikroökonomik II (Tutorium) *Inhalte*: In den Übungen werden die Inhalte der Vorlesung anhand von Aufgaben wiederholt und vertieft.	2 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: • Aufgaben sind sowohl rechnerisch als auch grafisch und verbal intuitiv zu lösen, • Nachweis grundlegender Kenntnisse des Wettbewerbsgleichgewichts eines Marktes und des allgemeinen Gleichgewichts, insbesondere der Rolle des Preises für die Markträumung, • Nachweis der Fähigkeit zur grafischen und mathematischen Analyse verschiedener Marktformen und deren Wohlfahrtseffekte, • Nachweis grundlegender Kenntnisse der Spieltheorie und Oligopoltheorie und der Fähigkeit der Bestimmung der optimalen Strategie der Marktteilnehmer, • Nachweis der Fähigkeit zur Bewertung der Risikoeinstellung von Marktteilnehmern und der Konsequenzen für die optimale Entscheidung.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-VWL.0113 Mikroökonomik I
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Claudia Keser, Prof. Dr. Udo Kreickemeier, Prof. Dr. Robert Schwager, Prof. Dr. Sebastian Vollmer
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 2 - 6
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0002: Makroökonomik II** *English title: Macroeconomics II*	6 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden: • können die außenwirtschaftlichen Beziehungen einer Volkswirtschaft systematisch erfassen, • sind in der Lage, ein gesamtwirtschaftliches Modell durch die Beziehungen zum Ausland zu erweitern und anhand dieses Modells die Wirkung verschiedener wirtschaftspolitischer Maßnahmen in einer offenen Volkswirtschaft zu diskutieren, • kennen die Eigenschaften verschiedener Währungssysteme und können deren Vor- und Nachteile unter Einbeziehung ihres Einflusses auf die Wirkung wirtschaftspolitischer Maßnahmen beurteilen, • verstehen die wesentlichen Herausforderungen der modernen Geld- und Fiskalpolitik und können wirtschaftspolitische Entscheidungsprozesse modelltheoretisch abbilden, • sind mit den Grundlagen der Wachstumsökonomik vertraut und können das Solow-Modell zur Bewertung von langfristigen Zusammenhängen und der Analyse der Quellen des Wirtschaftswachstums heranziehen, • können Mithilfe verschiedener Modellrahmen makroökonomische Argumente nachvollziehen und selbständig analysieren.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Makroökonomik II (Vorlesung) *Inhalte*: Die Vorlesung erweitert die makroökonomischen Grundmodelle der Vorlesung Makroökonomik I entlang drei Dimensionen. Einerseits wird die Annahme einer geschlossenen Volkswirtschaft gelockert und die makroökonomischen Prozesse um Außenhandel und Wechselkursdynamiken in einer offenen Volkswirtschaft erweitert. In diesem Kontext werden auch unterschiedliche Wechselkurssysteme diskutiert und die Auswirkungen wirtschaftspolitischer Interventionen analysiert. Des Weiteren werden ausgewählte wirtschaftspolitische Fragestellungen vertiefend analysiert, insbesondere die Interaktionen zwischen wirtschaftspolitischen Entscheidungsträgern und Wirtschaftsakteuren, sowie ausgewählte Fragestellungen der Fiskal- und Geldpolitik. Die Makroökonomik der langen Frist wird durch eine Einführung in die Wachstumstheorie analysiert, wobei insbesondere die Quellen volkswirtschaftlichen Wachstums modelltheoretisch dargestellt werden.	2 SWS
Lehrveranstaltung: Makroökonomik II (Übung) *Inhalte*: Im Rahmen der begleitenden Übung/Tutorium vertiefen die Studierenden die Kenntnisse aus der Vorlesung anhand ausgewa¨hlter theoretischer Fragestellungen und üben die eigenständige Anwendung von Modellen.	2 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen:	

nicht-amtliche Fassung

- Nachweis von Kenntnissen über die systematische Erfassung der außenwirtschaftlichen Beziehungen einer Volkswirtschaft und von Kenntnissen über deren Bedeutung für die Analyse des gesamtwirtschaftlichen Gleichgewichts und wirtschaftspolitischer Maßnahmen,
- Nachweis von Kenntnissen über verschiedene Wechselkurssysteme und deren Bedeutung für die Analyse des gesamtwirtschaftlichen Gleichgewichts und wirtschaftspolitischer Maßnahmen,
- Nachweis von Kenntnissen über ausgewählte vertiefende Fragen der Fiskal- und Geldpolitik,
- Nachweis von Kenntnissen des Grundmodells der Wachstumsökonomik und volkswirtschaftlicher Zusammenhänge in der langen Frist,
- die Studierenden zeigen, dass sie in der Lage sind, mit verschiedenen gesamtwirtschaftlichen Modellen analytisch und grafisch zu arbeiten, die dahinterstehenden Annahmen zu reflektieren sowie die sich ergebenden Unterschiede hinsichtlich der Wirkung wirtschaftspolitischer Maßnahmen darstellen und kritisch würdigen zu können.

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-VWL.0114 Makroökonomik I
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Tino Berger, Prof. Dr. Andreas Fuchs, Prof. Dr. Krisztina Kis-Katos, Dr. Katharina Werner
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 2 - 6
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0004: Finanzwissenschaft** *English title: Public Economics*	6 C 4 SWS

Lernziele/Kompetenzen: Nach Abschluss des Moduls kennen die Teilnehmer*innen die beiden grundlegenden Ansätze zur Erklärung staatlichen Handelns, Marktversagen und kollektive Entscheidungsfindung. Sie sind fähig, diese auf wichtige Gebiete des Staatshandelns anzuwenden. Sie verstehen, warum öffentlicher Güter und externe Effekte zu ineffizienten Entscheidungen führen. Sie kennen Grundlagen von Steuern und anderen staatlichen Instrumenten, und verstehen in Grundzügen, wie kollektive Entscheidungen in einer Demokratie getroffen werden.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Finanzwissenschaft (Vorlesung) *Inhalte*: 1. Der Staat im Überblick Einführung in grundlegende Konzepte und Begriffe sowie unterschiedlicher Theorien zur Motivation für staatliches Handeln. **Ausgaben und Einnahmen des Staates** 2. Öffentliche Güter: Grundlagen Beschreibung der Eigenschaften öffentlicher Güter und analytische Herleitung der Bedingung für die effiziente Bereitstellung öffentlicher Güter. Nash-Gleichgewicht der privaten Bereitstellung öffentlicher Güter und Lindahl-Gleichgewicht. 3. Steuern Definition verschiedener Abgabenarten sowie Einführung in Besteuerungsprinzipien und Steuertarife. Überblick über die wichtigsten Steuerarten und graphische sowie analytische Betrachtung der Inzidenz und Effizienz einer speziellen Verbrauchsteuer. 4. Öffentliche Güter: Anwendungen Überblick über die deutschen Staatsausgaben nach Ausgabenarten und Aufgabenbereichen. Einführung in die Nutzen-Kosten-Analyse. Analytische Betrachtung von öffentlichen Gütern mit Überfüllungskosten mit Anwendung auf Staatsausgaben im demographischen Kontext sowie auf Hochschulen. 5. Externe Effekte und Umweltpolitik Begriff des externen Effekts. Analytische Herleitung der optimalen Umweltsteuer sowie Beschreibung von Zertifikatlösungen (Kyoto-Protokoll, EU-Emissionshandel). **Entscheidungsverfahren und Organisation des Staates** 6. Mehrheitswahl Analytische Untersuchung des Medianwählertheorems sowie von Mehrheitsentscheidungen über öffentliche Güter. 7. Akteure der Politik Untersuchung und graphische Darstellung des Parteienwettbewerbs anhand des Downs-Modells. Überblick über den politischen Einfluss von Interessengruppen und Lobbys. Analytische Betrachtung des Einflusses der Bürokratie auf das Staatsbudget.	2 SWS

nicht-amtliche Fassung

8. Fiskalföderalismus Einführung in die Föderalismustheorie (Dezentralisierungstheorem, Skalenerträge, Spillovers) und Überblick über die föderale Ordnung Deutschlands.	
Lehrveranstaltung: Finanzwissenschaft (Übung) *Inhalte*: In der Übung werden die Inhalte der Vorlesung anhand von Aufgaben wiederholt und vertieft.	2 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: Die Studierenden zeigen, dass sie die wichtigsten Ursachen für Marktversagen und die Grundlagen demokratischer Entscheidungsfindung kennen und mit diesem Wissen Probleme lösen können. Dazu werden mehrere Aufgaben gestellt, in denen die Studierenden Fragen zu Modellen beantworten müssen, die sich auf den Inhalt von Vorlesung oder Übung beziehen. Auch einfaches institutionelles und Faktenwissen wird verlangt.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-VWL.0113 Mikroökonomik I
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Robert Schwager
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 3 - 6
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0005: Internationale Wirtschaftsbeziehungen** *English title: International Economics Foundations*	6 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden: • kennen verschiedene Ursachen für die Teilnahme eines Landes an der internationalen Arbeitsteilung, • können verschiedene Ursachen für den relativen Preisvorteil eine Landes theoretisch fundieren und deren wirtschaftspolitische Konsequenzen darstellen, • sind mit den Wohlfahrtswirkungen von Außenhandel vertraut und können deren gesellschaftlichen Folgen reflektieren, • kennen mögliche staatliche Instrumente zur Beeinflussung von Im- und Exporten und können die sich daraus ergebenden gesellschaftlichen Konsequenzen einzelstaatlich und weltwirtschaftlich bewerten, • sind mit den Voraussetzungen und den Motiven einer multinationalen Unternehmertätigkeit vertraut, • haben einen Überblick über die verschiedenen Erscheinungsformen von Devisenmärkten und den Motiven der dort handelnden Akteure und können die dabei bestehenden Zusammenhänge darstellen, • sind vertraut mit verschiedenen Determinanten von Wechselkursen und können deren Relevanz kritisch reflektieren, • verstehen die Auswirkungen von Wechselkursveränderungen für eine Volkswirtschaft, • sind vertraut mit verschiedenen Wechselkursregimen und deren spezifischen Eigenschaften.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Internationale Wirtschaftsbeziehungen (Vorlesung) *Inhalte*: Die Vorlesung besteht aus zwei Teilen. Teil 1 gibt einen Überblick über die Ursachen und die Folgen der internationalen Arbeitsteilung. Dabei werden verschiedene Theorien des Internationalen Handels analysiert und deren volkswirtschaftliche Konsequenzen dargestellt. Auch die Gründe für staatliche Interventionen in den Welthandel sowie deren ökonomische Konsequenzen werden analysiert. In Teil 2 werden die verschiedenen Erscheinungsformen von Devisenmärkten und die dort praktizierten Geschäfte untersucht und die Bestimmungsfaktoren von Wechselkursen diskutiert und theoretisch vertieft. Darüber hinaus wird die Validität der Theorien mittels empirischer Studien überprüft.	2 SWS
Lehrveranstaltung: Internationale Wirtschaftsbeziehungen (Übung) *Inhalte*: Im Rahmen der begleitenden Übung vertiefen die Studierenden die Kenntnisse aus der Vorlesung anhand ausgewählter theoretischer Fragestellungen.	2 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen:	

nicht-amtliche Fassung

Nachweis von: • Kenntnissen der Gründe für die internationale Arbeitsteilung sowie über Theorien zur Bestimmung relativer Preisvorteile eines Landes und über die ökonomischen Folgen des Außenhandels, • Kenntnissen über die Erscheinungsformen von Devisenmärkten und die dort praktizierten Geschäfte sowie der Bestimmungsfaktoren von Wechselkursen.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-VWL.0113 Mikroökonomik I, B.WIWI-VWL.0114 Makroökonomik I
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Udo Kreickemeier
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 3 - 6
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0006: Wachstum und Entwicklung** *English title: Economic Growth and Development*	6 C 4 SWS

Lernziele/Kompetenzen: Nach Abschluss dieses Moduls haben die Studierenden ein grundlegendes Verständnis für die Ursachen und Konsequenzen von langfristigem Wirtschaftswachstum bekommen. Sie machen sich mit den Standardmodellen der Wachstumstheorie vertraut, bewerten empirische Tests dieser, ziehen wirtschaftspolitische Implikationen und reflektieren diese kritisch.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Wachstum und Entwicklung (Vorlesung) *Inhalte*: 1) Faktorakkumulation i) Kapitalakkumulation ii) Das Modell überlappender Generationen. iii) Bevölkerungswachstum und Wirtschaftswachstum iv) Der Demographische Übergang v) Humankapital: Gesundheit und Ausbildung vi) Warum fließt Kapital nicht von reichen zu armen Ländern? 2) Produktivität i) Wachstumszerlegung ii) Erfindungen und Ideen iii) Technologischer Fortschritt und Wachstum vor dem 18. Jahrhundert iv) Technologischer Fortschritt und Wachstum heute 3) Deep Determinants	2 SWS
Lehrveranstaltung: Wachstum und Entwicklung (Übung) *Inhalte*: In der begleitenden Übung sollen die Studierenden anhand von Übungsaufgaben ihr Wissen zu den in der Vorlesung behandelten Themen vertiefen und erweitern.	2 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: Nachweis: • fundierter Kenntnisse über die Ursachen und Konsequenzen langfristiger Einkommensunterschiede, • grundlegendem Verständnis der behandelten Wachstumsmodelle, • der Fähigkeit zum selbstständigen Lösen von Anwendungsbeispielen im Themenbereich der Vorlesung (theoretisch, graphisch und verbal).	

Zugangsvoraussetzungen:	**Empfohlene Vorkenntnisse:**

nicht-amtliche Fassung

keine	B.WIWI-VWL.0114 Makroökonomik I B.WIWI-QMW.0015 Mathematik für Wirtschaftswissenschaften
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Holger Strulik Dr. Johannes Schünemann
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 3 - 6
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0007: Ökonometrie** *English title: Econometrics*	6 C 6 SWS

Lernziele/Kompetenzen: Das Modul gibt eine umfassende Einführung in die ökonometrische Analyse ökonomischer Fragestellungen. Die Studierenden erlernen mit Hilfe der Methoden linearer Regressionsanalyse erste eigene empirische Studien durchzuführen. Die vermittelten Kompetenzen beinhalten die Spezifikation von ökonometrischen Modellen, die Modellselektion und –schätzung. Darüber hinaus werden Studierende mit ersten Problemen im Bereich der linearen Regression wie beispielsweise Heteroskedastizität und Autokorrelation vertraut gemacht. Dieses Modul bildet das Fundament für weiterführende Ökonometrie Veranstaltungen.	**Arbeitsaufwand:** Präsenzzeit: 84 Stunden Selbststudium: 96 Stunden

Lehrveranstaltung: Ökonometrie (Vorlesung) *Inhalte*: 1. Einführung in lineare multiple Regressionsmodelle, Modellspezifikation, KQ-Schätzung, Prognose und Modellselektion, Multikollinearität und partielle Regression. 2. Lineares Regressionsmodell mit normalverteilten Störtermen, Maximum-Likelihood-Schätzung, Intervallschätzung, Hypothesentests 3. Asymptotische Eigenschaften des KQ- und GLS Schätzers 4. Lineares Regressionsmodell mit verallgemeinerter Kovarianzmatrix, Modelle mit autokorrelierten und heteroskedastischen Fehlertermen, Testen auf Autokorrelation und Heteroskedastizität.	2 SWS
Lehrveranstaltung: Ökonometrie (Übung) *Inhalte*: Die Großübung vertieft die Inhalte der Vorlesung anhand von Rechenaufgaben mit ökonomischen Fragestellungen und Datensätzen. Weiterhin werden theoretische Konzepte aus der Vorlesung detailliert hergeleitet.	2 SWS
Lehrveranstaltung: Ökonometrie (Tutorium) *Inhalte*: Das Tutorium vertieft die Inhalte der Vorlesung und Großübung anhand von Rechenaufgaben. Ein großer Teil beinhaltet das Schätzen von ökonometrischen Modellen mit realen Daten und mit Hilfe des Softwareprogramms Eviews.	2 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: Die Studierenden zeigen, dass sie einfache ökonometrische Konzepte verstanden haben. Darüber hinaus sind sie in der Lage, diese auf reale wirtschaftliche Fragestellungen anzuwenden.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-QMW.0015 Mathematik für Wirtschaftswissenschaften

nicht-amtliche Fassung

	B.WIWI-QMW.0016 Statistik und Data Science 1: Grundlagen der Angewandten Statistik B.WIWI-QMW.0017 Statistik und Data Science 2: Statistische Modellierung und ihre mathematischen Grundlagen B.WIWI-QMW.0018 Statistik und Data Science 3: Fortgeschrittene Verfahren der Statistischen Modellierung
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Helmut Herwartz
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 3 - 5
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0008: Geldtheorie und Geldpolitik** *English title: Money and International Finance*	6 C 4 SWS

Lernziele/Kompetenzen: Nach erfolgreicher Absolvierung der Veranstaltung sind Studierende in der Lage: • grundlegende makroökonomische Zusammenhänge zwischen der Geldpolitik und der Realwirtschaft zu verstehen, • die Funktionen des Finanzsystems, die Bedeutung von Zinsen und der Kreditvergabe zu verstehen, • die Transmissionskanäle der Geldpolitik zu verstehen, • die klassischen und neueren Instrumente der Zentralbanken zur Durchführung der Geldpolitik zu analysieren, • die Besonderheiten der Geldpolitik in der Eurozone zu verstehen.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Geldtheorie und Geldpolitik (Vorlesung) *Inhalte*: 1. Finanzmärkte 2. Finanzmarktinstitutionen 3. Zentralbanken 4. Geldtheorie	2 SWS
Lehrveranstaltung: Geldtheorie und Geldpolitik (Übung) *Inhalte*: In den Übungen werden die Inhalte der Vorlesung anhand von Aufgaben wiederholt und vertieft.	2 SWS
Prüfung: Klausur (90 Minuten) **Prüfungsvorleistungen:** Bis zu drei Einsendehausaufgaben; Länge jeweils bis zu drei maschinengeschriebenen Seiten (Bedingung zur Zulassung zur Klausur ist das Erreichen von 60% der insgesamt erreichbaren Punkte).	6 C

Prüfungsanforderungen: • Nachweis fundierter Kenntnisse der Begriffe im Bereich der Geldtheorie und Geldpolitik durch intuitive und analytische Beantwortung von Fragen, • Nachweis der Fähigkeit zur grafischen und mathematischen Analyse der Geldtheorie und Geldpolitik.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-VWL.0114 Makroökonomik I
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Tino Berger
Angebotshäufigkeit: unregelmäßig	**Dauer:** 1 Semester
Wiederholbarkeit:	**Empfohlenes Fachsemester:**

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zweimalig	3 - 6
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.WIWI-VWL.0009: Labor Economics**	6 C 3 WLH

Learning outcome, core skills: • Know the core economic concepts of labor economics and understand the main drivers of labor supply and demand as well as the concept of labor market equilibrium. • Understand the factors that determine individual wages as well as the overall wage structure in an economy. • Understand the role of human capital and the determinants of human capital investment decisions. • Are able to discuss further selected issues in labor economics, including labor mobility, the role of labor unions, labor market discrimination, incentive pay and unemployment. • Can perform a basic analysis of individual survey data in a statistical program in order to investigate the determinants of individual wages and employment and can interpret its results.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Labor Economics (Lecture) *Contents*: The course in Labor Economics targets advanced bachelor students of economics. The lecture presents and discusses core concepts of labor economics and introduces students to the analysis of labor markets. It introduces the microeconomic model of the individual labor supply decision as well as the model of firms' labor demand and derives the labor market equilibrium. It also introduces a number of further topics in the realm of labor economics, including the individual decision on human capital investment and schooling, various theoretical reasons for wage differentials, the labor market consequences of migration and the determinants of unemployment. The lecture complements the theoretical concepts by descriptive facts on the German labor market and discusses the models in the light of recent empirical evidence. Lecture plan: 1. Introduction 2. The basics of labor supply 3. Extensions of labor supply 4. Labor demand 5. Labor market equilibrium 6. Human capital 7. Wage differentials 8. Migration 9. Unemployment	2 WLH
Course: Labor Economics (Exercise) *Contents*: The lectures are accompanied by blocks of practical sessions that take place in a CIP-pool and aim at introducing students to the analysis of individual labor market data.	1 WLH

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The CIP-pool exercises will especially focus on determinants of employment and wage differences.	
Examination: Written examination (90 minutes) **Examination prerequisites:** Hand-in of two problem sheets (of pass quality). The problems will refer to the content introduced in the practical sessions.	6 C

Examination requirements: In the exam, students are required to demonstrate an understanding of basic concepts of labor economics and to apply the acquired knowledge to current policy issues. The hand-ins required as examination prerequisites will test the general understanding of the empirical concepts introduced in the practical sessions.

Admission requirements: none	**Recommended previous knowledge:** Bachelor courses in microeconomics, econometrics and statistics
Language: English	**Person responsible for module:** Prof. Dr. Krisztina Kis-Katos
Course frequency: irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 4 - 6
Maximum number of students: not limited	

Additional notes and regulations: The course takes place as a block course. The exam will be written before Christmas.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0010: Institutionenökonomik** *English title: Institutional Economics*	6 C 2 SWS

Lernziele/Kompetenzen: Die Studierenden: • kennen verschiedene Definitionen von internen und externen Institutionen, sowie deren Relevanz in der wirtschaftspolitischen Normsetzung, • kennen die Rolle von Eigentumsrechten und deren Durchsetzung in der ökonomischen Theorie und Praxis, • kennen Konzepte von Transaktionskosten und deren Wirkung auf die • Interaktion von Individuen und Firmen auf dem Markt, • kennen die Rolle des Staates bei der Einführung und Durchsetzung externer Institutionen, • kennen Grundlagen der Neuen Politischen Ökonomik und deren Theorie der Demokratie, Bürokratie und Interessengruppe, • kennen institutionenökonomische Analysekonzepte wie die Prinzipal-Agenten-Theorie oder Moral Hazard, sowie experimentelle Forschungsergebnisse zur Institutionenanalyse, • kennen die Rolle und den Wandel von Verhaltensmodellen als wirtschaftspolitisches Instrument.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 152 Stunden

Lehrveranstaltung: Institutionenökonomik (Vorlesung) *Inhalte*: Diese Vorlesung soll die theoretischen Grundlagen der Institutionenökonomik vermitteln und verschiede (Anwendungs-)Bereiche aufzeigen**.** Die Vorlesung ist inhaltlich in drei Blöcke unterteilt. Im ersten wird die institutionenökonomische Theorie vermittelt. Dabei wird mit der Abgrenzung zwischen internen und externen Institutionen, sowie ihrer Entwicklung und Bedeutung für das gesellschaftliche Zusammenleben begonnen. Dabei wird auch auf ihre Relevanz in der wirtschaftspolitischen Normsetzung und die Durchsetzungsmechanismen eingegangen. Im Anschluss werden Verfügungsrechte als eine der zentralen externen Institutionen bezüglich Konzept und Umsetzungsform erläutert und analysiert. Die Governancestrukturen sollen mithilfe der drei Akteure Unternehmen, Markt sowie Staat und politischer Prozess vermittelt werden. Dabei werden Theorie und Anwendungsmöglichkeiten von Transaktionskosten und deren Wirkung auf die Interaktion von Individuen und Firmen erörtert. Die Prinzipal-Agenten-Theorie und Moral Hazard dienten dabei als institutionenökonomische Analysekonzepte. Zudem sind die Rolle des Staates bei der Einführung und Durchsetzung externer Institutionen, sowie die Grundlagen der Neuen Politischen Ökonomik und deren Theorien der Demokratie, Bürokratie und Interessengruppen Gegenstand der Vorlesung. Der zweite Block konzentriert sich auf kulturvergleichende Institutionenökonomik. Der Fokus liegt auf dem Varieties of Capitalism-Ansatz von Hall & Soskice. Zudem wird	2 SWS

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der Zusammenhang von Institutionen mit wirtschaftlichem Wachstum und Entwicklung vermittelt. Der dritte Block thematisiert behavioral Governance und damit die Anwendungsmöglichkeiten von Institutionenökonomik. Beginnend mit der Rolle und dem Wandeln von ökonomischen Verhaltensmodellen und ihrer Relevanz für die Institutionenökonomik wird unter anderem das Verhaltensmodell des homo oeconomicus institutionalis vermittelt. Daran anschließend wird das Regulatory Choice Problem Gegenstand der Vorlesung. Zum Schluss werden das Konzept des Nudging und die bisherigen vielfältigen Anwendungen in der Politik vorgestellt und diskutiert. In diesem Block gibt es einen kurzen Einstieg in die experimentelle Ökonomik als ein Tool der institutionenökonomischen Analyse. Neben der Vermittlung der oben genannten Theorien und Konzepte ist in jeder Vorlesung Platz für die kritische Diskussion mit den Studierenden. Zur weiteren kritischen Auseinandersetzung mit dem vermittelten Inhalt werden zwei Hausaufgaben gestellt. In diesen sollen zum einen bestimmte Konzepte wiedergegeben werden und zum anderen sollen diese in den aktuellen Forschungskontext einbezogen werden.	
Prüfung: Klausur (90 Minuten) **Prüfungsvorleistungen:** Bearbeitung von zwei Hausaufgaben, von denen mindestens eine bestanden werden muss.	6 C

Prüfungsanforderungen: In der Klausur sollen die erlernten theoretischen Konzepte wiedergegeben, erklärt und kritische diskutiert bzw. reflektiert werden. Darüber hinaus müssen die Studierenden den Nachweis erbringen in der Lage zu sein diese theoretischen Konzepte auf aktuelle wirtschaftspolitische Fragestellungen anzuwenden.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-VWL.0113 Mikroökonomik I B.WIWI-VWL.0114 Makroökonomik I
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Kilian Bizer
Angebotshäufigkeit: unregelmäßig	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 3 - 6
Maximale Studierendenzahl: nicht begrenzt	

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Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0011: Finanz- und Steuerpolitik der EU** *English title: Taxation and fiscal policy in the European Union*	6 C 3 SWS

Lernziele/Kompetenzen: Die Teilnehmer können Kompetenzen und Entscheidungsfindung der Europäischen Union erklären. Sie kennen die Aufgaben und Funktionsweise der Organe der Europäischen Union. Sie wissen, wofür die Europäische Union ihre Mittel ausgibt und können die darin zum Ausdruck kommenden Prioritätensetzungen kritisch diskutieren. Die Teilnehmer kennen und verstehen das Schuldenregime der Europäischen Union. Sie können die Maßnahmen, die die Europäische Union zur Schuldenkontrolle und im Rahmen der gegenseitigen Haftung ergreift, ökonomisch bewerten sowie mögliche Alternativen herausarbeiten. Die Teilnehmer verstehen, welche Maßnahmen der Steuerharmonisierung durchgeführt werden und geplant sind. Die Teilnehmer können in begrenzter Zeit Dokumente der EU finden und in den Rahmen der Zuständigkeiten der Organe einordnen. Sie nehmen dazu aus Sicht der ökonomischen Theorie Stellung und sind für die politischen Interessanlagen sensibilisiert.	**Arbeitsaufwand:** Präsenzzeit: 42 Stunden Selbststudium: 138 Stunden

Lehrveranstaltung: Finanz- und Steuerpolitik in der EU (Vorlesung) *Inhalte*: • Europäische Verträge, • Organe der EU: Kommission, Rat, Parlament, Gerichtshof, Entscheidungsverfahren, • Haushalt der EU: Eigenmittel, Ausgabenschwerpunkte, Nettozahler, • Schuldenregime der EU: Fiskalpakt und Stabilitäts- und Wachstumspakt, Europäischer Stabilitätsmechanismus, Rolle der Europäischen Zentralbank für die Staatsschulden der Mitgliedstaaten der EU, • Steuerharmonisierung durch die EU: Mehrwertsteuer, Körperschaftssteuer.	3 SWS
Prüfung: Klausur (90 Minuten)	4 C
Prüfung: 3 Präsentationen (je ca. 10 Minuten) mit schriftlicher Ausarbeitung (Kurz-Stellungnahmen in der Gruppe, je max. 3 Seiten)	2 C

Prüfungsanforderungen: Die Teilnehmer zeigen in den Kurzstellungnahmen, dass sie sich in begrenzter Zeit über ein aktuelles Thema der europäischen Politik informieren und dazu Stellung nehmen können. Damit üben die Studierenden ein, sich in sehr kurzer Zeit, wie sie in journalistischer Recherche üblich ist, in ein konkretes, spezielles Thema einzuarbeiten und dazu unmittelbar begründet Position zu beziehen. In der Klausur zeigen die Teilnehmer, dass sie die Organe der EU kennen und deren Aufgaben erklären können. Sie zeigen, dass sie die Wirkungen des europäischen Schuldenregimes analysieren können. Sie zeigen, dass Sie die Grundstruktur des europäischen Haushalts kennen. Sie zeigen, dass Sie die Gründe für europäische Steuerharmonisierung verstehen. Die Klausur überprüft grundlegende Kenntnisse und	

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systematisches Verständnis. Sie verlangt von den Studierenden, ökonomische und politische Zusammenhänge allgemein zu erklären.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-OPH.0007 B.WIWI-VWL.0113 Mikroökonomik I
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Robert Schwager
Angebotshäufigkeit: unregelmäßig	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 4 - 6
Maximale Studierendenzahl: nicht begrenzt	

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Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0028: Spieltheorie** *English title: Game Theory*	6 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden: • kennen formale Modelle strategischer Interaktion und der Entscheidungen unter Unsicherheit und können diese (spiel-)theoretisch analysieren, • kennen Anwendungsgebiete dieser grundlegenden Konzepte in den Wirtschaftswissenschaften, • kennen die Grenzen der spieltheoretischen Betrachtungsweise, die sich in der experimentellen Wirtschaftsforschung zeigen.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Spieltheorie (Vorlesung) *Inhalte*: In dieser Veranstaltung werden die Grundkonzepte der Spiel- und Entscheidungstheorie vermittelt. 1) Simultane Spiele mit vollständiger Information Im ersten Teil der Veranstaltung werden Grundbegriffe der Spieltheorie eingeführt. Studierende werden mit dem Konzept des Nash-Gleichgewichts (in reinen und gemischten Strategien) vertraut gemacht. Ferner werden Konzepte zur Gleichgewichtsauswahl (insbesondere Risikodominanz) und zur Überprüfung der Robustheit von Gleichgewichten ggü. Fehlern der anderen Spieler bei der Strategiewahl (Trembling-Hand-Perfection), sowie das Konzept der evolutionären Stabilität von Strategien eingeführt. 2) Sequentielle Spiele mit vollständiger Information Im zweiten Teil der Veranstaltung lernen Studierende sequentielle Spiele in der Extensivform darzustellen und zu analysieren. Dabei wird Studierenden das Konzept der Teilspielperfektheit vermittelt. Es werden sequentielle Verhandlungen mit endlichem und unendlichem Zeithorizont behandelt. Abschließend wird in sequentielle Spiele mit unvollkommener Information eingeführt. 3) Spiele mit unvollständiger Information Im dritten Teil der Veranstaltung lernen Studierende wie man mit der Harsanyi-Transformation Spiele mit unvollständiger Information in Spiele mit imperfekter Information transformieren kann. Als neues Lösungskonzept wird das Bayesianische Gleichgewicht eingeführt. 4) Entscheidungen unter Risiko Im vierten und letzten Teil der Veranstaltung werden grundlegende Konzepte von individuellen Entscheidungen unter Risiko vermittelt. In diesem Teil wird die Von Neumann-Morgenstern Erwartungsnutzen-Hypothese vorgestellt und mit Bezugnahme auf diverse empirisch beobachtbare Paradoxa diskutiert. Studierende werden sich außerdem mit der Risikoeinstellung von Individuen, mit der Prospect Theory und mit Entscheidungsregeln für Entscheidungen unter Unwissenheit auseinandersetzen.	2 SWS

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Jeder Teil der Veranstaltung erfolgt anwendungsorientiert und nimmt Bezug auf Erkenntnisse der Verhaltensökonomik.	
Lehrveranstaltung: Spieltheorie (Übung) *Inhalte*: Im Rahmen der Übung werden die Inhalte der Vorlesung verfestigt. Das erlangte Wissen aus der Vorlesung wird themenweise in Form von Rechenaufgaben, Textaufgaben und mündlichen Diskussionen abgefragt. Zum Teil können Transferleistungen verlangt werden. Die Themen in der Übung entsprechen hauptsächlich den Themen in der Vorlesung und werden nach Möglichkeit in demselben zeitlichen Abschnitt behandelt.	2 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: Nachweis grundlegender Kenntnisse der Entscheidungstheorie, spieltheoretischer Modelle und Lösungskonzepte mittels der Bearbeitung von Rechen- und Textaufgaben, wobei auch Literaturwissen gefordert wird.

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-VWL.0113 Mikroökonomik I B.WIWI-VWL-0001 Mikroökonomik II
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Prof. Dr. Claudia Keser
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 4 - 6
Maximale Studierendenzahl: nicht begrenzt	

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Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0038: Ausgewählte Fragestellungen der Volkswirtschaftslehre** *English title: Selected Problems in Economics*	6 C 2 SWS

Lernziele/Kompetenzen: Die Studierenden verfügen über vertiefte Kenntnisse eines ausgewählten Themenbereichs der Volkswirtschaftslehre, beispielsweise in den Gebieten internationale Wirtschaftspolitik, Finanzwissenschaften oder Entwicklungsökonomik. Sie können wichtige Beiträge und aktuelle Entwicklungen zu dem Thema einordnen und kritisch hinterfragen. Darüber hinaus besitzen sie Kenntnisse spezieller Konzepte, Mechanismen und Methoden aus dem Bereich Volkswirtschaftslehre, mit deren Hilfe konkrete aktuelle Fragestellungen des entsprechenden Themengebietes adäquat bearbeitet werden können. Hierfür lernen die Studierenden, die wissenschaftliche Literatur zum Thema zu recherchieren, zu verstehen, kritisch zu bewerten und zu diskutieren.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 152 Stunden

Lehrveranstaltung: Ausgewählte Fragestellungen der Volkswirtschaftslehre (Vorlesung) *Inhalte*: Die Lehrveranstaltung, die von Gastdozierenden angeboten wird, behandelt verschiedene Aspekte eines relevanten volkswirtschaftlichen Themas anhand einer aktuellen Fragestellung.	2 SWS
Prüfung: Klausur * (90 Minuten)	6 C

Prüfungsanforderungen: • Nachweis von Kenntnissen über die Anwendung und Umsetzung verschiedener Konzepte, Mechanismen und Methoden im Bereich Volkswirtschaftslehre bezogen auf die jeweilige aktuelle Fragestellung, • kritische Diskussion über Eignung und Adäquanz der diskutierten Konzepte, Mechanismen und Methoden. *Abweichend von der oben genannten Prüfungsform kann die Prüfungskommission in begründeten Fällen eine alternative, niveaugleiche Prüfungsform zu Veranstaltungsbeginn festlegen. Verbindliche Informationen hierzu werden im Vorlesungsverzeichnis veröffentlicht.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Studiendekan*in
Angebotshäufigkeit: unregelmäßig	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 3 - 6

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Bemerkungen:
Detaillierte Informationen zu den Lehrveranstaltungen des Moduls werden jeweils zu Semesterbeginn im Vorlesungsverzeichnis bekannt gegeben.

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Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0059: Internationale Finanzmärkte** *English title: International Financial Markets*	6 C 4 SWS

Lernziele/Kompetenzen: Nach erfolgreicher Absolvierung der Veranstaltung sind Studenten in der Lage: • grundlegende makroökonomische Zusammenhänge auf dem Devisenmarkt zu verstehen und intuitiv wiederzugeben, • das Zusammenspiel von verschiedenen Makrovariablen und ihre Wirkung auf den Wechselkurs zu verstehen, • optimale Investitionsentscheidungen der Investoren selbstständig zu ermitteln, • Bedingungen zu bewerten, unter denen Industrie- und Entwicklungsländer auf dem internationalen Finanzmarkt zusammenarbeiten.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Internationale Finanzmärkte (Vorlesung) *Inhalte*: 1. Monetärer Ansatz auf lange Sicht Einfaches monetäres Modell. Die Art und Weise wie Preisanpassungen zu einem langfristigen Gleichgewicht führen. Realzins und Wechselkurs. 2. Asset-Ansatz auf kurze Sicht Kurzfristiges Gleichgewicht am Geldmarkt und am Devisenmarkt. Die Beziehung zwischen Inlandsrenditen, Auslandsrenditen und dem Wechselkurs einschließlich Überschreitung. 3. Zahlungsbilanz Bruttonationaleinkommen, Bruttoinlandsausgaben, Ersparnis und Investitionen in einer geschlossenen / offenen Wirtschaft. Leistungsbilanz und seine Komponenten. Globales Ungleichgewicht und reale Beispiele dafür. 4. Gewinne der finanziellen Globalisierung Das Konzept des externen Reichtums und wie man es berechnet. Die langfristige Budgetbeschränkung und ihre Anwendung für Industrie- und Schwellenländer. Konsumglättung, effiziente Investition, finanzielle Offenheit und Risikostreuung. 5. Fixe und flexible Wechselkurssysteme Feste Wechselkurse, Crawling Peg und flexible Wechselkurse: Vor- und Nachteile. Wirtschaftliche Ähnlichkeit und Kosten asymmetrischer Schocks. Kooperative und nicht kooperative Anpassungen der Zinssätze. 6. Währungsunionen Das Mundell-Fleming-Modell, Geld- und Fiskalpolitik. Die Theorie optimaler Währungsräume. Die Anwendung dieser Theorie auf die Eurozone und Zusammenhang mit der Eurokrise.	2 SWS
Lehrveranstaltung: Internationale Finanzmärkte (Übung) *Inhalte*:	2 SWS

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In den Übungen werden die Inhalte der Vorlesung anhand von Aufgaben wiederholt und vertieft.	
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: • Nachweis fundierter Kenntnisse der Begriffe im Bereich der internationalen Finanzen durch intuitive und analytische Beantwortung von Fragen, • Nachweis der Fähigkeit zur mathematischen Herleitung der gewinnoptimierenden Entscheidung von hypothetischen Investoren oder Zentralbanken, • Nachweis der Fähigkeit zur grafischen und mathematischen Analyse der finanziellen Globalisierung.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-VWL.0114 Makroökonomik I B.WIWI-VWL.0005 Internationale Wirtschaftsbeziehungen
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Tino Berger
Angebotshäufigkeit: unregelmäßig	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 3 - 6
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module B.WIWI-VWL.0084: Introduction to Global Health**	6 C 3 WLH

Learning outcome, core skills: The goal of this course is to give students an overview of the most important topics and concepts in the field of Global Health. Learning goals: • be able to describe key concepts in Global Health, including disease burden, risk factors, and population health measurement, • understand the relationship between health and economic development, • be able to describe major epidemiological patterns and trends across the globe, • understand the importance of public health policies and health system design.	**Workload:** Attendance time: 42 h Self-study time: 138 h

Course: Introduction to Global Health (Lecture) *Contents*: The course provides a broad introduction to Global Health, which is a growing and interdisciplinary field at the intersection of public health and development economics. A key focus of the course will be on epidemiological patterns and trends across the globe as well as relevant public health concepts. Moreover, we will study major drivers for health disparities across countries and discuss the role of public health policies and health system design. While we will make reference to the situation in Germany, low- and middle-income countries will receive most of the attention.	2 WLH
Course: Introduction to Global Health (Tutorial) *Contents*: Each tutorial covers topics discussed in the lecture in more depth and gives students the opportunity to clarify remaining questions.	1 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: Students should demonstrate their familiarity with key concepts and topics discussed in the lecture. In addition, students will be expected to have read the background literature mentioned in the course.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Sebastian Vollmer
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 3 - 6
Maximum number of students: not limited	

Additional notes and regulations:

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The module cannot be taken if module B.WIWI-SDS.0014 PLanetary Health has already been successfully completed.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0113: Mikroökonomik I** *English title: Microeconomics I*	6 C 5 SWS

Lernziele/Kompetenzen: Nach erfolgreicher Absolvierung der Veranstaltung sind Studierende der Lage: • die Grundlagen der Haushaltstheorie zu verstehen und die optimalen Entscheidungen der Haushalte selbstständig zu ermitteln, • die Grundlagen der Unternehmenstheorie zu verstehen und die optimale Entscheidung der Unternehmen selbstständig zu ermitteln, • grundlegende mikroökonomische Zusammenhänge von Angebot und Nachfrage zu verstehen und intuitiv wiederzugeben, • mathematische und andere analytische Konzepte zur Lösung mikroökonomischer Fragestellung selbstständig anzuwenden, • selbständig Lösungsansätze für komplexe mikroökonomische Fragestellungen zu entwickeln.	**Arbeitsaufwand:** Präsenzzeit: 70 Stunden Selbststudium: 110 Stunden

Lehrveranstaltung: Mikroökonomik I (Vorlesung) *Inhalte*: **Haushaltstheorie** • *Das Budget:* Herleitung der Budgetrestriktion von Haushalten in Abhängigkeit des Einkommens und aller Güterpreise. • *Präferenzen und Nutzenfunktionen:* Mathematische und grafische Herleitung verschiedener Präferenzrelationen und deren Eigenschaften. Grafische und mathematische Darstellung verschiedener Nutzenunktionen; Einführung des Grenznutzen und der Grenzrate der Substitution. • *Nutzenmaximierung und Ausgabenminimierung:* Grafische und mathematisch analytische Herleitung der optimalen Entscheidung der Haushalte anhand des Lagrange-Optimierungsverfahrens. • *Die Nachfrage:* Herleitung der Nachfragefunktion der Haushalte. Einführung von Einkommens-Konsumkurve und Engel-Kurve sowie Preis-Konsumkurve am Beispiel verschiedener Güterklassen und Präferenzen. • *Einkommens- und Preisänderungen:* Analyse der Änderung der optimalen Entscheidung bei Änderung von Einkommen und Preisen mithilfe grafischer und mathematisch analytischer Methoden. Analyse von Einkommens- und Substitutionseffekt. • *Das Arbeitsangebot:* Herleitung des Arbeitsangebots und Einbeziehung in das Optimierungsproblems des Haushaltes. Mathematisch analytische Betrachtung der Änderung des Arbeitsangebots bei Änderung des Lohns. **Unternehmenstheorie** • *Technologie und Produktionsfunktion:* Einführung und Definition grundlegender Begriffe der Unternehmenstheorie. Grafische und mathematische Herleitung verschiedener Technologien und Produktionsfunktionen.	3 SWS

nicht-amtliche Fassung

• *Gewinnmaximierung:* Grafische und mathematische Betrachtung der Gewinnmaximierung eines Unternehmens. Komparative Statik der Änderung der optimalen Entscheidung bei Änderung der Faktorpreise. Kurzfristige und langfristige Gewinnmaximierung. • *Kostenminimierung:* Einführung der Kostengleichung und Isokostenlinie als Teilproblem der optimalen Entscheidung des Unternehmens. Analytische Kostenminimierung anhand des Lagrange-Verfahrens. • *Kostenkurven:* Zusammenhang von Kostenfunktion und Skalenerträgen. Einführung von Durchschnitts- und Grenzkosten. Unterscheidung von kurzfristiger und langfristiger Kostenfunktion. • *Der Wettbewerbsmarkt:* Kombination der Ergebnisse aus Haushalts- und Unternehmenstheorie zu einem gleichgewichtigen Wettbewerbsmarkt. Grafische Wohlfahrtsanalyse. • *Das Monopol:* Einführende Analyse von Gewinnmaximierung im Monopol einschließlich Wohlfahrtsbetrachtung.	
Lehrveranstaltung: Tutorenübung Mikroökonomik I (Übung) *Inhalte*: In den Tutorien werden die Inhalte der Vorlesung anhand von Aufgaben wiederholt und vertieft.	2 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: • Nachweis fundierter Kenntnisse der Haushalts- und Unternehmenstheorie durch intuitive und analytische Beantwortung von Fragen, • Nachweis der Fähigkeit zur grafischen und mathematischen Herleitung der optimalen Güternachfrage der Haushalte, der Anwendung von komparativer Statik sowie der Analyse von Einkommens- und Substitutionseffekten, • Nachweis der Fähigkeit zur grafischen und mathematischen Herleitung der gewinnoptimierenden Entscheidung von Unternehmen, der damit verbundenen minimalen Kosten sowie der Anwendung von komparativer Statik zur Analyse der Änderung von Faktorpreisen, • Nachweis der Fähigkeit zur grafischen und mathematischen Analyse des Marktgleichgewichts und der allgemeinen Wohlfahrt.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Claudia Keser, Prof. Dr. Udo Kreickemeier, Prof. Dr. Robert Schwager, Prof. Dr. Sebastian Vollmer
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 2

Bemerkungen:

nicht-amtliche Fassung

Das Modul darf nicht absolviert werden, wenn bereits das Modul B.WIWI-OPH.0007 Mikroökonomik I erfolgreich absolviert wurde.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-VWL.0114: Makroökonomik I** *English title: Macroeconomics I*	6 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden: • können makroökonomische Kerngrößen definieren, ihre Berechnung erklären und kritisch reflektieren, • sind in der Lage, das Bruttoinlandsprodukt über verschiedene Wege zu erfassen und abzugrenzen und seine Bedeutung als Wohlfahrtsmaß eines Landes kritisch zu reflektieren, • kennen die Funktionen und die volkswirtschaftliche Bedeutung des Geldes und sind mit der Messung und den Folgen von Inflation vertraut, • können das Zusammenspiel der Güter- und Finanzmärkte analytisch darstellen und ihre Bedeutung für das gesamtwirtschaftliche Gleichgewicht erklären, • können Mithilfe eines grundlegenden Modellrahmens makroökonomische Argumente nachvollziehen und die Auswirkungen von Geld- und Fiskalpolitik, sowie unterschiedlicher Schocks selbständig analysieren, • verstehen die Zusammenhänge auf Arbeitsmärkten, kennen die Determinanten von Arbeitsangebot und Arbeitsnachfrage und ko¨nnen ein Arbeitsmarktgleichgewicht darstellen, • sind in der Lage, zwischen gesamtwirtschaftlichen Anpassungen in der kurzen und mittleren Frist zu unterscheiden und die Rolle der Erwartungen zu berücksichtigen, • können die Zusammenhänge zwischen Inflation und Arbeitslosigkeit anhand der Phillips-Kurve darstellen und diese kritisch reflektieren.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Makroökonomik I (Vorlesung) *Inhalte*: Die Vorlesung bietet einen Überblick über die Erfassung und Bewertung wirtschaftlicher Prozesse auf gesamtwirtschaftlichem Aggregationsniveau. Es wird die volkswirtschaftliche Bedeutung des Geldes diskutiert und die Erreichung des gesamtwirtschaftlichen Gleichgewichts sowie die Wirkung wirtschaftspolitischer Maßnahmen analysiert. Hierbei wird zwischen der kurzen und der mittleren Frist unterschieden, die durch unterschiedliche Modellrahmen abgebildet werden. In der kurzen Frist wird insbesondere die keynesianische Betrachtungsweise eingeführt und für die Bewertung wirtschaftspolitischer Konjunkturmaßnahmen verwendet. Durch die Einbeziehung arbeitsmarkttheoretischer Zusammenhänge werden die mittelfristigen Wirkungen wirtschaftpolitischer Maßnahmen abgebildet und der Zusammenhang zwischen Inflation und Arbeitslosigkeit dargestellt, sowie die Rolle der Erwartungen reflektiert. Die den theoretischen Modellen zugrunde liegenden Annahmen werden in Bezug auf ihre empirische Validität stets kritisch hinterfragt.	2 SWS
Lehrveranstaltung: Übung oder Tutorenübung Makroökonomik I (Übung) *Inhalte*:	2 SWS

nichtamtliche Fassung

Im Rahmen der begleitenden Übung/Tutorium vertiefen die Studierenden die Kenntnisse aus der Vorlesung anhand ausgewählter theoretischer Fragestellungen und üben die eigenständige Anwendung von Modellen.	
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: • Nachweis von Kenntnissen über die Definition und Bedeutung des Bruttoinlandsprodukts sowie anderer gesamtwirtschaftlicher Größen, • Nachweis von Kenntnissen über die Bedeutung des Geldes sowie den Ursachen und der Wirkung von Inflation, • Nachweis von Kenntnissen über das gesamtwirtschaftliche Gleichgewicht in der kurzen Frist, • Nachweis von Kenntnissen über das makroökonomische Gleichgewicht auf dem Arbeitsmarkt und die Bedeutung der angebotsseitigen Betrachtung, sowie der Erwartungen der Wirtschaftssubjekte für das mittelfristige Gleichgewicht, • die Studierenden zeigen, dass sie in der Lage sind, mit verschiedenen gesamtwirtschaftlichen Modellen analytisch und grafisch zu arbeiten, die dahinterstehenden Annahmen zu reflektieren sowie die sich ergebenden Unterschiede hinsichtlich der Wirkung wirtschaftspolitischer Maßnahmen darstellen und kritisch würdigen zu können.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Tino Berger, Prof. Dr. Andreas Fuchs, Prof. Dr. Krisztina Kis-Katos, Dr. Katharina Werner
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 2

Bemerkungen:
Das Modul darf nicht absolviert werden, wenn bereits das Modul B.WIWI-OPH.0008 Makroökonomik I erfolgreich absolviert wurde.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-WB.0006: Kritische Ökonomik** *English title: Critical Economics*	6 C 2 SWS

Lernziele/Kompetenzen: Studierende werden mit alternativen wirtschaftswissenschaftlichen Ansätzen vertraut gemacht. Sie können sich eigenständig und kritisch mit zentralen ökonomischen Theorien und Konzepten auseinandersetzen und diese einordnen.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 152 Stunden

Lehrveranstaltung: Kritische Ökonomik (Seminar) *Inhalte*: In diesem von Studierenden organisierten Seminar werden wechselnde Themen behandelt. Im Mittelpunkt steht entweder eine heterodoxe Denkschule (Österreichische Schule, Post-/Neo-/Neukeynesianismus, Post-/Neomarxismus, Cambridge School, Feministische Ökonomik, Ökologische Ökonomik, Postwachstumsökonomik, etc.) oder die kritische Diskussion zentraler Annahmen, Modelle oder blinder Flecken der etablierten Wirtschaftswissenschaften (z.B. Ethik und Gerechtigkeitsfragen in den Wirtschaftswissenschaften, Aspekte der Wissenschaftstheorie, Genderfragen, anthropologische Grundlagen, etc). Ein Fokus auf interdisziplinäre Ansätze (z.B. Sozialökonomie, Verhaltensökonomik, etc.) ist ebenfalls möglich. Lektüreempfehlungen wechseln und werden jeweils im Seminar gegeben.	2 SWS
Prüfung: Hausarbeit (max. 20 Seiten) mit Präsentation (ca. 20 Minuten) **Prüfungsvorleistungen:** Regelmäßige Teilnahme	6 C

Prüfungsanforderungen: Studierende können sich eigenständig und kritisch mit zentralen ökonomischen Theorien und Konzepten auseinandersetzen und diese einordnen, vergleichen, und bewerten.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Dr. Alexander Silbersdorff
Angebotshäufigkeit: unregelmäßig	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 3 - 6
Maximale Studierendenzahl: 25	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-WIN.0001: Enterprise Architecture und Prozessmodellierung** *English title: Enterprise Architecture and Process Modeling*	6 C 4 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Abschluss des Moduls sind die Studierenden in der Lage, Unternehmensarchitekturen zu entwerfen, zu implementieren und zu managen. Sie verfügen über fundierte Kenntnisse und methodische Fähigkeiten, um komplexe Unternehmensstrukturen systematisch zu gestalten und weiterzuentwickeln. Insbesondere können sie: • die Phasen der Entwicklung und des Managements von Unternehmensarchitekturen beschreiben und erläutern, • Vorgehensweisen des Enterprise Architecture Managements erklären und auf unterschiedliche Anwendungsfälle anwenden, • Fakten- und Methodenwissen gezielt nutzen, um Unternehmensarchitekturen erfolgreich zu planen, umzusetzen, zu analysieren und kontinuierlich zu verbessern, • Modellierungstechniken sowie Gestaltungsmöglichkeiten von Geschäftsprozessen und Anwendungssystemen beschreiben und anwenden, • grundlegende Konzepte der Daten- und Prozessmodellierung zur Beschreibung, Analyse und Gestaltung von Unternehmensarchitekturen einsetzen, • Modellierungsaufgaben aus dem Themenfeld der Vorlesung eigenständig bearbeiten, kritisch reflektieren und konstruktiv bewerten.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Enterprise Architecture und Prozessmodellierung (Vorlesung) *Inhalte*: **1. Grundlagen von Unternehmensarchitekturen** a. Definitionen und Überblick über Architekturebenen b. IST-Analyse und strategische Bewertung von Unternehmensarchitekturen c. Grundlagen der Informationssystementwicklung **2. Datenarchitektur** a. Entity-Relationship-Modelle b. Normalisierung **3. Prozessarchitektur** a. Ordnungsrahmenentwicklung b. Prozessmodellierung mit der (e)EPK **4. Enterprise Architecture Management** a. Integrationskonzepte b. Betrieb, Monitoring und kontinuierliche Weiterentwicklung **5. Trend: Architekturen in Ökosystemen**	2 SWS

nicht-amtliche Fassung

a. digitale Plattformen b. Datenräume	
Lehrveranstaltung: Enterprise Architecture und Prozessmodellierung (Übung) *Inhalte*: Im Rahmen der begleitenden Übung vertiefen und erweitern die Studierenden die in der Vorlesung erworbenen Kenntnisse und Fähigkeiten. Dabei wenden sie insbesondere ihr Methodenwissen praktisch an, indem sie mit Software-Artefakten arbeiten, um die Planung, Modellierung, Implementierung, Analyse und Verbesserung realweltlicher Unternehmensarchitekturen handelnd einzuüben. In Gruppen von drei bis fünf Personen bearbeiten die Studierenden vorlesungsbegleitende Übungsaufgaben, die sie schrittweise durch die verschiedenen Phasen des Enterprise Architecture Managements führt.	2 SWS
Prüfung: Klausur (60 Minuten) **Prüfungsvorleistungen:** Erfolgreiche Bearbeitung von Übungsaufgaben. Im Verlauf des Semesters müssen verschiedene Aufgabenstellungen nacheinander bearbeitet und eingereicht werden.	6 C

Prüfungsanforderungen: • Darlegung eines grundlegenden Verständnisses der Gestaltung, Analyse und des Managements von Unternehmensarchitekturen, • Anwendung von Methodenwissen zur Analyse und Bewertung komplexer Unternehmensarchitekturen, • inhaltlich-funktionales Wissen über die Umsetzung von Unternehmensarchitekturen in diversen Wirtschaftssektoren, • Vorgehensweisen, Ansätze und Werkzeuge zur Entwicklung von Unternehmensarchitekturen auf praktische Problemstellungen transferieren können.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-WIN.0039 Grundlagen der Digitalisierung und Digitalen Transformation
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Christian Bartelheimer
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 3 - 5
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-WIN.0002: Strategisches IS- und Daten-Management** *English title: Strategic IS and Data Management*	6 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden: • erlangen ein Verständnis für strategisches IT-Management und IT-Governance und lernen, diese auf Informations- und Anwendungssysteme anzuwenden, • lernen die Bedeutung, Verarbeitung und Nutzung von Daten zur Unterstützung von Managemententscheidungen kennen, • erlangen das für Managementaufgaben notwendige Grundlagenwissen im Bereich der Informations- und Anwendungssysteme, • gewinnen ein Verständnis über die methodischen und technischen Grundlagen zur Organisation, Speicherung und Analyse von Datenbeständen, • lernen, Bedrohungen und Risiken für Informationssysteme zu erkennen, zu bewerten und geeignete Schutzmaßnahmen zu implementieren, • erfahren, wie Sie die Leistung von IT-Systemen und Projekten verbessern und nachhaltige IT-Strategien (Green IT) entwickeln können.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Strategisches IS- und Daten-Management (Vorlesung) *Inhalte*: • Einführung, Grundlagen & Modelle des Informationsmanagements • Strategisches IT-Management & IT-Governance • IT-Organisation & Sourcing von IT-Dienstleistungen • Einführung in datengestützte Entscheidungsfindung • Informations- und Anwendungssysteme • Datenmanagement und Data Science I • Datenmanagement und Data Science II • IS-Sicherheitsmanagement & Risk Management • IS-Performance Management & Projektmanagement • Umsetzung, Betrieb und Green IT	2 SWS
Lehrveranstaltung: Methodische und inhaltliche Übung: Strategisches IS- und Daten-Management (Übung) *Inhalte*: In der methodischen und inhaltlichen Übung werden die Studierenden mit den Themen der Vorlesung "Strategisches IS- und Daten-Management" vertraut gemacht und erlernen die Grundlagen und Konzepte verschiedener Bereiche, wie Informationsmanagement, IT-Management und Datenmanagement. Durch praktische Übungen und Fallbeispiele werden die Studierenden in der Lage sein, ihre Kenntnisse und Fähigkeiten anzuwenden und kritisch zu bewerten, ob das vorgeschlagene Vorgehen in den Modellen angemessen ist.	2 SWS
Prüfung: Klausur (90 Minuten) **Prüfungsvorleistungen:**	6 C

nicht-amtliche Fassung

Der Besuch von Gastvorlesungen, die Teil des Moduls sein können, gilt als empfehlenswert für die Ablegung der Prüfung.	

Prüfungsanforderungen: Die Studierenden zeigen in der Modulprüfung, dass sie nicht nur die Grundlagen und Konzepte des strategischen IS- und Daten-Managements nachvollziehen können, sondern auch in der Lage sind, ihr Wissen anhand von Fallbeispielen lösungsorientiert anzuwenden. Dies beinhaltet insbesondere den Transfer von Wissen auf Anwendungsfälle sowie die Anwendung von Werkzeugen aus der Wirtschaftsinformatik. Darüber hinaus sind die Studierenden in der Lage, kritisch zu bewerten, ob das vorgeschlagene Vorgehen in den Modellen angemessen ist, und es während der Anwendung auf ein Problemfeld anzupassen.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Lutz Maria Kolbe
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 3 - 4

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-WIN.0007: SAP-Blockschulung** *English title: SAP Bloc-Seminar*	3 C 1 SWS

Lernziele/Kompetenzen: Nach erfolgreicher Teilnahme am Modul sind die Studierenden in der Lage: • die theoretischen Grundlagen von Unternehmensstandardsoftware am Beispiel von SAP S/4HANA zu beschreiben und zu erklären, • die wesentlichen Komponenten von SAP S/4HANA zu unterscheiden und ihre jeweiligen Zuständigkeitsbereiche zu erläutern, • die wichtigsten Unterstützungspotenziale von Unternehmensstandardsoftware zu erarbeiten und zu analysieren, • die Funktionsweise spezifischer Teile von SAP S/4HANA anhand einer allgemeinen Fallstudie aufzuzeigen sowie diese Teile auf verwandte Situationen zu übertragen und anzuwenden, • Probleme mit Hilfe der erworbenen Kommunikations- und Organisationsfähigkeiten sowie mit Computerunterstützung selbstständig zu bearbeiten.	**Arbeitsaufwand:** Präsenzzeit: 14 Stunden Selbststudium: 76 Stunden

Lehrveranstaltung: SAP-Blockschulung (Vorlesung) *Inhalte*: • Grundlagen von SAP s/4hana • Vertrieb • Materialwirtschaft • roduktionsplanung und –steuerung • Finanzwirtschaft • Controlling • Business Warehouse Management	1 SWS
Prüfung: Klausur (60 Minuten)	3 C

Prüfungsanforderungen: Die Studierenden weisen in der Modulprüfung nach, dass sie: • Theorien und Konzepte von SAP s/4hana erläutern und beurteilen können, • Funktionsumfang und Anwendungsbeispiele der vorgestellten Lösungen aufzeigen können, • in der Blockschulung kennengelernte Ansätze auf vergleichbare Problemstellungen übertragen können.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** B.WIWI-WIN.0039 Grundlagen der Digitalisierung und Digitalen Transformation
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Matthias Schumann
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester

nicht-amtliche Fassung

Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 3 - 6
Maximale Studierendenzahl: 50	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul B.WIWI-WIN.0027: Seminar zu Themen der Wirtschaftsinformatik** *English title: Seminar on Topics in Business Information Systems*	6 C 2 SWS

Lernziele/Kompetenzen: Nach erfolgreicher Teilnahme sind die Studierenden in der Lage: • die Grundlagen eines ausgewählten Themas der Wirtschaftsinformatik (u. a. aus den Bereichen Informationsmanagement, Management-Informationssysteme sowie Informations- und Kommunikationssystemen) zu beschreiben und zu erklären, • in der Literatur existierende Erkenntnisse zu den oben genannten Themengebieten auf eine gegebene Problemstellung anzuwenden, • auf Basis existierender Literatur eigene Erkenntnisse zu einer Problemstellung zu entwerfen und zu analysieren.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 152 Stunden

Lehrveranstaltung: Seminar zu Themen der Wirtschaftsinformatik (Seminar) *Inhalte*: • Selbständiges Anfertigen einer wissenschaftlichen Hausarbeit. Erfordert das bearbeitete Thema die Entwicklung eines Programms, dann wird dieses im Rahmen der Hausarbeit dokumentiert, • Präsentation der Hausarbeit vor einem Auditorium, • die Themen des Seminars orientieren sich an den aktuellen Forschungsschwerpunkten des Lehrstuhls.	2 SWS
Prüfung: Hausarbeit (max. 20 Seiten) mit Präsentation (ca. 20 Minuten) **Prüfungsvorleistungen:** Regelmäßige Teilnahme am Seminar sowie am Blockkurs „Einführung in das wissenschaftliche Arbeiten“	6 C

Prüfungsanforderungen: Die Studierenden weisen in der Modulprüfung nach, dass sie… • selbstständig in der Lage sind, eine gegebene Problemstellung der Wirtschaftsinformatik zu analysieren und mit Hilfe wissenschaftlicher Literatur sowie wissenschaftlicher Vorgehensweisen zu lösen, • eigene Lösungen kritisch reflektieren und Alternativen aufzeigen können, • die erarbeiteten Ergebnisse in Form einer Seminararbeit verfassen sowie in Form eines Vortrags präsentieren können, • kritische Fragen zum gehaltenen Vortrag beantworten können und somit zu einem intensiven und konstruktiven akademischen Diskurs beitragen können.	

Zugangsvoraussetzungen: B.WIWI-ECON.0003 Wissenschaftliches Arbeiten mit KI (verpflichtend für alle Studierenden in den Bachelor-Studiengängen Wirtschaftsinformatik	**Empfohlene Vorkenntnisse:** B.WIWI-WIN.0039 Grundlagen der Digitalisierung und Digitalen Transformation

nicht-amtliche Fassung

und BWL in einer Version der Prüfungs- und Studienordnung ab dem Wintersemester 2026/27)	
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Martin Adam Prof. Dr. Christian Bartelheimer, Prof. Dr. Lutz Kolbe, Prof. Dr. Manuel Trenz, Prof. Dr. Matthias Schumann
Angebotshäufigkeit: jedes Semester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 3 - 5
Maximale Studierendenzahl: 30	

Bemerkungen:
Die Prüfungsleistung kann neben Deutsch auch auf Englisch erbracht werden.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul M.Che.1311: Schwingungsspektroskopie und zwischenmolekulare Dynamik** *English title: Vibrational Spectroscopy and Intermolecular Dynamics*	6 C 5 SWS

Lernziele/Kompetenzen: • Die Absolvent*innen dieses Moduls haben vertiefte theoretische Kenntnisse zur Schwingungsspektroskopie und zwischenmolekularen Dynamik, sowie deren Ausstrahlung auf andere Gebiete der Naturwissenschaften erworben und sind in der Lage, quantitative Fragestellungen dazu zu erfassen und zu lösen. • Insbesondere verstehen sie harmonische und anharmonische Kopplungen, Intensitätseffekte, fortgeschrittene Symmetrieaspekte und experimentelle Techniken der Schwingungsspektroskopie. • Sie können zwischenmolekulare Wechselwirkungen beschreiben, die sich daraus ergebenden Potentialhyperflächen, Aggregatstrukturen und dynamischen Phänomene analysieren und experimentelle Methoden der Spektroskopie von Molekülaggregaten vergleichen.	**Arbeitsaufwand:** Präsenzzeit: 70 Stunden Selbststudium: 110 Stunden

Lehrveranstaltung: Schwingungsspektroskopie und zwischenmolekulare Dynamik (Vorlesung)	3 SWS
Prüfung: Klausur (180 Minuten)	6 C

Lehrveranstaltung: Schwingungsspektroskopie und zwischenmolekulare Dynamik (Übung)	2 SWS

Prüfungsanforderungen: Erfassung und quantitative Lösung von exemplarischen Fragestellungen aus dem Forschungsgebiet mit begrenzten Hilfsmitteln in vorgegebener Zeit, mindestens 50% der Sollpunktzahl. Bis zu 1/3 der Prüfungsleistung kann nach einheitlicher Festlegung in der ersten Vorlesung durch bewertete Haus- oder Präsenzarbeiten zum Thema "kritischer Umgang mit künstlichen Intelligenzwerkzeugen" mit Bezug auf den Vorlesungs- und Übungsinhalt ersetzt werden.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Prof. Dr. Martin Suhm
Angebotshäufigkeit: unregelmäßig (jedes zweite oder dritte Semester)	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** 1 - 2
Maximale Studierendenzahl: 64	

nicht-amtliche Fassung

Bemerkungen:
Die aktive Teilnahme an den angebotenen Übungsstunden wird dringend empfohlen.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul M.Che.1313: Elektronische Spektroskopie und Reaktionsdynamik** *English title: Electronic Spectroscopy and Reaction Dynamics*	6 C 5 SWS

Lernziele/Kompetenzen: Die Absolvent*innen dieses Moduls haben vertiefte theoretische Kenntnisse zur elektronischen Spektroskopie und Reaktionsdynamik sowie deren Ausstrahlung auf andere Gebiete der Naturwissenschaften erworben und sind in der Lage, quantitative Fragestellungen dazu zu erfassen und zu lösen.	**Arbeitsaufwand:** Präsenzzeit: 70 Stunden Selbststudium: 110 Stunden

Lehrveranstaltung: Elektronische Spektroskopie und Reaktionsdynamik (Vorlesung)	3 SWS
Prüfung: Klausur (180 Minuten)	6 C

Lehrveranstaltung: Elektronische Spektroskopie und Reaktionsdynamik (Übung)	2 SWS

Prüfungsanforderungen: Erfassung und quantitative Lösung von exemplarischen Fragestellungen aus dem Forschungsgebiet mit begrenzten Hilfsmitteln in vorgegebener Zeit, mindestens 50% der Sollpunktzahl.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Dr. Oliver Bünermann
Angebotshäufigkeit: unregelmäßig (jedes zweite oder dritte Semester)	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** 1 - 2
Maximale Studierendenzahl: 64	

Bemerkungen: Die aktive Teilnahme an den angebotenen Übungsstunden wird dringend empfohlen.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul M.Che.1314: Biophysikalische Chemie** *English title: Biophysical Chemistry*	6 C 5 SWS

Lernziele/Kompetenzen: Nach erfolgreichem Abschluss des Moduls ... • sollen die Studierenden in der Lage sein, die wesentlichen physikochemischen Zusammenhänge biologischer Materie zu verstehen • die generellen Triebkräfte biologischer Reaktionen kennen • Spektroskopische Methoden zur Strukturbestimmung biologischer Makromoleküle verstehen und anwenden können • die Grundzüge moderner optischer Mikroskopie sowie der Sondenmikroskopie verstanden haben • die Mechanik und Dynamik biologischer Systeme ausgehend vom Einzelmolekül bis zur einzelnen Zelle erörtern können	**Arbeitsaufwand:** Präsenzzeit: 70 Stunden Selbststudium: 110 Stunden

Lehrveranstaltung: Biophysikalische Chemie (Vorlesung)	3 SWS
Prüfung: Klausur (180 Minuten)	6 C

Lehrveranstaltung: Biophysikalische Chemie (Übung)	2 SWS

Prüfungsanforderungen: • Übertragung genereller physikochemischer Prinzipien, wie zum Beispiel der Reaktionsdynamik, (statistischen) Thermodynamik und Quantentheorie auf die Beschreibung biologischer Phänomene • Beschreibung biologisch relevanter Wechselwirkungskräfte, stochastischer Prozesse wie Diffusion, physikalischer Biopolymer-Modelle, der Eigenschaften von Biomembranen und der Visikoelastizität von weicher Materie. • Kenntnisse der wesentlichen Methoden, wie z.B. UV-Vis, Circulardichroismus, Rasterkraftmikroskopie, optische Fallen, Fluoreszenz, und optische Mikroskopie.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Prof. Dr. Andreas Janshoff
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: dreimalig	**Empfohlenes Fachsemester:** 1 - 2
Maximale Studierendenzahl: 64	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Che.1315: Chemical Dynamics at Surfaces**	6 C 5 WLH

Learning outcome, core skills: The students of this module will achieve a deeper theoretical knowledge of chemical dynamics on surfaces as well as their influence on other fields in natural science, in order that they will be able to approach and solve problems regarding the quantitative questions in this field.	**Workload:** Attendance time: 70 h Self-study time: 110 h

Course: Chemical Dynamics at Surfaces (Lecture)	3 WLH
Examination: Written examination (180 minutes)	6 C

Course: Chemical Dynamics at Surfaces (Exercise)	2 WLH

Examination requirements: By Understanding and solving exemplary questions regarding this research field with the help of limited reference material in predetermined time will count as minimum 50 % of the required score	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Alec Wodtke
Course frequency: irregular (every second or third semester)	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 2
Maximum number of students: 64	

Additional notes and regulations: Active participation in provided tutorial is recommanded.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul M.Inf.1112: Effiziente Algorithmen** *English title: Efficient Algorithms*	5 C 3 SWS

Lernziele/Kompetenzen: Erwerb fortgeschrittener Kenntnisse und Fähigkeiten zur Entwicklung und Analyse effizienter Algorithmen und zur Untersuchung der Komplexität von Problemen in unterschiedlichen Anwendungsbereichen.	**Arbeitsaufwand:** Präsenzzeit: 42 Stunden Selbststudium: 108 Stunden

Lehrveranstaltung: Vorlesung/Übung *Inhalte*: Zum Beispiel: Randomisierte und Approximationsalgorithmen, Graphalgorithmen, Onlinealgorithmen, Netzwerkalgorithmen, Neurocomputing, Pattern-Matching-Algorithmen.	3 SWS
Prüfung: Klausur (90 Min.) oder mündliche Prüfung (ca. 25 Min.). **Prüfungsanforderungen:** Fähigkeit zum Entwurf von effizienten Algorithmen für gegebene Probleme. Beurteilungskompetenz von deren inherenter Komplexität in den Bereichen der Kerninformatik und ggf. ihren Anwendungen.	5 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch, Englisch	**Modulverantwortliche[r]:** Prof. Dr. Florin-Silviu Manea
Angebotshäufigkeit: unregelmäßig	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 30	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul M.Inf.1141: Semistrukturierte Daten und XML** *English title: Semistructured Data and XML*	6 C 4 SWS

Lernziele/Kompetenzen:	**Arbeitsaufwand:**
Die Studierenden kennen die Konzepte semistrukturierter Datenmodelle und die Parallelen sowie Unterschiede zum "klassischen" strukturierten, relationalen Datenmodell. Sie können damit für eine Anwendung abschätzen, welche Technologien gegebenenfalls zu wählen und zu kombinieren sind. Die Studierenden verfügen über praktische Grundkenntnisse in den üblichen Sprachen dieses Bereiches. Sie haben einen Überblick über die historische Entwicklung von Modellen und Sprachen im Datenbankbereich und können daran wissenschaftliche Fragestellungen und Vorgehensweisen nachvollziehen.	Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Semistrukturierte Daten und XML (Vorlesung,Übung)	
Prüfung: Klausur (90 Min.) oder mündliche Prüfung (ca. 25 Min.) **Prüfungsanforderungen:** Konzepte semistrukturierter Datenmodelle und die Parallelen sowie Unterschiede zum "klassischen" strukturierten, relationalen Datenmodell; Fähigkeit zur Beurteilung, welche Technologien in einer konkreten Anwendung zu wählen und zu kombinieren sind; praktische Grundkenntnisse in den üblichen Sprachen dieses Bereiches; Überblick über die historische Entwicklung von Modellen und Sprachen im Datenbankbereich; Fähigkeit zum Nachvollziehen wissenschaftlicher Fragestellungen und Vorgehensweisen.	6 C

Zugangsvoraussetzungen: Datenbanken	**Empfohlene Vorkenntnisse:** keine
Sprache: Englisch, Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Wolfgang May
Angebotshäufigkeit: unregelmäßig	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 100	

Bemerkungen:
Das Modul wird auf English angeboten. Es besteht die Möglichkeit, die Prüfungsleistung auf Deutsch zu absolvieren (in der Klausur können Text-Antworten auch auf deutsch gegeben werden).

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Inf.1171: Cloud and Service Computing**	5 C 3 WLH

Learning outcome, core skills: Successfully completing the module, students understand • hybrid clouds, consisting of private and public clouds • basic web technologies (transfer protocols, markup languages, markup processing, RESTful and SOAP web services) • virtualization technologies (server, storage, and network virtualization) • data services (sharing, management, and analysis) • continuous integration/continuous delivery • container and orchestration in clouds (e.g. Kubernetes, OpenStack Heat) • monitoring of cloud infrastructures • interoperability in clouds (e.g. Helm) • portability and security • microservices • cloud computing workloads On completion of this module students will have a good understanding of the fundamental and up-to-date concepts used in the context cloud computing. This basic knowledge can be leveraged by students to design, implement, and manage service-oriented cloud infrastructures by themselves.	**Workload:** Attendance time: 42 h Self-study time: 108 h

Course: Cloud and Service Computing (Lecture,Exercise) *Contents*: Cloud Computing is a method of providing shared computing resources, such as applications, computing, storage, networking, development, and deployment platforms. In cloud computing these resources can be delivered as service to the user. Such Service-oriented infrastructures are the backbone of modern IT systems. They pool resources, enable collaboration between people, and provide complex services to end-users. Everybody who uses today's web applications implicitly relies on sophisticated service-oriented infrastructures. The same is true for users of mobile devices such as tablet computers and smart phones, which provide most of their benefits leveraging services. The key challenges of cloud computing infrastructures are related to scaling services. More specifically large cloud-computing infrastructures require scalability of IT management, programming models, and power consumption. The challenges to scale services lie in the inherent complexity of hardware, software, and the large amount of user requests, which large-scale services are expected to handle. This module teaches methods that address and solve those challenges in practice. Key aspects of the module are the management of IT infrastructures, the management of service landscapes, and programming models for distributed applications. The module covers the virtualization of computing, storage, and network resources as the fundament for scaling. IT management is covered by the discussion of deployment	3 WLH

nicht-amtliche Fassung

models, service level agreements. Programming models are covered by discussing RESTful and SOAP web-services. Both, lectures and exercises, keep a close connection to the practical application of the discussed topics. The practical value of service-oriented infrastructures is highlighted in the context of enterprises as well as in the context of science. The methods taught in this module benefit from the lecturers' experiences at GWDG and thus provide exclusive insights into the topic. After successfully attending these modules students will understand the most important aspects to design, implement, and manage internet-scale cloud computing infrastructures.	
Examination: Written exam (90 min) or oral exam (approx. 30 min) **Examination requirements:** • Hybrid and Multi cloud infrastructures • RESTful and SOAP web services • Compute, storage, and network virtualisation • Infrastructure-as-a-service, platform-as-a-service, software-as-a-service • Characteristics of Cloud computing (NIST) • Service life cycle • Service level agreements • Cloud computing workloads (e.g. batch, SaaS, big data, back-end)	5 C

Admission requirements: none	**Recommended previous knowledge:** • Basic programming skills • Basic knowledge of Linux operating systems
Language: English	**Person responsible for module:** Prof. Dr. Ramin Yahyapour
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Bachelor: 5 - 6; Master: 1 - 4
Maximum number of students: 50	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Inf.1172: Using Research Infrastructures**	5 C 3 WLH

Learning outcome, core skills: Successfully completing the module, students • understand what methods and services are available in state-of-the-art research infrastructures and direction of future development • understand the infrastructures for eScience and eResearch • know basics of data management and data analysis • know the fundamental of technologies like cloud computing and grids • understand the real-world problems from different domains (e.g., high energy physics, humanities, medical science, etc.) which are tackled by research infrastructures • understand certain aspects, methods and tools of these infrastructures for different use cases from different domains • will be motivated to take part in other related modules (e.g., Specialization in Distributed Systems, Parallel Computing, etc.)	**Workload:** Attendance time: 42 h Self-study time: 108 h

Course: Using Research Infrastructures - Examples from Humanities and Sciences (Lecture,Exercise) *Contents*: Successfully completing the lecture, students • understand the role and importance of the research infrastructure and their general building blocks • know the basics of grid computing • know the basics of cloud computing • learn basics on system virtualization • learn fundamental ideas of data management and analysis • understand the real-world problems from different domains (e.g., high energy physics, humanities, medical science/life science, etc.) which are tackled by research infrastructures • understand certain aspects, methods and tools of these infrastructures for different use cases from different domains • will be motivated to take part in other related modules (e.g., Specialization in Distributed Systems, Parallel Computing, etc.) • get familiar with real-world challenges through talks from experts who will present their current research activities and the role of research infrastructures on their research	3 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Grid computing; cloud computing; system virtualization; data management; data analysis; application of eResearch infrastructure in high energy physics; eResearch in medicine and life science; eResearch in humanities	5 C

nicht-amtliche Fassung

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Ramin Yahyapour
Course frequency: unregelmäßig	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 30	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Inf.1185: Sensor Data Fusion**	5 C 4 WLH

Learning outcome, core skills: This module is concerned with fundamental principles and algorithms for the processing and fusion of noisy (sensor) data. Applications in the context of navigation, object tracking, sensor networks, robotics, Internet-of-Things, and data science are discussed. After successful completion of the module, students are able to • define the notion of data fusion and distinguish different data fusion levels • formalize data fusion problems as state estimation problems • develop distributed and decentralized data fusion architectures • describe the basic concepts of linear estimation theory • explain the fundamental formulas for the fusion of noisy data • deal with unknown correlations in data fusion • understand the Bayesian approach to data fusion and estimation • formulate dynamic models for time-varying phenomena • describe the concept of a recursive Bayesian state estimator • explain and apply the Kalman filter for state estimation in dynamic systems • explain and apply basic nonlinear estimation techniques such as the Extended Kalman filter (EKF) and Unscented Kalman filter (UKF) • assess the properties, advantages, and disadvantages of the discussed (nonlinear) estimators • explain different approaches to deal with uncertainty such as probability theory, fuzzy theory, and Dempster–Shafer theory • identify data fusion applications and assess the benefits of data fusion	**Workload:** Attendance time: 56 h Self-study time: 94 h

Course: Sensor Data Fusion (Lecture,Exercise)	4 WLH
Examination: Written exam (90 min.) or oral exam (approx. 20 min.) **Examination requirements:** Definition of data fusion; data fusion levels; formalization of data fusion problems; distributed and decentralized fusion architectures; linear estimation theory; fundamental fusion formulas; dynamic state estimation; Kalman filter; Extended Kalman filter (EKF); Unscented Kalman filter (UKF), algorithms for dealing with unknown correlations; fuzzy theory; Dempster-Shafer theory	5 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Marcus Baum
Course frequency: irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**

nicht-amtliche Fassung

Maximum number of students: 50	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Inf.1186: Seminar Hot Topics in Data Fusion and Analytics**	5 C 2 WLH

Learning outcome, core skills: After successful completion of the modul students are able to • get acquainted with a specific research topic in the area of data fusion and data analytics • explain the considered problem in the chosen research topic • collect, evaluate, and summarize related work • describe solution approaches for the considered problem • discuss advantages and disadvantages of the proposed approaches • give an outlook to future research directions • prepare and give a presentation about the chosen research topic • write a scientific report about the chosen research topic • follow recent research in data fusion and data analytics	**Workload:** Attendance time: 28 h Self-study time: 122 h

Course: Hot Topics in Data Fusion and Analytics (Seminar)	2 WLH
Examination: Presentation (approx. 45 minutes) and written report (max. 20 pages) **Examination prerequisites:** Attendance in 80% of the seminar presentations **Examination requirements:** Advanced knowledge of a specific research topic in the field of data fusion and data analytics; written scientific report; oral presentation	5 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Marcus Baum
Course frequency: irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Inf.1188: Mobile Robotics**	5 C 4 WLH

Learning outcome, core skills: This module is concerned with fundamental principles and algorithms for mobile robot navigation and perception. After completion, the students are able to • model the locomotion of wheeled mobile robots • understand the concept of dead reckoning • describe the most common sensors for mobile robots, e.g., inertial sensors and beam-based sensors • employ probabilistic state estimation methods such as Kalman filters and sequential Monte Carlo methods (particle filters) for robot navigation and perception • describe and distinguish different concepts for localization such as trilateration and triangulation • implement and evaluate basic algorithms for localization • understand the robot mapping problem and explain different map representations such as occupancy grids • describe the problem of Simultaneous Localization and Mapping (SLAM) • implement and evaluate basic algorithms for SLAM such as graph-based approaches and Rao-Blackwellized particle filters • implement and evaluate basic feature extraction methods such as Random Sample Consensus (RANSAC) • design basic planning algorithms for mobile robots using, e.g., a Markov Decision Process (MDP)	**Workload:** Attendance time: 56 h Self-study time: 94 h

Course: Mobile Robotics (Lecture,Exercise)	4 WLH
Examination: Written exam (90 min.) or oral exam (approx. 20 min.) **Examination requirements:** Motion models for wheeled robots; dead reckoning; mobile robot sensors; Kalman filter; particle filter; localization concepts and algorithms; robot mapping; Simultaneous Localization and Mapping (SLAM); feature extraction methods; planning algorithms	5 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Marcus Baum
Course frequency: irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: not limited	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Inf.1232: Parallel Computing**	6 C 4 WLH

Learning outcome, core skills: Successfully completing the module, students are able to: • define and describe the benefit of parallel computing • specify the classification of parallel computers (Flyn classification) • analytically evaluate the performance of parallel computing approaches (scaling/ performance models) • know the parallel hardware and performance improvement approaches (cache coherence, pipeline, etc.) • know the interconnects and networks and their role in parallel computing • understand and develop sample parallel programs using different paradigms and development environments (e.g., shared memory and distributed models) • expose to some applications of Parallel Computing through hands-on exercises	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Parallel Computing (Lecture,Exercise) *Contents*: Successfully completing the lecture, students are able to: • define and describe the benefit of parallel computing and identify the role of software and hardware in parallel computing • specify the Flynn classification of parallel computers (SISD, SIMD, MIMD) • analytically evaluate the performance of parallel computing approaches (Scaling/ Performance models) • understand the different architecture of parallel hardware and performance improvement approaches (e.g., caching and cache coherence issues, pipeline, etc.) • define Interconnects and networks for parallel computing • architecture of parallel computing (MPP, Vector, Shared memory, GPU, Many-Core, Clusters, Grid, Cloud) • design and develop parallel software using a systematic approach • parallel computing algorithms and development environments (i.e. shared memory and distributed memory parallel programming) • write parallel algorithms/programs using different paradigms and environments (e.g., POSIX Multi-threaded programming, OpenMP, MPI, OpenCL/CUDA, MapReduce, etc.) • get exposed to some applications of Parallel Computing through exercises References • An Introduction to Parallel Programming, Peter S. Pacheco, Morgan Kaufmann (MK), 2011, ISBN: 978-0-12-374260-5. • Designing and Building Parallel Programs, Ian Foster, Addison-Waesley, 1995, ISBN 0-201-57594-9 (Available online).	4 WLH

nicht-amtliche Fassung

• Advanced Computer Architecture: Parallelism, Scalability, Programmability, Kai Hwang, Int. Edition, McGraw Hill, 1993, ISBN: 0-07-113342-9. • In addition to the mentioned text book, tutorial and survey papers will be distributed in some lectures as extra reading material.	
Examination: Klausur (90 Min.) oder mündliche Prüfung (ca. 20 Min.) **Examination requirements:** Parallel programming; Shared Memory Parallelism; Distributed Memory Parallelism, Single Instruction Multiple Data (SIMD); Multiple Instruction Multiple Data (MIMD); Hypercube; Parallel interconnects and networks; Pipelining; Cache Coherence; Parallel Architectures; Parallel Algorithms; OpenMP; MPI; Multi-Threading (pthreads); Heterogeneous Parallelism (GPGPU, OpenCL/CUDA)	6 C

Admission requirements: • Data structures and algorithms • Programming in C/C++	**Recommended previous knowledge:** • Computer architecture • Basic knowledge of computer networks and topologies
Language: English	**Person responsible for module:** Prof. Dr. Ramin Yahyapour
Course frequency: unregelmäßig	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 50	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Inf.1244: Seminar on optimal transport**	5 C 2 WLH

Learning outcome, core skills: By using original references students will familiarize themselves with advanced aspects of optimal transport theory or its applications in modern data analysis and machine learning and present their findings to the other participants. • read and understand original research papers or graduate-level textbooks • collect background material on a given topic and its context • order and prioritize this material for a presentation • prepare a structured presentation with a corresponding handout • give an accessible presentation • answer questions from the audience that may go slightly beyond the presentation material • leading and participating in a scientific discussion	**Workload:** Attendance time: 28 h Self-study time: 122 h

Course: Seminar on optimal transport (Seminar)	2 WLH
Examination: Presentation (approx. 45 min.), follow-up discussion, and handout (max. 5 pages) **Examination requirements:** Advanced knowledge on a specific topic in optimal transport research; structured presentation; handout	5 C

Admission requirements: none	**Recommended previous knowledge:** Lecture “Computational optimal transport” or some course on optimization are strongly recommended.
Language: English	**Person responsible for module:** Prof. Dr. Bernhard Schmitzer
Course frequency: irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 15	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul M.Inf.1802: Praktikum XML** *English title: Practical Course on XML*	6 C 4 SWS

Lernziele/Kompetenzen: Die Studierenden verfügen über vertiefte Kenntnisse und Erfahrungen mit Konzepten und Sprachen aus dem Bereich XML. Sie wissen, welche Sprachen und Werkzeuge ggf. bei Problemstellungen anwendbar sind und können Projekte in diesem Bereich umsetzen. Sie sind mit der Grundidee der W3C-Standards vertraut und können sich selber benötigte Informationen im Web zusammensuchen. Vermittlung von praktischen Fähigkeiten aus dem Bereich XML, XPath, XQuery, XSLT, Web Services und weiteren Sprachen und Werkzeugen.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Praktikum XML (Praktikum)	
Prüfung: Praktische Prüfung (ca. 4 Übungs- und Programmieraufgaben) und mündliche Prüfung (ca. 20 Min.) **Prüfungsanforderungen:** Vertiefte Kenntnisse und Erfahrungen in Sprachen aus dem Bereich XML. Kenntnisse darüber, welche Sprachen und Werkzeuge ggf. bei Problemstellungen anwendbar sind; Fähigkeit zum Umsetzen von Projekten in diesem Bereich; Kenntnisse der W3C-Standards.	6 C

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** M.Inf.1141
Sprache: Englisch, Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Wolfgang May
Angebotshäufigkeit: unregelmäßig	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:**
Maximale Studierendenzahl: 50	

Bemerkungen:
Das Modul wird auf English angeboten. Es besteht die Möglichkeit, die Prüfungsleistung auf Deutsch zu absolvieren.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Inf.1808: Practical Course on Parallel Computing**	6 C 4 WLH

Learning outcome, core skills: Successfully completing the module, students are able to: • practically work with a cluster of computers (e.g., using a batch system) • practically utilize grid computing infrastructures and manage their jobs (e.g., Globus toolkit) • apply distributed memory architectures for parallelism through practical problem solving (MPI programming) • utilize shared memory architectures for parallelism (e.g., OpenMP and pthreads) • utilize heterogenous parallelism (e.g., OpenCL, CUDA and general GPU programming concepts) • utilize their previous knowledge in data structures and algorithms to solve problems using their devised (or enhanced) parallel algorithms	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Practical Course on Parallel Computing (Practical course) *Contents*: As a practical course, the focus will be on the hands-on session and problem solving. Students will get a brief introduction to the topic and then will use the laboratory equipment to solve assignments of each section of the course.	4 WLH
Examination: Oral examination (approx. 20 minutes), not graded **Examination requirements:** • understand how to manage computing jobs using a cluster of computers or using grid computing facilities • understand the configuration of a PBS cluster through practical assignments • practically use LRM clusters and POVRay examples • understand cluster computing related topics (error handling, performance management, security) in more depth and using hands-on experience and practically using Globus toolkit • design and implement solutions for parallel programs using distributed memory architectures (using MPI) • design and implement solutions for parallel programs using shared memory parallelism (using OpenMP, pthreads) • practically work with MapReduce programming framework and problem solving using MapReduce • practically work with heterogenous parallelism environment (GPGPU, OpenCL, CUDA, etc.)	6 C

Admission requirements: • Data structures and algorithms • Programming in C(/C++)	**Recommended previous knowledge:** • Parallel Computing • Computer architecture • Basic knowledge of computer networks • Basic know-how of computing clusters

nicht-amtliche Fassung

Language: English	**Person responsible for module:** Prof. Dr. Ramin Yahyapour
Course frequency: unregelmäßig	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 20	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Inf.2102: Advanced Statistical Learning for Data Science**	6 C 4 WLH

Learning outcome, core skills: Students will • learn concepts of advanced statistical methods and their scope of applications. These methods comprise the EM algorithm, Markov models, Hidden Markov Models, Markov chain Monte Carlo. • gain a solid understanding of ensemble learning algorithms. In particular, we will address additive tree approaches like boosting and Random Forest algorithms, as well as methods for ensemble optimization • learn strategies for model assessment and selection such as nested cross-validation, Monte Carlo validation, or permutation tests. Moreover, this will comprise measures of model quality and robustness. • develop a workflow for statistical modelling including model development, model optimization, model selection, and model validation. • learn reporting guidelines for the documentation of model development as a prerequisite for application in clinical practice. • acquire practical experience in the interpretation of machine learning models and learn required methods for feature selection, importance, stability, and robustness • learn techniques of statistical network inference, their implementation as well as their application to high-dimensional data.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Advanced Statistical Learning for Data Science (Lecture) Hastie, et al. Elements of Statistical Learning https://web.stanford.edu/~hastie/ElemStatLearn/ Bishop: Pattern Recognition and Machine Learning. https://cs.ugoe.de/prml	2 WLH
Examination: Written exam (90 min) or oral exam (approx. 20 min) **Examination prerequisites:** M.Inf.2102.Ex: At least 50% of homework exercises solved. **Examination requirements:** Knowledge of advanced statistical methods, ensemble learning, model assessment, and interpretation as well as statistical network inference. Evaluate their advantages and disadvantages and the ability to implement and interpret the results of these techniques.	6 C

Course: Statistical Learning in Data Science Exercise (Exercise)	2 WLH

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of linear algebra and probability Completion of B.Inf.1236 Machine Learning or equivalent
Language: English	**Person responsible for module:** Prof. Dr. Björn-Hergen Laabs Prof. Dr. Michael Altenbuchinger
Course frequency:	**Duration:**

nicht-amtliche Fassung

each winter semester	1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 3
Maximum number of students: 20	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Inf.2201: Probabilistic Machine Learning**	9 C 6 WLH

Learning outcome, core skills: After successful completion of the module, students • know the principles, paradigms, and challenges of probabilistic reasoning • apply basis principles and tools to perform probabilistic reasoning • manipulate distributions and densities of random variables • apply different methods for inference in probabilistic models (direct solving, sampling, variational inference, Laplace approximation) • apply latent variable models for given problems • perform inference in various forms of Gaussian models using closure properties of the Gaussian family • use graphical models to describe and reason about multivariate distributions of random variables • apply and implement learning algorithms in probabilistic models • can choose from a toolbox of basic algorithms for probabilistic inference on given problems • can implement and debug probabilistic algorithms and inference techniques • apply state of the art deep probabilistic models such as variational autoencoders or normalizing flows	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Probabilistic Machine Learning (Lecture,Exercise)	6 WLH
Examination: Written exam (120 min.) or oral exam (approx. 30 min.) **Examination requirements:** • Ability to use principles and tools of probabilistic reasoning on given problems • Ability to extend and modify existing algorithms of probabilistic inference • Ability to diagnose problems in algorithms of probabilistic reasoning • Ability to mathematically derive results in probabilistic models • Ability to use graphical models to simplify problems of probabilistic reasoning • Knowledge of common models and algorithms of probabilistic inference (Gaussian, Bayesian logistic regression, autoencoders, normalizing flows, and others). • Knowledge of common sampling algorithms (importance sampling, MCMC)	9 C

Admission requirements: none	**Recommended previous knowledge:** • Basic knowledge of linear algebra • Basic knowledge of multivariate calculus • Python, in particular numpy • Basic knowledge of probability
Language: English	**Person responsible for module:** Prof. Dr. Fabian Sinz Dr. Johannes Söding
Course frequency: each winter semester	**Duration:** 1 semester[s]

nicht-amtliche Fassung

Number of repeat examinations permitted:	Recommended semester:
twice	1 - 4
Maximum number of students:	
50	

Additional notes and regulations:
The course can be taken in parallel to B.Inf.1237 Deep Learning.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Inf.2203: Interpretability and Bias of Machine Learning Models**	6 C 4 WLH

Learning outcome, core skills:	**Workload:**
Machine learning models influence societal processes when they are used to predict highly complex scenarios for political decisions, medical advice, scientific discovery, or educational funding. In these high-stakes scenarios, we need to be transparent about the conditions and values that are under- or misrepresented in the model because they remain invisible for identifying patterns and predicting trends. In this course, students are introduced to a range of interpretability methods that can provide partial insights into the information encoded in the model. They learn to pay attention to different types of biases that arise during the application and development of ML models and practice strategies for discovering and quantifying undesirable bias. We focus on neural models for language processing scenarios because these models are particularly prone to learning dubious shortcuts. After completion of this module, students can • explain the concepts underlying interpretability research and use the respective terminology appropriately • apply interpretability methods to better understand machine learning models • interpret and discuss the output of interpretability methods and their limitations • identify sources of bias for machine learning models and discuss their implications	Attendance time: 56 h Self-study time: 124 h

Course: Interpretability and Bias of Machine Learning Models (Lecture)	2 WLH
Examination: Written exam (90 minutes) or oral exam (approx. 20 minutes) **Examination prerequisites:** successful completion of exercise projects **Examination requirements:** Students need to achieve the learning goals	6 C

Course: Interpretability and Bias of Machine Learning Models - Exercise (Exercise) *Contents*: Students practice the lecture contents in applied projects and present them to tutors.	2 WLH

Admission requirements:	**Recommended previous knowledge:**
none	Python programming skills **and** B.Inf.1236 or equivalent **or** B.Inf.1237 or equivalent **or** B.Inf.1250 or equivalent
Language: English	**Person responsible for module:** Prof. Dr. Lisa Beinborn
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**

nicht-amtliche Fassung

Maximum number of students: 50	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Inf.2204: Introduction to Graph Machine Learning**	5 C 2 WLH

Learning outcome, core skills: Upon completion of the module, students will • Understand the fundamental concepts and principles of graph machine learning • Understand the significance of graph data for machine learning as well as its challenges • Be able to apply various graph-based machine learning algorithms such as Message-Passing Graph Neural Networks (MPGNNs), Graph Kernels, and Graph Transformers • Learn to preprocess data, including handling of discrete numerical features such as the atomic number in molecular data • Implement graph machine learning algorithms such as message-passing GNNs and Graph Transformers based on machine learning libraries for graph learning • Be able to apply supervised and unsupervised learning strategies on graph data • Investigate practical data science problems using graph machine learning	**Workload:** Attendance time: 28 h Self-study time: 122 h

Course: Introduction to Graph Machine Learning (Lecture,Exercise) *Contents*: • Core Characteristics of Graph data • Methods: Graph Kernels, Message-Passing GNNs, Graph Transformer • Unsupervised node embeddings • Dense and sparse implementations of GNNs • Positional and Structural Embeddings • Machine learning workflow from dataset to prediction • Expressivity of GNNs and the Weisfeiler-Leman hierarchy	2 WLH
Examination: Oral exam (approx. 20 minutes) or written exam (90 minutes) **Examination prerequisites:** At least 50% of homework exercises solved and N-1 exercise sheets submitted. **Examination requirements:** Knowledge of basic Graph Learning paradigms with their advantages and disadvantages as well as possible application areas. Being able to implement those techniques.	5 C

Admission requirements: none	**Recommended previous knowledge:** General knowledge from Machine Learning and/or deep learning as well as basic python
Language: English	**Person responsible for module:** Prof. Dr. Alexander Ecker
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**

nicht-amtliche Fassung

Maximum number of students: 24	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Inf.2241: Current Topics in Machine Learning**	5 C 2 WLH

Learning outcome, core skills: After successful completion of the module, students • have gained a deeper knowledge in specific topics within the field of machine learning • have improved their oral presentation skills • know how to methodically read and analyse scientific research papers • know how to write an analysis of a specific research field based on their analysis of state-of-the-art research • have improved their ability to work independently in a pre-defined context	**Workload:** Attendance time: 28 h Self-study time: 122 h

Course: Current Topics in Machine Learning (Seminar)	2 WLH
Examination: Oral presentation (approx. 30 min.) and term paper (max. 5000 words) **Examination requirements:** Knowledge in a specific field of machine learning; ability to present the acquired knowledge in a both orally and in a written report.	5 C

Admission requirements: none	**Recommended previous knowledge:** B.Inf.1236 Machine Learning B.Inf.1237 Deep Learning (the seminar can accompany lecture in the same term)
Language: English	**Person responsible for module:** Prof. Dr. Alexander Ecker
Course frequency: irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 4
Maximum number of students: 15	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.0731: Advanced practical course in scientific computing**	10 C 4 WLH

Learning outcome, core skills: **Learning outcome:** After having successfully completed the module, students have basic practical experience in scientific computing. They • are able to create programming projects in both individual and group work; • have solid programming skills; • are proficient in the use of an integrated development environment; • are able to version projects using a version control system; • have mastered some basic procedures for the numerical solution of mathematical problems; • are able to ensure the quality and reliability of code through testing; • are proficient in working with environments to develop and deploy applications consistently; • have basic knowledge of automation in software development; • are able to apply techniques to parallelise tasks or use GPU computing to accelerate calculations; • can carry out performance profiling and implement strategies to optimise memory consumption; • master the optimisation of algorithms to improve efficiency in software development. **Core skills:** After successfully completing the module, students will be able to • structure programming tasks in such a way that they can be completed efficiently in group work; • develop and document a programming project in an understandable way; • use a version control system; • implement mathematical algorithms and procedures in a programming language or user system; • ensure the reliability of code in an automated way; • provide a programming project in an efficient and user-friendly way; • identify mathematical problems in application questions independently and convert them into a mathematical model; • convert complex mathematical problems into a series of simple programming tasks in order to solve them independently; • independently analyse and present questions in the field of scientific computing.	**Workload:** Attendance time: 56 h Self-study time: 244 h

Course: Advanced practical course in scientific computing (Internship)	4 WLH
Examination: Term Papermax. 50 pages (not counted appendices), alternatively, presentation (appr. 30 minutes)	10 C

nicht-amtliche Fassung

Examination prerequisites: Regular participation in the practical course	

Examination requirements: • analysis and systematisation of applied problems; • knowledge in special methods of optimisation; • good programming skills.	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.2300 Proficiency in object oriented programming
Language: English	**Person responsible for module:** Dean of studies
Course frequency: winter or summer semester, on demand	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 3
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.0741: Advanced practical course in stochastics**	10 C 6 WLH

Learning outcome, core skills: **Learning outcome:** After having successfully completed the module, students have deepened and expanded their knowledge of a stochastical simulation and analysis software that they acquired in the module "Practical course in stochastics". They have acquired advanced knowledge in project work in stochastics. They • autonomously implement and interpret more complex stochastical problems using suitable software; • master some advanced methods of statistical data analysis and stochastical simulation like, for example, MCMC computation, quasi-Monte Carlo computation, kernel density estimation, ML estimation in generalised linear models, sparse estimation in high-dimensional linear models, estimation and testing in tim series models, change point estimation, resampling methods such as jackknife and the bootstrap, the EM algorithm, estimation methods for censored data in survival analysis, estimation of the extreme value index (e.g. the Hill-estimator), methods of multiple testing. **Core skills:** After having successfully completed the module, students will be able to • handle practical problems with the aid of advanced stochastical methods and the suitable stochastical simulation and statistical analysis software and present the obtained results well; • use advanced visualisation methods for statistical data (e. g. of spatial data); • apply tailored algorithms for specific stochastic problems.	**Workload:** Attendance time: 84 h Self-study time: 216 h

Course: Advanced practical course in stochastics (Internship)	6 WLH
Examination: Portfolio (maximum 50 pages, without attachments) **Examination prerequisites:** Participation in the practical course	5 C
Examination: Oral examination (approximately 20 minutes)	5 C

Examination requirements: Special knowledge in stochastics, especially mastery of complex stochastical simulation and analysis software as well as methods for data analysis	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5140 or M.Mat.5144
Language: English	**Person responsible for module:** Dean of studies
Course frequency:	**Duration:**

nicht-amtliche Fassung

each winter semester	1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 3
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.0971: Internship**	10 C (incl. key comp.: 10 C)

Learning outcome, core skills: After having successfully completed the module, students have competencies in project-oriented and research-oriented team work as well as in project management. They are familiar with methods, tools and processes of mathematics as well as the organisational and social environment in practice.	**Workload:** Attendance time: 0 h Self-study time: 300 h

Course: Examination colloquium (Colloquium)	
Examination: Presentation (appr. 20 minutes) and written report (max. 10 pages), not graded **Examination prerequisites:** Certificate of the successful completion of the posed duties in accordance with the internship contract	10 C

Examination requirements: Successfully handling of the posed duties according to the internship contract between the student and the enterprise.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers of the Unit Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5140: Statistical learning I**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area "Statistical Learning" enables students to learn methods, concepts, theories and applications in this area. During the course of two semesters students will be successively introduced to current research topics and able to begin to carry out independent contributions to research at the level of a Master's thesis. **Learning outcome:** Depending on the current course offer the following content-related competencies may be pursued. Students • are familiar with the most important methods of statistical learning like estimation, testing, confidence statements, prediction, resampling, pattern recognition and classification, and use them in modeling real world applications; • evaluate statistical methods mathematically precisely via suitable statistical risk and loss concepts; • analyze characteristics of statistical estimation methods via lower and upper information bounds; • are familiar with basic statistical distribution models that base on the (asymptotic) theory of exponential families such as generalized linear models; • are confident in modeling real world data structures such as categorial data, multidimensional and high dimensional data or data with serial dependencies; • are familiar with tools of non-parametric regression; • evaluate complex statistical methods and enhance them in a problem-oriented way. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of "Statistical learning"; • explain basic ideas of proof in this area; • illustrate typical applications in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Statistical learning I (Lecture)	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination prerequisites:** M.Mat.5140.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Statistical learning I - exercises	2 WLH

Examination requirements: Proof of knowledge basic competencies in selected topics in the area "Statistical learning".	

nichtamtliche Fassung

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4147 B.Mat.4141 or B.Mat.4142
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5141: Applied stochastic processes I**	9 C 6 WLH

Learning outcome, core skills: The successful completion of this module enables students to learn and apply methods, concepts, theories and proof techniques in the area of applied stochastic processes and to use these for the modelling and statistical analysis of stochastic systems. During the course students will be successively introduced to current research topics so that they will be able to carry out independent contributions to research (e. g. within the scope of a Master's thesis). **Learning outcome:** Depending on the current course offer the following content-related competencies may be pursued. Students • are familiar with substantial concepts and approaches of probability modelling and inferential statistics for stochastic processes; • know advanced characteristics of stochastic processes as well as conditions for their existence and uniqueness; • have a pool of different stochastic processes in time and space at their disposal and characterise those, differentiate them and analyse examples in applications; • analyse regularity characteristics of the paths of stochastic processes; • understand and identify basic characteristics of invariance of stochastic processes like stationary processes and isotropy; • analyse the convergence characteristic and long time behavior of stochastic processes; • use and analyse stochastic algorithms such as Markov chain Monte Carlo for sampling; • discuss and compare different modelling approaches and evaluate the reliability of parameter estimates and predictions. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of "Applied stochastic processes"; • explain basic ideas of proof in this area; • illustrate typical applications in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Applied stochastic processes I (Lecture)	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination prerequisites:** M.Mat.5141.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Applied stochastic processes I - exercises	2 WLH

Examination requirements:	

nicht-amtliche Fassung

Proof of knowledge basic competencies in selected topics in the area "Applied stochastic processes".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4141 or B.Mat.4142
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5142: Stochastic processes I**	9 C 6 WLH

Learning outcome, core skills: The successful completion of this module enables students to learn and apply methods, concepts, theories and proof techniques in the area of stochastic processes and to use these for the modelling of stochastic systems. During the course students will be successively introduced to current research topics so that they will be able to carry out independent contributions to research (e. g. within the scope of a Master's thesis). **Learning outcome:** Depending on the current course offer the following content-related competencies may be pursued. Students • construct, characterise, and analyse fundamental classes of stochastic processes (like e. g. Poisson processes, Brownian motions, Levy processes, stationary processes, multivariate and spatial processes as well as branching processes); • analyse regularity characteristics of the paths of stochastic processes; • are familiar with the theory of general Markov processes and characterise and analyse these with the use of generators, semigroups, martingale problems; • analyse martingales in discrete and continuous time using the corresponding martingale theory, especially using martingale equations, martingale convergence theorems, martingale stopping theorems and martingale representation theorems; • are familiar with stochastic concepts in general state spaces as well as with the topologies, metrics and convergence theorems relevant for stochastic processes; • know fundamental convergence theorems for stochastic processes and generalise these; • model stochastic systems from different application areas in natural sciences and technology with the aid of suitable stochastic processes. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of "Stochastic processes"; • explain basic ideas of proof in this area; • illustrate typical applications in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Stochastic processes I (Lecture)	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination prerequisites:** M.Mat.5142.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Stochastic processes I - exercises	2 WLH

Examination requirements: Proof of knowledge basic competencies in selected topics in the area "Stochastic processes".	

nicht-amtliche Fassung

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4141 or B.Mat.4142
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5144: Mathematical statistics I**	9 C 6 WLH

Learning outcome, core skills: The successful completion of this module enables students to learn and apply methods, concepts, theories and proof techniques in the area "Mathematical statistics". During the course students will be successively introduced to current research topics so that they will be able to carry out independent contributions to research (e. g. within the scope of a Master's thesis). **Learning outcome:** Depending on the current course offer specialized and timely topics will be discussed; e.g., • low- and high-dimensional statistics; • statistics for intermediate dimensions, such as change point analysis; • minimax theory for estimation and testing; • non-parametric density and function estimation. **Core skills:** After having successfully completed the module, students will be able to • discuss basic concepts of "Mathematical statistics"; • explain basic ideas of proof in this area; • illustrate typical applications in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Mathematical statistics I (Lecture)	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination prerequisites:** M.Mat.5144.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Mathematical statistics I - exercises	2 WLH

Examination requirements: Proof of knowledge basic competencies in selected topics in the area "Mathematical statistics".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4147
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students:	

nicht-amtliche Fassung

not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5212: Nonlinear partial differential equations**	9 C 6 WLH

Learning outcome, core skills: In this course students develop a deeper mathematical understanding in the area "Partial differential equations". They are enabled to carry out independent contributions to research, e. g. within the scope of a thesis project. **Learning outcome:** After completing the module, students will be able to apply PDE techniques and techniques from nonlinear analysis to solve specific problems about nonlinear partial differential equations. They • have mastered a review of the linear theory; • are familiar with nonlinear elliptic partial differential equations, in particular, mapping degrees and other topological methods and bifurcation analysis; • master hyperbolic systems of conservation laws and are familiar with entropy solutions, formation and stability of strong discontinuities and the compressible Euler equations from gas dynamics as an important example; • are familiar with free boundary problems, in particular, viscosity solutions, regularity questions. **Core skills:** After having successfully completed the module, students will be able to • handle methods and concepts of the area "Partial differential equations" confidently; • explain complex issues of the area "Partial differential equations"; • apply methods of the area "Partial differential equations" to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Nonlinear partial differential equations (Lecture)	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination prerequisites:** M.Mat.5212.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise session	9 C

Course: Nonlinear partial differential equations - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Nonlinear partial differential equations".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4112
Language: English	**Person responsible for module:** Dean of studies mathematics

nicht-amtliche Fassung

Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5213: Differential geometry II**	9 C 6 WLH

Learning outcome, core skills: In this course students develop a deeper mathematical understanding in the area "Differential geometry". They are enabled to carry out independent contributions to research, e. g. within the scope of a thesis project. **Learning outcome:** Depending on the current course offer the following content-related competencies may be pursued. Students • master the concepts of differential geometry such as principal bundles, associated vector bundles, connections and their curvatures on principal bundles; • understand Bianchi identities and the Ambrose-Singer theorem and are familiar with parallel translation, holonomy and holonomy groups; • develop an understanding of the concepts of Riemannian manifolds, principal bundles of frames and its reductions, canonical 1-form and local coordinate systems, metric and metric connections, and torsion; • are familiar with Riemannian curvature tensor and its symmetries via representation theory; • develop a spatial sense of geodesics, their variations, geodesic coordinates and isometries; • develop an understanding of complex and Kähler geometry as well as Hyperkähler and quaternionic Kähler geometry and the Berger classification; • acquire the skill to apply methods of analysis, algebra and topology for the treatment of geometrical problems; • are able to import geometrical problems to a broader mathematical and physical context. **Core skills:** After having successfully completed the module, students will be able to • handle methods and concepts of the area "Differential geometry" confidently; • explain complex issues of the area "Differential geometry"; • apply methods of the area "Differential geometry" to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Differential geometry II (Lecture)	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination prerequisites:** M.Mat.5213.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Differential geometry II - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Differential geometry".	

nichtamtliche Fassung

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4113
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5214: Algebraic topology II**	9 C 6 WLH

Learning outcome, core skills: Algebraic topology uses concepts and tools of algebra, geometry and analysis and can be applied to these areas. In the modules in the area "Algebraic topology" students get to know the most important classes of topological spaces as well as algebraic and analytical tools for studying these spaces and the mappings between them. The students use these tools in geometry, mathematical physics, algebra and group theory. They are introduced to current research questions and enabled to carry out independent contributions to research, e. g. within the scope of a thesis project. **Learning outcome:** In this course students develop a deeper mathematical understanding in the area "Algebraic topology". The following content-related competencies are pursued: Students • know more homological algebra: dual chain complexes, cohomology; • deduce algebraic characteristics of homology and cohomology with the aid of homological algebra; • are familiar with more advanced homological algebra: resolutions, Tor/Ext, universal coefficient theorems; • construct and use product structures in cohomology; become acquainted with connections between analysis and topology; • apply algebraic structures to deduce special global characteristics of the cohomology of a local structure of manifolds, in particular Poincare duality. **Core skills:** Students develop advanced skills in algebraic topology. They • handle methods and concepts of algebraic topology confidently; • explain complex issues of the cohomology of manifolds and of other areas of algebraic topology; • compute and use the multiplicative structure of cohomology to restrict potential classes of maps and spaces; • transfer homological methods from algebraic topology to areas like group theory, algebraic geometry, differential geometry.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Algebraic topology II (Lecture)	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination prerequisites:** M.Mat.5214.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Algebraic topology II - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Algebraic topology".	

nichtamtliche Fassung

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4114
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5219: Microlocal analysis**	9 C 6 WLH

Learning outcome, core skills: In this course students develop a deeper mathematical understanding in the area "Microlocal analysis". They are enabled to carry out independent contributions to research, e. g. within the scope of a thesis project. **Learning outcome:** After completing the module, students will be able to apply PDE techniques and techniques from nonlinear analysis to solve specific problems about nonlinear partial differential equations. They • have mastered a review of the linear theory; • are familiar with nonlinear elliptic partial differential equations, in particular, mapping degrees and other topological methods and bifurcation analysis; • master hyperbolic systems of conservation laws and are familiar with entropy solutions, formation and stability of strong discontinuities and the compressible Euler equations from gas dynamics as an important example; • are familiar with free boundary problems, in particular, viscosity solutions, regularity questions. **Core skills:** After having successfully completed the module, students will be able to • handle methods and concepts of the area "Microlocal analysis" confidently; • explain complex issues of the area "Microlocal analysis"; • apply methods of the area "Microlocal analysis" to new problems in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Microlocal analysis (Lecture)	4 WLH
Examination: Oral examination (approx. 20 minutes) **Examination prerequisites:** M.Mat.5219.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Microlocal analysis - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Microlocal analysis".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4112
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: at least once every three years	**Duration:** 1 semester[s]

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Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

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Georg-August-Universität Göttingen **Module M.Mat.5240: Statistical learning II**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area "Statistical learning" enables students to learn methods, concepts, theories and applications in this area. During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master's thesis). **Learning outcome:** Depending on the current course offer specialized and timely topics will be discussed; e.g., • non-parametric statistics; • non-parametric Bayesian theory; • random matrix theory and statistical applications; • statistical optimal transport; • non-Euclidean statistics; • deep neural networks. **Core skills:** After having successfully completed the module, students will be able to • discuss advanced concepts of "Statistical learning"; • explain ideas of proof in this area; • illustrate typical applications in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Statistical learning II (Lecture)	4 WLH
Examination: oral examination (20 minutes) **Examination prerequisites:** M.Mat.5240.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Statistical learning II - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Statistical learning".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5140
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6

nicht-amtliche Fassung

Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

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Georg-August-Universität Göttingen **Module M.Mat.5241: Applied stochastic processes II**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area "Applied stochastic processes" enables students to learn methods, concepts, theories and applications in this area. During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master's thesis). **Learning outcome:** Depending on the current course offer specialized and timely topics will be discussed. Students • are familiar with substantial concepts and approaches of probability modelling and inferential statistics for stochastic processes; • know advanced characteristics of stochastic processes as well as conditions for their existence and uniqueness; • have a pool of different stochastic processes in time and space at their disposal and characterise those, differentiate them and analyse examples in applications; • analyse regularity characteristics of the paths of stochastic processes; • adequately model temporal and spatial phenomena in natural and economic sciences as stochastic processes, if necessary with unknown parameters; • analyse probabilistic and statistic models regarding their typical characteristics, estimate unknown parameters and make predictions for their paths on areas not observed / at times not observed; • discuss and compare different modelling approaches and evaluate the reliability of parameter estimates and predictions. **Core skills:** After having successfully completed the module, students will be able to • discuss advanced concepts of "Applied stochastic processes"; • explain ideas of proof in this area; • illustrate typical applications in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Applied stochastic processes II (Lecture)	4 WLH
Examination: oral examination (20 minutes) **Examination prerequisites:** M.Mat.5241.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Applied stochastic processes II - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Applied stochastic processes".	

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Admission requirements: none	**Recommended previous knowledge:** B.Mat.4242 or M.Mat.5140
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

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Georg-August-Universität Göttingen **Module M.Mat.5242: Stochastic processes II**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area "Stochastic processes and stochastic calculus" enables students to learn methods, concepts, theories and applications in this area. During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master's thesis). **Learning outcome:** Depending on the current course offer specialized and timely topics will be discussed. Students • construct, characterise, and analyse fundamental classes of stochastic diffusion processes; • analyse regularity characteristics of the paths of stochastic diffusion processes; • know and utilise properties of stochastic processes such as the Markov and martingale property; • formulate stochastic integrals as well as stochastic differential equations with the use of Ito calculus and analyse their characteristics; • know and analyse Brownian motion and diffusion processes; • model stochastic systems from different application areas in natural sciences and technology with the aid of suitable stochastic processes; • analyse models in mathematical economics and finance and understand evaluation methods for financial products. **Core skills:** After having successfully completed the module, students will be able to • discuss advanced concepts of "Stochastic calculus and applications"; • explain ideas of proof in this area; • illustrate typical applications in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Stochastic processes II (Lecture)	4 WLH
Examination: oral examination (20 minutes) **Examination prerequisites:** M.Mat.5242.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C
Course: Stochastic processes II - exercises (Exercise)	2 WLH
Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Stochastic calculus and applications".	

Admission requirements:	**Recommended previous knowledge:**
none	B.Mat.4142

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	B.Mat.4141 or B.Mat.4142
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

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Georg-August-Universität Göttingen **Module M.Mat.5244: Mathematical statistics II**	9 C 6 WLH

Learning outcome, core skills: The successful completion of modules in the area "Mathematical Statistics" enables students to learn methods, concepts, theories and applications in this area. During the course students will be successively introduced to current research topics and able to carry out independent contributions to research (e. g. within the scope of a Master's thesis). **Learning outcome:** Depending on the current course offer specialized and timely topics will be discussed; e.g., • non-parametric statistics; • non-parametric Bayesian theory; • random matrix theory and statistical applications; • statistical optimal transport; • non-Euclidean statistics; • deep neural networks. **Core skills:** After having successfully completed the module, students will be able to • discuss advanced concepts of "Mathematical statistics"; • explain ideas of proof in this area; • illustrate typical applications in this area.	**Workload:** Attendance time: 84 h Self-study time: 186 h

Course: Mathematical statistics II (Lecture)	4 WLH
Examination: oral examination (20 minutes) **Examination prerequisites:** M.Mat.5244.Ue: Achievement of at least 50% of the exercise points and presentation, twice, of solutions in the exercise sessions	9 C

Course: Mathematical statistics II - exercises (Exercise)	2 WLH

Examination requirements: Proof of advancement of knowledge and competencies acquired in the introductory module of the area "Mathematical statistics".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5140 or M.Mat.5144
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

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three times	Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

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Georg-August-Universität Göttingen **Module M.Mat.5413: Seminar on differential geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Differential geometry" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Differential geometry" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on differential geometry (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5413.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Differential geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4113
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

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Georg-August-Universität Göttingen **Module M.Mat.5414: Seminar on algebraic topology**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Algebraic topology" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Algebraic topology" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on algebraic topology (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5414.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Algebraic topology".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4114
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

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Georg-August-Universität Göttingen **Module M.Mat.5415: Seminar on mathematical methods in physics**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Mathematical methods in physics" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Mathematical methods in physics" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on mathematical methods in physics (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5415.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Mathematical methods in physics".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4115
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

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Georg-August-Universität Göttingen **Module M.Mat.5416: Seminar on advanced Lie theory**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Advanced Lie theory" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Advanced Lie theory" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on advanced Lie theory (Seminar)	
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5416.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Advanced Lie theory"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4116 or B.Mat.4216
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

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Georg-August-Universität Göttingen **Module M.Mat.5417: Seminar on non-commutative geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Non-commutative geometry" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Non-commutative geometry" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on non-commutative geometry (Seminar)	
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5417.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Non-commutative geometry"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4217
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

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Georg-August-Universität Göttingen **Module M.Mat.5419: Seminar on higher analysis**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Higher analysis" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Higher analysis" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on higher analysis (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5419.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Higher analysis".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4112 or M.Mat.5219
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

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Georg-August-Universität Göttingen **Module M.Mat.5421: Seminar on algebraic geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Algebraic geometry" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Algebraic geometry" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on algebraic geometry (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5421.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Algebraic geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4121
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

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Georg-August-Universität Göttingen **Module M.Mat.5423: Seminar on algebraic structures**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Algebraic structures" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Algebraic structures" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on algebraic structures (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5423.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Algebraic structures".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4123
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

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Georg-August-Universität Göttingen **Module M.Mat.5426: Seminar on arithmetic geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Arithmetic geometry" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Arithmetic geometry" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on arithmetic geometry (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5426.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Arithmetic geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4126
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5427: Seminar on primes**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Primes" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Primes" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on primes (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5427.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Primes".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4127
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

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Georg-August-Universität Göttingen **Module M.Mat.5428: Seminar on additive number theory**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Additive number theory" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Additive number theory" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on additive number theory (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5428.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Additive number theory".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4128
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5430: Seminar on applied mathematics in the natural sciences**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Applied mathematics" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Applied mathematics" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on applied mathematics in the natural sciences (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5430.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Applied mathematics".	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

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Georg-August-Universität Göttingen **Module M.Mat.5431: Seminar on inverse problems**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Inverse problems" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Inverse problems" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on inverse problems (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5431.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Inverse problems".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4131
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5432: Seminar on approximation**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Approximation" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Approximation" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on approximation (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5432.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Approximation".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4139 or B.Mat.4336 or B.Mat.4339
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5433: Seminar on numerics of partial differential equations**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Numerics of partial differential equations" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Numerics of partial differential equations" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on numerics of partial differential equations (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5433.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Numerics of partial differential equations".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4133
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5434: Seminar on optimisation**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Optimisation" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Optimisation" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on optimisation (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5434.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Optimisation".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4134
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5435: Seminar on numerical analysis**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Numerical analysis" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Numerical analysis" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on numerical analysis (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5435.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Numerical analysis".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5436: Seminar on functional analysis**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Functional analysis" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Functional analysis" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on functional analysis (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5436.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Functional analysis".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5438: Seminar on discrete differential geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Discrete differential geometry" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Discrete differential geometry" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on discrete differential geometry (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5438.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Discrete differential geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4138
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5439: Seminar on scientific computing**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Scientific computing" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Scientific computing" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on scientific computing (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5439.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Scientific computing".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4139
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5440: Seminar on statistical methods for machine learning**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Statistical methods for machine learning" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Statistical methods for machine learning" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on statistical methods for machine learning (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5440.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Statistical methods for machine learning".	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5441: Seminar on applied and mathematical stochastics**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Applied and mathematical stochastics" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Applied and mathematical stochastics" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on applied and mathematical stochastics (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5441.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Applied and mathematical stochastics".	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5442: Seminar on stochastic processes**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Stochastic processes" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Stochastic processes" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on stochastic processes (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5442.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Stochastic processes".	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5444: Seminar on mathematical statistics**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Mathematical statistics" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Mathematical statistics" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on mathematical statistics (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5444.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Mathematical statistics".	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5447: Seminar on statistical foundations of data science**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Statistical foundations of data science" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Statistical foundations of data science" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on statistical foundations of data science (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5447.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Statistical foundations of data science".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4147
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5448: Seminar on stochastic processes and modelling**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Stochastic processes and modelling" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Stochastic processes and modelling" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on stochastic processes and modelling (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5448.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Stochastic processes and modelling".	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5449: Seminar on stochastic methods and models**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will • learn to explore a topic in the area "Stochastic methods and models" independently; • develop the ability to read, understand, and critically evaluate scientific literature; • learn to communicate complex ideas clearly and effectively to a broader audience; • review other students' work and provide constructive feedback. The specific topics will be announced well in advance of the begin of the semester, e.g. via the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • become acquainted with a mathematical topic in the area "Stochastic methods and models" and present it in a talk; • conduct scholarly debates in a familiar context.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Seminar on stochastic methods and models (Seminar)	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5449.Sem: Participation in the seminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues in the area "Stochastic methods and models".	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5613: Topics in differential geometry**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Differential geometry" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Differential geometry"; • carry out scientific work under supervision in the area "Differential geometry".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in differential geometry	4 WLH
Examination: oral examination (20 minutes)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Differential geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4113
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5614: Topics in algebraic topology**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Algebraic topology" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Algebraic topology"; • carry out scientific work under supervision in the area "Algebraic topology".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in algebraic topology	4 WLH
Examination: oral examination (20 minutes)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Algebraic topology".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4114
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5615: Topics in mathematical methods of physics**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Mathematical methods of physics" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Mathematical methods of physics"; • carry out scientific work under supervision in the area "Mathematical methods of physics".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in mathematical methods of physics	4 WLH
Examination: oral examination (20 minutes)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Mathematical methods in physics".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4115
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5616: Topics in advanced Lie theory**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Advanced Lie theory" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Advanced Lie theory"; • carry out scientific work under supervision in the area "Advanced Lie theory".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in advanced Lie theory	4 WLH
Examination: oral examination (20 minutes)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Advanced Lie theory"	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4116 or B.Mat.4216
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5617: Topics in non-commutative geometry**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Non-commutative geometry" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Non-commutative geometry"; • carry out scientific work under supervision in the area "Non-commutative geometry".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in non-commutative geometry	4 WLH
Examination: oral examination (20 minutes)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Non-commutative geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4217
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5619: Topics in singular analysis**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Singular analysis" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Singular analysis"; • carry out scientific work under supervision in the area "Singular analysis".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in singular analysis	4 WLH
Examination: oral examination (20 minutes)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Singular analysis".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5219
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5621: Topics in algebraic geometry**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Algebraic geometry" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Algebraic geometry"; • carry out scientific work under supervision in the area "Algebraic geometry".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in algebraic geometry	4 WLH
Examination: oral examination (20 minutes)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Algebraic geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4221
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5623: Topics in algebraic structures**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Algebraic structures" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Algebraic structures"; • carry out scientific work under supervision in the area "Algebraic structures".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in algebraic structures	4 WLH
Examination: oral examination (20 minutes)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Algebraic structures".	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5626: Topics in arithmetic geometry**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Arithmetic geometry" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Arithmetic geometry"; • carry out scientific work under supervision in the area "Arithmetic geometry".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in arithmetic geometry	4 WLH
Examination: oral examination (20 minutes)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Arithmetic geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4226
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5627: Topics in primes**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Primes" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Primes"; • carry out scientific work under supervision in the area "Primes".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in primes	4 WLH
Examination: oral examination (20 minutes)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Primes".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4227
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5628: Topics in additive number theory**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Additive number theory" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Additive number theory"; • carry out scientific work under supervision in the area "Additive number theory".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in additive number theory	4 WLH
Examination: oral examination (20 minutes)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Additive number theory".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4228
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5630: Topics in applied mathematics in the natural sciences**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Applied mathematics" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Applied mathematics"; • carry out scientific work under supervision in the area "Applied mathematics".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in applied mathematics in the natural sciences	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Applied mathematics".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4130
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5631: Topics in inverse problems**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Inverse problems" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Inverse problems"; • carry out scientific work under supervision in the area "Inverse problemss".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in inverse problems	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Inverse problems".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4131
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5632: Topics in approximation**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Approximation" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Approximation"; • carry out scientific work under supervision in the area "Approximation".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in approximation	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Approximation".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4139, B.Mat.4236, B.Mat.4239
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5633: Topics in numerics of partial differential equations**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Numerics of partial differential equations" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Numerics of partial differential equations"; • carry out scientific work under supervision in the area "Numerics of partial differential equations".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in numerics of partial differential equations	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Numerics of partial differential equations".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4233
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5634: Topics in optimisation**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Optimisation" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Optimisation"; • carry out scientific work under supervision in the area "Optimisation".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in optimisation	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Optimisation".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4134
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5635: Topics in integral equations**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Integral equations" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Integral equations"; • carry out scientific work under supervision in the area "Integral equations".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in integral equations	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Integral equations".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5636: Topics in function spaces**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Functional analysis" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Functional analysis"; • carry out scientific work under supervision in the area "Functional analysis".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in function spaces	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Functional analysis" with particular focus on function spaces.	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.1021, B.Mat.1022, B.Mat.1023, B.Mat.1024
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5638: Topics in discrete differential geometry**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Discrete differential geometry" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Discrete differential geometry"; • carry out scientific work under supervision in the area "Discrete differential geometry".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in discrete differential geometry	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Discrete differential geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4138
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5639: Topics in scientific computing**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Scientific computing" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Scientific computing"; • carry out scientific work under supervision in the area "Scientific computing".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in scientific computing	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Scientific computing".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4130
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5640: Topics in statistical methods for machine learning**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Statistical methods for machine learning" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Statistical methods for machine learning"; • carry out scientific work under supervision in the area "Statistical methods for machine learning".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in statistical methods for machine learning	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Statistical methods for machine learning".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5141 or M.Mat.5142
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5641: Topics in applied stochastic processes**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Applied stochastic processes" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Applied stochastic processes"; • carry out scientific work under supervision in the area "Applied stochastic processes".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in applied stochastic processes	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Applied stochastic processes".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5140 or M.Mat.5144
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5642: Topics in stochastic processes**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Stochastic processes" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Stochastic processes"; • carry out scientific work under supervision in the area "Stochastic processes".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in stochastic processes	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Stochastic processes".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5141 or M.Mat.5142
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5644: Topics in mathematical statistics**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Mathematical statistics" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Mathematical statistics"; • carry out scientific work under supervision in the area "Mathematical statistics".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in mathematical statistics	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Mathematical statistics".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5140 or M.Mat.5144
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5647: Topics in statistical foundations of data science**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Statistical foundations of data science" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Statistical foundations of data science"; • carry out scientific work under supervision in the area "Statistical foundations of data science".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in statistical foundations of data science	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Statistical foundations of data science".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4247 or M.Mat.5140
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5648: Topics in stochastic processes and modelling**	6 C 4 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Stochastic processes and modelling" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Stochastic processes and modelling"; • carry out scientific work under supervision in the area "Stochastic processes and modelling".	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Topics in stochastic processes and modelling	4 WLH
Examination: oral examination (approx. 20 min)	6 C

Examination requirements: Proof of the acquisition of special skills and the mastery of advanced competencies in the area "Stochastic processes and modelling".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5141 or M.Mat.5142
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5713: Special course in differential geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Differential geometry" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Differential geometry"; • carry out scientific work under supervision in the area "Differential geometry".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in differential geometry (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Differential geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4113
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5714: Special course in algebraic topology**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Algebraic topology" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Algebraic topology"; • carry out scientific work under supervision in the area "Algebraic topology".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in algebraic topology (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Algebraic topology".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4114
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5715: Special course in mathematical methods in physics**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Mathematical methods in physics" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Mathematical methods in physics"; • carry out scientific work under supervision in the area "Mathematical methods in physics".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in mathematical methods in physics (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Mathematical methods in physics".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4115
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5716: Special course in advanced Lie theory**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Advanced Lie theory" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Advanced Lie theory"; • carry out scientific work under supervision in the area "Advanced Lie theory".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in advanced Lie theory (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Advanced Lie theory".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4116 or B.Mat.4216
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5717: Special course in non-commutative geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Non-commutative geometry" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Non-commutative geometry"; • carry out scientific work under supervision in the area "Non-commutative geometry".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Lecture course (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Non-commutative geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4217
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5719: Special course in higher analysis**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Higher analysis" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Higher analysis"; • carry out scientific work under supervision in the area "Higher analysis".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in higher analysis (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Higher analysis".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4112 or M.Mat.5219
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5721: Special course in algebraic geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Algebraic geometry" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Algebraic geometry"; • carry out scientific work under supervision in the area "Algebraic geometry".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in algebraic geometry (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Algebraic geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4221
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5723: Special course in algebraic structures**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Algebraic structures" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Algebraic structures"; • carry out scientific work under supervision in the area "Algebraic structures".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in algebraic structures (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Algebraic structures".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4223
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5726: Special course in arithmetic geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Arithmetic geometry" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Arithmetic geometry"; • carry out scientific work under supervision in the area "Arithmetic geometry".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in arithmetic geometry (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Arithmetic geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4226
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5727: Special course in primes**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Primes" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Primes"; • carry out scientific work under supervision in the area "Primes".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in primes (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Primes".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4227
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5728: Special course in additive number theory**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Additive number theory" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Additive number theory"; • carry out scientific work under supervision in the area "Additive number theory".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in additive number theory (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Additive number theory".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4228
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5730: Special course in applied mathematics in the natural sciences**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Applied mathematics" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Applied mathematics"; • carry out scientific work under supervision in the area "Applied mathematics".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in applied mathematics in the natural sciences (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Applied mathematics".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4130
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5731: Special course in inverse problems**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Inverse problems" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Inverse problemss"; • carry out scientific work under supervision in the area "Inverse problems".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in inverse problems (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Inverse problems".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4331 or B.Mat.4335
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5732: Special course in approximation**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Approximation" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Approximation"; • carry out scientific work under supervision in the area "Approximation".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in approximation (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Approximation".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4139 or B.Mat.4336 or B.Mat.4339
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5733: Special course in numerics of partial differential equations**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Numerics of partial differential equations" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Numerics of partial differential equations"; • carry out scientific work under supervision in the area "Numerics of partial differential equations".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in numerics of partial differential equations (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Numerics of partial differential equations".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4233
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5734: Special course in optimisation**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Optimisation" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Optimisation"; • carry out scientific work under supervision in the area "Optimisation".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in optimisation (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Optimisation".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5240
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5738: Special course in discrete differential geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Discrete differential geometry" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Discrete differential geometry"; • carry out scientific work under supervision in the area "Discrete differential geometry".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in discrete differential geometry (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Discrete differential geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4138
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5739: Special course in scientific computing**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Scientific computing" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Scientific computing"; • carry out scientific work under supervision in the area "Scientific computing".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in scientific computing (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Scientific computing".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4130
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5740: Special course in statistical learning**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Statistical learning" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Statistical learning"; • carry out scientific work under supervision in the area "Statistical learning".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in statistical learning (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Statistical learning".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5140 or M.Mat.5144
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5741: Special course in applied stochastic processes**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Applied stochastic processes" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Applied stochastic processes"; • carry out scientific work under supervision in the area "Applied stochastic processes".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in applied stochastic processes (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Applied stochastic processes".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5141 or M.Mat.5142
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5742: Special course in applied stochastic processes**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Stochastic processes" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Stochastic processes"; • carry out scientific work under supervision in the area "Stochastic processes".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in stochastic processes (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Stochastic processes".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5141 or M.Mat.5142
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5744: Special course in mathematical statistics**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Mathematical statistics" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Mathematical statistics"; • carry out scientific work under supervision in the area "Mathematical statistics".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in mathematical statistics (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Mathematical statistics".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5140 or M.Mat.5144
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5747: Special course in statistical foundations of data science**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Statistical foundations of data science" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Statistical foundations of data science"; • carry out scientific work under supervision in the area "Statistical foundations of data science".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in statistical foundations of data science (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Statistical foundations of data science".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4247 or M.Mat.5140
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5748: Special course in stochastic processes and modelling**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** The successful completion of modules in the area "Stochastic processes and modelling" enables students to learn methods, concepts, theories and applications in this area with particular focus on expansion of knowledge in their field of specialisation as well as on advanced knowledge of methodical and thematic structure of this field. During the course students will be introduced to current research topics in this area and will be able to apply a rich repertoire of methods in this area (e. g. within the scope of a Master's thesis). The specific topics will be announced well in advance of the begin of the semester, e.g. in the Vorlesungskommentar of the Department of Mathematics. **Core skills:** After having successfully completed the module, students will be able to • conduct scholarly debates about problems of the area "Stochastic processes and modelling"; • carry out scientific work under supervision in the area "Stochastic processes and modelling".	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Special course in stochastic processes and modelling (Lecture)	2 WLH
Examination: Oral examination (approx. 20 minutes)	3 C

Examination requirements: Proof of the acquisition of further special skills and the mastery of advanced competencies in the area "Stochastic processes and modelling".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4247 or M.Mat.5140
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

Additional notes and regulations: **Instructor:** Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5913: Oberseminar on differential geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Differential geometry" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Differential geometry" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on differential geometry	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5913.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Differential geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4113
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5914: Oberseminar on algebraic topology**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Algebraic topology" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Algebraic topology" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on algebraic topology	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5914.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Algebraic topology".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4114
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5915: Oberseminar on mathematical methods in physics**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Mathematical methods in physics" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Mathematical methods in physics" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on mathematical methods in physics	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5915.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Mathematical methods in physics".	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5916: Oberseminar on Lie theory**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Advanced Lie theory" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Advanced Lie theory" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on Lie theory	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5916.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Advanced Lie theory".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4116 or B.Mat.4216
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5917: Oberseminar on non-commutative geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Non-commutative geometry" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Non-commutative geometry" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on non-commutative geometry	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5917.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Non-commutative geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4217
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1 - 4
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5919: Oberseminar on higher analysis**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Higher analysis" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Higher analysis" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on higher analysis	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5919.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Higher analysis".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4112 or M.Mat.5219
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: once a year	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5921: Oberseminar on algebraic geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Algebraic geometry" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Algebraic geometry" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on algebraic geometry	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5921.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Algebraic geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4221
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5923: Oberseminar on algebraic geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Algebraic geometry" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Algebraic geometry" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on algebraic geometry	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5923.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Algebraic geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4223
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5926: Oberseminar on arithmetic geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Arithmetic geometry" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Arithmetic geometry" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on arithmetic geometry	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5926.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Arithmetic geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4226
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5927: Oberseminar on primes**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Primes" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Primes" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on primes	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5927.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Primes".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4227
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5928: Oberseminar on additive number theory**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Additive number theory" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Additive number theory" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on additive number theory	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5928.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Additive number theory".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4228
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Mathematical Institute

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5930: Oberseminar on applied mathematics in the natural sciences**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Applied mathematics" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Applied mathematics" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on applied mathematics in the natural sciences	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5930.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Applied mathematics".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4130
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5931: Oberseminar on inverse problems**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Inverse problems" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Inverse problems" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on inverse problems	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5931.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Inverse problems".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4231
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5932: Oberseminar on approximation**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Approximation" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Approximation" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on approximation	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5932.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Approximation".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4139 or B.Mat.4336 or B.Mat.4339
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5933: Oberseminar on numerics of partial differential equations**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Numerics of partial differential equations" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Numerics of partial differential equations" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on numerics of partial differential equations	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5933.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Numerics of partial differential equations".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4233
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5934: Oberseminar on optimisation**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Optimisation" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Optimisation" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on optimisation	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5934.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Optimisation".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5240
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5938: Oberseminar on discrete differential geometry**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Discrete differential geometry" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Discrete differential geometry" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on discrete differential geometry	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5938.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Discrete differential geometry".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4238
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5939: Oberseminar on scientific computing**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Scientific computing" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Scientific computing" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on scientific computing	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5939.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Scientific computing".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4130
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Numerical and Applied Mathematics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5940: Oberseminar on statistical learning**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Statistical learning" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles; • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Statistical learning" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on statistical learning	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5940.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Statistical learning".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5140 or M.Mat.5144
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5941: Oberseminar on applied stochastic processes**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Applied stochastic processes" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Applied stochastic processes" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on applied stochastic processes	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5941.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Applied stochastic processes".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5141 or M.Mat.5142
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5942: Oberseminar on stochastic processes**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Stochastic processes" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Stochastic processes" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on stochastic processes	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5942.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Stochastic processes".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5141 or M.Mat.5142
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5944: Oberseminar on mathematical statistics**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Mathematical statistics" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Mathematical statistics" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on mathematical statistics	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5944.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Mathematical statistics".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4247 or M.Mat.5140
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5947: Oberseminar on statistical data science**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Statistical data science" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Statistical data science" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on statistical data science	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5947.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Statistical data science".	

Admission requirements: none	**Recommended previous knowledge:** B.Mat.4247 or M.Mat.5140
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Mat.5948: Oberseminar on stochastic processes and modelling**	3 C 2 WLH

Learning outcome, core skills: **Learning outcome:** In this course, students will learn to explore a complex topic in the area "Stochastic processes and modelling" independently and prepare it for a presentation. Students will be introduced to current research topics and are enabled to carry out independent contributions to research (e. g. within the scope of a Master's thesis). They learn to • independently formulate mathematical problems; • describe appropriate solution strategies; • communicate solution ideas and obstacles • review other students' work and provide constructive feedback as part of the academic peerreview process. **Core skills:** After having successfully completed the module, students will be able to • apply a rich repertoire of methods in their field of specialisation; • independently study on recent research results on the basis of recent research literature; • present a mathematical topic of current research interest in the area "Stochastic processes and modelling" in a talk; • conduct scholarly debates with reference to current research.	**Workload:** Attendance time: 28 h Self-study time: 62 h

Course: Oberseminar on stochastic processes and modelling	2 WLH
Examination: Oral Presentation (approx. 75 minutes) **Examination prerequisites:** M.Mat.5948.Sem: Participation in the Oberseminar	3 C

Examination requirements: Autonomous permeation and presentation of complex mathematical issues of current research literature in the area "Stochastic processes and modelling".	

Admission requirements: none	**Recommended previous knowledge:** M.Mat.5141 or M.Mat.5142
Language: English	**Person responsible for module:** Dean of studies mathematics
Course frequency: not specified	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4; Promotion: 1 - 6
Maximum number of students: not limited	

nicht-amtliche Fassung

Additional notes and regulations:
Instructor: Lecturers at the Institute of Mathematical Stochastics

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul M.Phi.101: Ausgewählte Themen der Theoretischen Philosophie** *English title: Selected Topics in Theoretical Philosophy*	9 C 4 SWS

Lernziele/Kompetenzen: Das Wahlpflichtmodul dient der Erweiterung der Kenntnisse und Fähigkeiten in einem Wahlbereich der Philosophie. Im 42-C-Master-Fach wird hier ein Schwerpunkt mit vertieften Kenntnissen ausgebildet. Im 78-C-Master-Fach sollen ergänzende Themen studiert werden, die nicht im Bereich des zu wählenden Studienschwerpunktes (s. Module 104-107) liegen. Die Studierenden besitzen vermehrte Kenntnis von Theorieansätzen und umfassendere Problemperspektiven auf Gebieten der Theoretischen Philosophie. Sie kennen unterschiedliche Methoden und Terminologien, können Positionen und Problemstellungen in größere Zusammenhänge einordnen, mit anderen Positionen vergleichen und ihre Relevanz und Leistungsfähigkeit beurteilen. Z.B. können erkenntnistheoretische Ansätze durch zusätzliche Kenntnisse aus der Sprachphilosophie, der Ontologie oder der Philosophie des Geistes adäquater eingeschätzt werden und umgekehrt.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 214 Stunden

Lehrveranstaltung: Vorlesung für Fortgeschrittene (= nicht Einführungskurs), Seminar oder Hauptseminar zu einem Thema der theoretischen Philosophie	2 SWS
Lehrveranstaltung: Seminar oder Hauptseminar zu einem Thema der theoretischen Philosophie	2 SWS

Von den folgenden Prüfungen ist genau eine erfolgreich zu absolvieren:	
Prüfung: Hausarbeit (max. 15 Seiten) **Prüfungsvorleistungen:** Eine kleine Leistung mindestens in Textform (max. 3 Seiten) **Prüfungsanforderungen:** Kenntnisse wichtiger Positionen der Sprachphilosophie, Erkenntnistheorie, Philosophie des Geistes, Wissenschaftsphilosophie oder Metaphysik; Fähigkeit, philosophische Probleme in diesen Bereichen zu behandeln und Lösungsvorschläge unter sachgerechter Abwägung von Argumenten zu diskutieren.	7 C
Prüfung: Mündlich (ca. 30 Minuten) **Prüfungsvorleistungen:** Eine kleine Leistung mindestens in Textform (max. 3 Seiten) **Prüfungsanforderungen:** Kenntnisse wichtiger Positionen der Sprachphilosophie, Erkenntnistheorie, Philosophie des Geistes, Wissenschaftsphilosophie oder Metaphysik; Fähigkeit, philosophische Probleme in diesen Bereichen zu behandeln und Lösungsvorschläge unter sachgerechter Abwägung von Argumenten zu diskutieren.	7 C

Die folgende Prüfung ist erfolgreich zu absolvieren:	
Prüfung: Eine kleine Leistung mindestens in Textform (max. 3 Seiten), unbenotet	2 C

nichtamtliche Fassung

Prüfungsanforderungen: Fähigkeit, sich mit wichtigen Positionen der Sprachphilosophie, Erkenntnistheorie, Philosophie des Geistes, Wissenschaftsphilosophie oder Metaphysik auseinanderzusetzen und in kurzer schriftlicher Form einzelne Fragen, Probleme oder Lösungsvorschläge argumentativ verständlich darzulegen. Bei der kleinen Leistung kann es sich um ein Protokoll, ein Handout zu einem Referat, die Bearbeitung von Aufgaben oder Fragen zur Textvor- oder Nachbereitung, einen kurzen Essay oder Vergleichbares (je nach Arbeitsform der betreffenden Veranstaltung) handeln.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Catrin Misselhorn
Angebotshäufigkeit: jedes Semester	**Dauer:** 1-2 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 3
Maximale Studierendenzahl: 25	

Bemerkungen:
Von den zwei Lehrveranstaltungen darf nur eine in Form einer Vorlesung besucht werden, die andere muss ein Seminar oder Hauptseminar sein.
Es kann gewählt werden, in welcher Veranstaltung die "große" Prüfung und in welcher die kleine Leistung abgelegt wird.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul M.Phi.102: Ausgewählte Themen der Praktischen Philosophie** *English title: Selected Topics in Practical Philosophy*	9 C 4 SWS

Lernziele/Kompetenzen: Das Wahlpflichtmodul dient der Erweiterung der Kenntnisse und Fähigkeiten in einem Wahlbereich der Philosophie. Im 42-C-Master-Fach wird hier ein Schwerpunkt mit vertieften Kenntnissen ausgebildet. Im 78-C-Master-Fach sollen ergänzende Themen studiert werden, die nicht im Bereich des zu wählenden Studienschwerpunktes (s. Module 104-107) liegen. Die Studierenden besitzen erweiterte Kenntnisse von Theorieansätzen in mehreren Bereichen der Praktischen Philosophie. Sie können ethische und politiktheoretische Positionen und Problemstellungen in größere Zusammenhänge einordnen, unterschiedliche Ansätze vergleichen und ihre Relevanz und Leistungsfähigkeit beurteilen. Im Bereich der Ethik wird z.B. die Kenntnis individualethischer Positionen durch solche der Sozialethik oder der politischen Philosophie ergänzt, durch Ansätze der Metaethik in der Grundlagendimension vertieft oder durch Ansätze der Angewandten Ethik in der Anwendungsdimension konkretisiert.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 214 Stunden

Lehrveranstaltung: Vorlesung für Fortgeschrittene (= nicht Einführungskurs), Seminar oder Hauptseminar zu einem Thema der praktischen Philosophie	2 SWS
Lehrveranstaltung: Seminar oder Hauptseminar zu einem Thema der praktischen Philosophie	2 SWS

Von den folgenden Prüfungen ist genau eine erfolgreich zu absolvieren:	
Prüfung: Hausarbeit (max. 15 Seiten) **Prüfungsvorleistungen:** Eine kleine Leistung mindestens in Textform (max. 3 Seiten) **Prüfungsanforderungen:** Kenntnisse wichtiger Positionen der Theoretischen oder der Angewandten Ethik oder der Politischen Philosophie; Fähigkeit, philosophische Probleme in diesen Bereichen zu behandeln und Lösungsvorschläge unter sachgerechter Abwägung von Argumenten zu diskutieren.	7 C
Prüfung: Mündlich (ca. 30 Minuten) **Prüfungsvorleistungen:** Eine kleine Leistung mindestens in Textform (max. 3 Seiten) **Prüfungsanforderungen:** Kenntnisse wichtiger Positionen der Theoretischen oder der Angewandten Ethik oder der Politischen Philosophie; Fähigkeit, philosophische Probleme in diesen Bereichen zu behandeln und Lösungsvorschläge unter sachgerechter Abwägung von Argumenten zu diskutieren.	7 C

Die folgende Prüfung ist erfolgreich zu absolvieren:	
Prüfung: Eine kleine Leistung mindestens in Textform (max. 3 Seiten), unbenotet **Prüfungsanforderungen:**	2 C

nicht-amtliche Fassung

Fähigkeit, sich mit wichtigen Positionen der Theoretischen Ethik, der Angewandten Ethik oder der Politischen Philosophie auseinanderzusetzen und in kurzer schriftlicher Form einzelne Fragen, Probleme oder Lösungsvorschläge argumentativ verständlich darzulegen. Bei der kleinen Leistung kann es sich um ein Protokoll, ein Handout zu einem Referat, die Bearbeitung von Aufgaben oder Fragen zur Textvor- oder Nachbereitung, einen kurzen Essay oder Vergleichbares (je nach Arbeitsform der betreffenden Veranstaltung) handeln.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Holmer Steinfath
Angebotshäufigkeit: jedes Semester	**Dauer:** 1-2 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 3
Maximale Studierendenzahl: 25	

Bemerkungen:
Von den zwei Lehrveranstaltungen darf nur eine in Form einer Vorlesung besucht werden, die andere muss ein Seminar oder Hauptseminar sein.
Es kann gewählt werden, in welcher Veranstaltung die "große" Prüfung und in welcher die kleine Leistung abgelegt wird.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul M.Phi.103: Ausgewählte Themen der Geschichte der Philosophie** *English title: Selected Topics in History of Philosophy*	9 C 4 SWS

Lernziele/Kompetenzen: Das Wahlpflichtmodul dient der Erweiterung der Kenntnisse und Fähigkeiten in einem Wahlbereich der Philosophie. Im 42-C-Master-Fach wird hier ein Schwerpunktbereich mit vertieften Kenntnissen ausgebildet. Im 78-C-Master-Fach sollen ergänzende Themen studiert werden, die nicht im Bereich des zu wählenden Studienschwerpunktes (s. Module 104-107) liegen. Die Studierenden kennen verschiedene philosophiegeschichtliche Theorieansätze und die wesentlichen Diskussionszusammenhänge, in denen sie stehen. Klassische Primärtexte können unter Einbeziehung ihrer historischen und systematischen Kontexte sachgemäß interpretiert und analysiert werden. Philosophische Positionen können entwicklungsgeschichtlich aufeinander bezogen, fortschrittliche und wiederkehrende Elemente darin erkannt und Diskussionsbeiträge oder Theorieentwürfe nach ihrer theoriegeschichtlichen Bedeutung eingeschätzt werden.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 214 Stunden

Lehrveranstaltung: Vorlesung für Fortgeschrittene (= nicht Einführungskurs), Seminar oder Hauptseminar zu einem Thema der Geschichte der Philosophie	2 SWS
Lehrveranstaltung: Seminar oder Hauptseminar zu einem Thema der Geschichte der Philosophie	2 SWS

Von den folgenden Prüfungen ist genau eine erfolgreich zu absolvieren:	
Prüfung: Hausarbeit (max. 15 Seiten) **Prüfungsvorleistungen:** Eine kleine Leistung mindestens in Textform (max. 3 Seiten) **Prüfungsanforderungen:** Kenntnisse wichtiger philosophiegeschichtlicher Werke und Positionen; Fähigkeit, klassische Texte sachgemäß zu interpretieren, in ihre historischen und systematischen Kontexte einzuordnen und ihre theoretische Leistungsfähigkeit zu beurteilen.	7 C
Prüfung: Mündlich (ca. 30 Minuten) **Prüfungsvorleistungen:** Eine kleine Leistung mindestens in Textform (max. 3 Seiten) **Prüfungsanforderungen:** Kenntnisse wichtiger philosophiegeschichtlicher Werke und Positionen; Fähigkeit, klassische Texte sachgemäß zu interpretieren, in ihre historischen und systematischen Kontexte einzuordnen und ihre theoretische Leistungsfähigkeit zu beurteilen.	7 C

Die folgende Prüfung ist erfolgreich zu absolvieren:	
Prüfung: Eine kleine Leistung mindestens in Textform (max. 3 Seiten), unbenotet **Prüfungsanforderungen:** Fähigkeit, sich mit wichtigen philosophiegeschichtlichen Werken und Positionen auseinanderzusetzen, sie sachgemäß zu interpretieren sowie in ihren historischen und	2 C

nichtamtliche Fassung

systematischen Kontexten einzuordnen. Fähigkeit, in kurzer schriftlicher Form einzelne Fragen, Probleme oder Lösungsvorschläge argumentativ verständlich darzulegen. Bei der kleinen Leistung kann es sich um ein Protokoll, ein Handout zu einem Referat, die Bearbeitung von Aufgaben oder Fragen zur Textvor- oder Nachbereitung, einen kurzen Essay oder Vergleichbares (je nach Arbeitsform der betreffenden Veranstaltung) handeln.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** keine
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Sebastian Bender
Angebotshäufigkeit: jedes Semester	**Dauer:** 1-2 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 3
Maximale Studierendenzahl: 25	

Bemerkungen:
Von den zwei Lehrveranstaltungen darf nur eine in Form einer Vorlesung besucht werden, die andere muss ein Seminar oder Hauptseminar sein.
Es kann gewählt werden, in welcher Veranstaltung die "große" Prüfung und in welcher die kleine Leistung abgelegt wird.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.409: Research Seminar Astro-/Geophysics**	4 C 2 WLH

Learning outcome, core skills: After successful completion of the module, students should present complex lines of reasoning and evaluate own and others' presentations in critical discussion.	**Workload:** Attendance time: 28 h Self-study time: 92 h

Course: Research Seminar Astro-/Geophysics	
Examination: Lecture(4 weeks preparation time) (approx. 60 minutes) **Examination requirements:** Preparation of complex topics for presentation and scientific discussions.	4 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Dean of Studies of the Faculty of Physics
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.410: Research Seminar Biophysics/Physics of Complex Systems**	4 C 2 WLH

Learning outcome, core skills:	**Workload:**
After successful completion of the module, students should present complex lines of reasoning and evaluate own and others' presentations in critical discussion.	Attendance time: 28 h Self-study time: 92 h

Course: Research Seminar Biophysics/Physics of Complex Systems	
Examination: Lecture(4 weeks preparation time) (approx. 60 minutes) **Examination prerequisites:** active partizipation **Examination requirements:** Preparation of complex topics for presentation and scientific discussions.	4 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Dean of Studies of the Faculty of Physics
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.411: Research Seminar Solid State/Materials Physics**	4 C 2 WLH

Learning outcome, core skills: After successful completion of the module, students should present complex lines of reasoning and evaluate own and others' presentations in critical discussion.	**Workload:** Attendance time: 28 h Self-study time: 92 h

Course: Research Seminar Solid State/Materials Physics	
Examination: Lecture(4 weeks preparation time) (approx. 60 minutes) **Examination prerequisites:** active participation **Examination requirements:** Preparation of complex topics for presentation and scientific discussions.	4 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Dean of Studies of the Faculty of Physics
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.412: Research Seminar Particle Physics**	4 C 2 WLH

Learning outcome, core skills: After successful completion of the module, students should present complex lines of reasoning and evaluate own and others' presentations in critical discussion.	**Workload:** Attendance time: 28 h Self-study time: 92 h

Course: Research Seminar Particle Physics	
Examination: Lecture(4 weeks preparation time) (approx. 60 minutes) **Examination prerequisites:** active participation **Examination requirements:** Preparation of complex topics for presentation and scientific discussions.	4 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Dean of Studies of the Faculty of Physics
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.413: General Seminar**	4 C 2 WLH

Learning outcome, core skills:	**Workload:**
After successful completion of the module, students should be able to develop the content of scientific publications (usually in English) independently and present it to a wide audience. They should be also able to evaluate it criticaly.	Attendance time: 28 h Self-study time: 92 h

Course: General Seminar	
Examination: Lecture(4 weeks preparation time) (approx. 60 minutes) **Examination prerequisites:** active participation **Examination requirements:** Use of presentation media, presentation of complex issues in front of expert and non-expert audiences, communication and discussion skills, critical awareness and expressiveness.	4 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Dean of Studies of the Faculty of Physics
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: 150	

Additional notes and regulations:
We recomend to chose the seminar not of the own research focus.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.415: Research Seminar Theoretical Physics**	4 C 2 WLH

Learning outcome, core skills: After successful completion of the module, students are able to present complex lines of reasoning and evaluate own and others' presentations in critical discussion.	**Workload:** Attendance time: 28 h Self-study time: 92 h

Course: Research Seminar Theoretical Physics	
Examination: Lecture(4 weeks preparation time) (approx. 60 minutes) **Examination prerequisites:** active participation **Examination requirements:** Preparation of complex topics for presentation and scientific discussions.	4 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Laura Covi
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.5401: Advanced Statistical Physics**	6 C 6 WLH

Learning outcome, core skills: After successful completion of the module students will be familiar with the core concepts and mathematical methods of statistical physics both in and out of equilibrium. Students will be able to model and analyse interacting or fluctuation-dominated systems using methods from statistical physics, and be aware of a range of application domains including soft matter, biophysics and network dynamics.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Advanced Statistical Physics (Lecture)	4 WLH
Examination: written (120 min.) or oral exam (approx. 30 min.) **Examination prerequisites:** At least 50% of the homework of the excercises have to be solved successfully.	6 C

Course: Advanced Statistical Physics (Exercise)	2 WLH

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of statistical mechanics of equilibrium
Language: English	**Person responsible for module:** Prof. Dr. Matthias Krüger
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1
Maximum number of students: 80	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.541: Advanced Topics in Classical Theoretical Physics I**	6 C 6 WLH

Learning outcome, core skills: **Learning outcome:** After successful completion of the modul students will be able to understand and apply advanced concepts of Classical Theoretical Physics to current research topics. **Core skills:** Students will be able to describe and discuss state-of-the-art problems of Classical Theoretical Physics.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: A Course (6 C) in the field of Classical Theoretical Physics *Course frequency:* each semester	
Examination: Written examination (120 Min.) or oral examination approx. 30 Min.) or talk (approx. 30 Min.),2 weeks preparation time **Examination requirements:** Advanced techniques and models in Classical Theoretical Physics	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Peter Kurt Sollich
Course frequency: every 4th semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 4
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.542: Advanced Topics in Classical Theoretical Physics II**	6 C 4 WLH

Learning outcome, core skills: After successful completion of the modul students will be familiar with advanced concepts of Classical Theoretical Physics	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: A Course (3 C) in the field of Classical Theoretical Physics *Course frequency:* each semester	2 WLH
Examination: Written exam (120 min) or oral exam (ca. 30 min) or talk (ca. 30 min), 2 weeks preparation time **Examination requirements:** Advanced techniques and models in Classical Theoretical Physics	3 C

Course: A Course (3 C) in the field of Classical Theoretical Physics *Course frequency:* each semester	2 WLH
Examination: Written exam (120 min) or oral exam (ca. 30 min) or talk (ca. 30 min), 2 weeks preparation time **Examination requirements:** Advanced techniques and models in Classical Theoretical Physics	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Peter Kurt Sollich
Course frequency: every 4th semester	**Duration:** 2 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 4
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.543: Advanced Topics in Theoretical Quantum Physics I**	6 C 6 WLH

Learning outcome, core skills: **Learning outcome:** After successful completion of the modul students will be able to understand and apply advanced concepts of Theoretical Quantum Physics to current research topics. **Core skills:** Students will be able to describe and discuss state-of-the-art problems of Theoretical Quantum Physics .	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: A Course (6 C) in the field of Theoretical Quantum Physics *Course frequency:* each semester	
Examination: Written examination (120 Min.) or oral examination approx. 30 Min.) or talk (approx. 30 Min.),2 weeks preparation time **Examination requirements:** Advanced Advanced techniques and models in Theoretical Quantum Physics	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Stefan Kehrein
Course frequency: every 4th semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 4
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.544: Advanced Topics in Theoretical Quantum Physics II**	6 C 4 WLH

Learning outcome, core skills: After successful completion of the modul students will be familiar with advanced concepts of Theoretical Quantum Physics	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: A Course (3 C) in the field of Theoretical Quantum Physics *Course frequency:* each semester	2 WLH
Examination: Written exam (120 min) or oral exam (ca. 30 min) or talk (ca. 30 min), 2 weeks preparation time **Examination requirements:** Advanced techniques and models in Theoretical Quantum Physics	3 C

Course: A Course (3 C) in the field of Theoretical Quantum Physics *Course frequency:* each semester	2 WLH
Examination: Written exam (120 min) or oral exam (ca. 30 min) or talk (ca. 30 min), 2 weeks preparation time **Examination requirements:** Advanced techniques and models in Theoretical Quantum Physics	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Prof. Dr. Steffen Schumann
Course frequency: every 4th semester	**Duration:** 2 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 4
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.551: Advanced Topics in Astro-/Geophysics I**	6 C 6 WLH

Learning outcome, core skills: **Learning outcome:** After successful completion of the modul students will be able to understand and apply advanced concepts of astro- and geophysics to current research topics. **Core skills:** Students will be able to describe and discuss state-of-the-art problems of astro-/ geophysics.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: Course (6 C) in the field of Astro- or Geophysics	
Examination: Written exam (120 min) or oral exam (ca. 30 min) or talk (ca. 30 min), 2 weeks preparation time **Examination requirements:** Advanced experimental techniques or theoretical models in astro- or geophysics	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Dean of Studies of the Faculty of Physics
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 4
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.552: Advanced Topics in Astro-/Geophysics II**	6 C 4 WLH

Learning outcome, core skills: After successful completion of the modul students should be familiar with advanced concepts of astrophysics and Geophysics.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Advanced Topics in Astro-/Geophysics IIa	2 WLH
Examination: Written examination (120 Min.) or oral examination (approx. 30 Min.) or talk (approx. 30 Min.), 2 weeks preparation time **Examination requirements:** Advanced experimental techniques or theoretical models in astro- or geophysics	3 C

Course: Advanced Topics in Astro-/Geophysics IIb	2 WLH
Examination: Written examination (120 Min.) or oral examination (approx. 30 Min.) or talk (approx. 30 Min.), 2 weeks preparation time **Examination requirements:** Advanced experimental techniques or theoretical models in astro- or geophysics	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: German, English	**Person responsible for module:** StudiendekanIn der Fakultät für Physik
Course frequency: each semester	**Duration:** 2 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 4
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.5601: Seminar Computational Neuroscience/Neuro-informatics**	4 C 2 WLH

Learning outcome, core skills: After successful completion of the module, students ... • have deepened their knowledge of computational neuroscience / neuroinformatics by an independent elaboration of a topic; • have learned methods of presentation of topics from computer science; • are able to deal with (English-language) literature; • are able to present an informatic topic; • are able to lead a scientific discussion.	**Workload:** Attendance time: 28 h Self-study time: 92 h

Course: Seminar (Seminar) *Course frequency:* each semester	
Examination: Presentation (approx. 45 Min.) with written report (max. 7 S.) **Examination prerequisites:** regular participation **Examination requirements:** Independent preparation and presentation of research-related topics from the area of computational neuroscience / neuroinformatics as well as biophysics of neuronal systems.	4 C

Admission requirements: none	**Recommended previous knowledge:** B.Phy.5614
Language: English	**Person responsible for module:** Prof. Dr. Florentin Andreas Wörgötter
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** Master: 1 - 3
Maximum number of students: 14	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.571: Advanced Topics in Solid State/Materials Physics I**	6 C 6 WLH

Learning outcome, core skills: **Learning outcome:** After successful completion of the modul students will be able to understand and apply advanced concepts of Solid State/Materials Physics to current research topics. **Core skills:** Students will be able to describe and discuss state-of-the-art problems of Solid State/ Materials Physics.	**Workload:** Attendance time: 84 h Self-study time: 96 h

Course: A course (6 C) in the field of Solid State/Materials Physics	
Examination: Written exam (120 min) or oral exam (ca. 30 min) or talk (ca. 30 min), 2 weeks preparation time **Examination requirements:** Advanced experimental techniques or theoretical models in Solid State/Materials Physics	6 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Dean of Studies
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** Master: 1 - 4
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.Phy.572: Advanced Topics in Solid State/Materials Physics II**	6 C 4 WLH

Learning outcome, core skills: After successful completion of the modul students should be familiar with advanced concepts of Solid State/Materials Physics.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Course (3 C) in the field of Solid State/Materials Physics	2 WLH
Examination: Written exam (120 min) or oral exam (ca. 30 min) or talk (ca. 30 min), 2 weeks preparation time **Examination requirements:** Advanced experimental techniques or theoretical models in Solid State/Materials Physics	3 C

Course: Course (3 C) in the field of Solid State/Materials Physics	2 WLH

Examination: Written exam (120 min) or oral exam (ca. 30 min) or talk (ca. 30 min), 2 weeks preparation time **Examination requirements:** Advanced experimental techniques or theoretical models in Solid State/Materials Physics	3 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English, German	**Person responsible for module:** Dean of Studies
Course frequency: each semester	**Duration:** 2 semester[s]
Number of repeat examinations permitted: three times	**Recommended semester:** 1 - 4
Maximum number of students: 40	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul M.WIWI-BWL.0002: Rechnungslegung nach IFRS** *English title: IFRS Financial Reporting*	6 C 4 SWS

Lernziele/Kompetenzen: Gegenstand der Veranstaltung sind die Ziele, Instrumente, Prinzipien und Einzelregelungen der Rechnungslegung nach den International Financial Reporting Standards (IFRS). Mit erfolgreicher Teilnahme am Moduls sind die Studierenden in der Lage die kennengelernten Regelungen einzuordnen, kritisch zu Hinterfragen und anzuwenden. Darüber hinaus können die Teilnehmer unterschiedliche Sachverhalte in Bilanzierungs- und Offenlegungsregelungen einordnen, diese kritisch würdigen und prinzipienorientierte Lösungen entwickeln.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Rechnungslegung nach IFRS (Vorlesung) *Inhalte*: I. Die „IFRS-Revolution“ II. Das Konzept der kapitalmarktorientierten Rechnungslegung III. Institutionelle Grundlagen IV. Rechnungslegungsprinzipien in den IFRS V. Bestandteile des Jahresabschlusses nach IFRS VI. Ansatz und Bewertung nach den IFRS	2 SWS
Lehrveranstaltung: Rechnungslegung nach IFRS (Übung) *Inhalte*: Im Rahmen der begleitenden Übung vertiefen und erweitern die Studierenden die in der Vorlesung erworbenen Kenntnisse und Fähigkeiten.	2 SWS
Prüfung: Klausur (90 Minuten)	6 C

Prüfungsanforderungen: • Darlegung eines übergreifenden Verständnisses grundlegender Fragestellungen der internationalen Rechnungslegung und des damit verbundenen institutionellen Rahmens, • Nachweis der Kenntnis zentraler Regelungen der Rechnungslegung nach IFRS und der Fähigkeit diese anzuwenden.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Grundkenntnisse der Buchführung sowie der Bilanzierung nach Handelsrecht und IFRS werden vorausgesetzt
Sprache: Deutsch	**Modulverantwortliche[r]:** N. N.
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit:	**Empfohlenes Fachsemester:**

nicht-amtliche Fassung

zweimalig	1 - 2
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul M.WIWI-BWL.0003: Unternehmensbesteuerung** *English title: Company Taxation*	6 C 4 SWS

Lernziele/Kompetenzen: Mit Abschluss haben die Studierenden folgende Kompetenzen erworben: • Sie können die steuerliche Behandlung von Kapitalgesellschaften und die Besonderheiten der Konzernbesteuerung erklären, • ausgewählte Problemstellungen der Besteuerung von Personenunternehmen und des Gesellschafterwechsels analysieren, • Steuerbelastungen in den genannten Bereichen quantifizieren und Optimierungsmöglichkeiten erarbeiten, • theoretisches Wissen auf praktische Fälle anwenden und • ausgewählte Themen des Steuerverfahrens, einschließlich der Abgabenordnung, verstehen und anwenden.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Unternehmensbesteuerung (Vorlesung) *Inhalte*: a. Aufgaben und Grundlagen der Betriebswirtschaftlichen Steuerlehre b. Die Ertragsbesteuerung der Unternehmen (Einkommen-, Körperschaft- und Gewerbesteuer) c. Rechtsformbesteuerung und Steuerplanung (Einzelunternehmen, Personengesellschaften, Kapitalgesellschaften, Rechtsformkombinationen, Konzernbesteuerung) d. Grundzüge des Steuerverfahrens	2 SWS
Lehrveranstaltung: Unternehmensbesteuerung (Übung) *Inhalte*: Im Rahmen der begleitenden Übung vertiefen, ergänzen und erweitern die Studierenden die in der Vorlesung erworbenen Kenntnisse und Fähigkeiten. Insbesondere werden mit den Studierenden Übungsfälle erarbeitet und diskutiert, mithilfe derer ein tieferes Verständnis für die praktische Anwendung der in der Vorlesung theoretisch vermittelten Inhalte geschaffen wird.	2 SWS
Prüfung: Klausur (60 Minuten)	6 C

Prüfungsanforderungen: Die Studierenden erbringen den Nachweis, dass sie die wirtschaftlichen Wirkungen der Besteuerung sowie grundlegende Steuerplanungsüberlegungen verstehen und auf praktische Sachverhalte anwenden können. Sie zeigen ihre Fähigkeit, grundlegende Kenntnisse der Besteuerung alternativer Rechtsformen zu erläutern und anzuwenden.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Grundkenntnisse im Bereich Unternehmenssteuern werden vorausgesetzt

nicht-amtliche Fassung

Sprache: Deutsch	**Modulverantwortliche[r]:** N. N.
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 2
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.WIWI-BWL.0004: Financial Risk Management**	6 C 4 WLH

Learning outcome, core skills: After a successful completion of the course students are able to: • understand and explain how risk management is related to other issues in corporate finance, • critically assess different motivations for corporate risk management, • understand and critically assess different risk measures and how they are applied in practice, • understand and explain how international risks can be managed and how the management of international risks is related to various economic parity conditions, • understand, analyze and critically apply measures and methods to manage interest rate risk, • understand, analyze and critically apply measures and methods to manage credit risk, • understand, analyze and critically apply hedging strategies for commodity price risk.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Financial Risk Management (Lecture) *Contents*: 1. Introduction 2. Risk Management: Motivation and Strategies 3. Managing Interest Rate Risk 4. Managing Credit Risk 5. Managing International Risks 6. Managing Commodity Price Risk Parts of the material covered by the lectures will be transmitted via recordings that students have to work through on their own. Parts of the contact hours during lectures will be used by the students to discuss open issues and to work on specific cases and applications of the main concepts.	2 WLH
Course: Financial Risk Management (Tutorial) *Contents*: In the accompanying practice sessions students deepen and broaden their knowledge from the lectures.	2 WLH
Examination: Written examination (60 minutes)	6 C

Examination requirements: • Demonstrate a profound knowledge of how risk management is related to other issues in corporate finance, • document an understanding of viable reasons for corporate risk management and how corporate risk management can create value, • demonstrate the ability to analyze and apply different risk measures,	

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• show a profound understanding of methods and techniques used to manage international risks, interest rate risk, credit risk, and commodity price risk.	

Admission requirements: none	**Recommended previous knowledge:** M.WIWI-BWL.0001 Sustainable Finance
Language: English	**Person responsible for module:** Prof. Dr. Olaf Korn
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2 - 3
Maximum number of students: not limited	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul M.WIWI-BWL.0006: Seminar in Finanzwirtschaft** *English title: Seminar in Finance*	6 C 2 SWS

Lernziele/Kompetenzen: Mit dem erfolgreichen Abschluss des Moduls haben die Studierenden folgende Kompetenzen erworben: • sie können komplexe und relevante finanzwirtschaftliche Forschungsfragen identifizieren und verfeinern, • sie können Lösungen für Forschungsfragen eigenständig erarbeiten, in den Kontext der bisherigen Forschung einordnen und diese Lösungen sowohl schriftlich als auch mündlich sachgerecht kommunizieren, • sie können von anderen erarbeiteten Lösungen für Forschungsfragen auf ihre zentralen Aspekte reduzieren und kritisch kommentieren, • sie können zu einer durch Referate angestoßenen Diskussion durch eigene qualifizierte Beiträge beitragen.	**Arbeitsaufwand:** Präsenzzeit: 28 Stunden Selbststudium: 152 Stunden

Lehrveranstaltung: Seminar in Finanzwirtschaft (Seminar) *Inhalte*: Inhalt des Seminars ist die Erarbeitung von Lösungen für übergreifende, komplexe finanzwirtschaftliche Probleme. Genaue Inhalte und Themen können von Semester zu Semester wechseln und werden zum Ende des vorangehenden Semesters bekannt gegeben.	2 SWS
Prüfung: Hausarbeit (max. 15 Seiten) mit Präsentation (ca. 20 Minuten) **Prüfungsvorleistungen:** Regelmäßige und aktive Teilnahme am Seminar.	6 C

Prüfungsanforderungen: • Nachweis der Fähigkeit, eine komplexe finanzwirtschaftliche Fragestellung zu identifizieren und zu strukturieren, • Nachweis der Fähigkeit, eigenständige Lösungen der finanzwirtschaftlichen Fragestellung zu entwickeln und sowie diese zu kommunizieren.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** M.WIWI-BWL.0001 Sustainable Finance
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Olaf Korn
Angebotshäufigkeit: jedes Sommersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 2 - 3
Maximale Studierendenzahl: 16	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.WIWI-BWL.0020: Risk Management and Solvency**	6 C 2 WLH

Learning outcome, core skills: • Knowledge and understanding of the functions and elements of a risk management system, of the risk potentials and its valuation of an insurance company, • knowledge of the legal requirements regarding risk management and solvency, especially Solvency II, • knowledge of the relevant techniques used in risk management of an insurance company (stress tests, ALM, Embedded Value, actuarial analysis, Value Based Management), • understanding of the relevant methods used in the balance sheet of an insurance company (HGB, IFRS, solvency balance sheet), • ability to develop simple task settings independently with regard to risk management and solvency.	**Workload:** Attendance time: 28 h Self-study time: 152 h

Course: Risk Management and Solvency (Lecture) *Contents*: • Role and components of a risk management system • Legal requirements: MaRisk, stress tests, actuarial reporting, market consistent valuation (IFRS) • Solvency requirements (Solvency I, Solvency II) • Value Based Management, Embedded Value, Asset Liability Management (ALM)	2 WLH
Examination: Written examination (120 minutes)	6 C

Examination requirements: • Document a knowledge and understanding of the functions and instruments of risk management and of the valuation of risk potentials, • demonstrate a knowledge and understanding of quantitative and qualitative requirements of the solvency regime, • demonstrate a knowledge and understanding of market consistent valuation within solvency, HGB,IFRS, • demonstrate the ability for simple calculations with regard to risk management and solvency.	

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Martin Balleer
Course frequency: every second semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 3
Maximum number of students: not limited	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Modul M.WIWI-BWL.0023: Performance Management** *English title: Performance Management*	6 C 4 SWS

Lernziele/Kompetenzen: Mit Abschluss haben die Studierenden die konzeptionellen Grundlagen der wesentlichen Kennzahlen im Bereich der wertorientierten Unternehmensführung kennengelernt. Durch die Kombination von wissenschaftlichen Kenntnissen und praxisnahen Inhalten haben die Studierenden Kenntnis über die positiven und negativen Wirkungen von Instrumenten des Value Based Managements erlangt. Des Weiteren haben die Studierenden Kenntnisse über Ansätze zur Messung von Nachhaltigkeit in der Unternehmenssteuerung erworben.	**Arbeitsaufwand:** Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden

Lehrveranstaltung: Performance Management (Vorlesung) *Inhalte*: Die Veranstaltung befasst sich mit wesentlichen Aspekten des Performancemanagements unternehmerischer Aktivitäten mit dem Fokus auf einer wertorientierten Perspektive ergänzt durch die zunehmend wichtiger werdende Nachhaltigkeitsperspektive. Die Veranstaltung ist in fünf Hauptkapitel gegliedert. Zuerst werden Grundlagen des Management Accounting und der wertorientierten Unternehmensführung diskutiert. Auf dieser Basis werden Ansätze für die kapitalmarkt- und bilanzorientierte Performancemessung vorgestellt und deren Grenzen aufgezeigt. Darauffolgend werden die konzeptionellen Grundlagen eines ganzheitlichen Value Based Managements und die entsprechenden Dimensionen einer konsistenten Implementierung vorgestellt. Ein weiterer Fokus wird auf die Messung der Nachhaltigkeit im Unternehmen gelegt. Abschließend erfolgt eine Einbettung der vorgestellten Ansätze in die Ausgestaltung von Performance Management Systemen.	2 SWS
Lehrveranstaltung: Performance Management (Übung) *Inhalte*: Die Übung dient dazu die Konzepte der wertorientierten Unternehmensführung auf praktische Fragestellungen anzuwenden, indem Übungsaufgaben gelöst und die Inhalte an praktischen Beispielen diskutiert werden. Im Sinne eines breiteren Einstiegs beginnt die Übung mit einer Abgrenzung der verschiedenen Stakeholdergruppen, um sich im Folgenden stärker auf die Shareholder-orientierten Inhalte der Unternehmensbewertung und deren Eignung für ein wertorientiertes Steuerungssystem zu diskutieren. Daraufhin werden traditionelle Kennzahlenkonzepte vorgestellt und mögliche Nachteile aufgezeigt. Auf dieser Basis werden die methodischen Grundlagen von wertorientierten Kennzahlen erörtert und deren Potentiale aufgezeigt. Den Gedanken der Stakeholder Orientierung wieder aufnehmend werden die Eigenschaften von Nachhaltigkeitskennzahlen genauer betrachtet. Zum Abschluss wird die Eignung der ganzheitlichen Implementierung von Value Based Management diskutiert.	2 SWS
Prüfung: Klausur (60 Minuten)	6 C

Prüfungsanforderungen:	

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Nachweis von Kenntnissen der Konzepte, Dimensionen und Grenzen der Kapitalmarkt- und Bilanz-orientierten Performancemessung, des Value-Based Managements sowie von Nachhaltigkeitskennzahlen durch Nennen, Erläutern und Berechnen in entsprechenden Aufgaben. Außerdem das Anwenden des erworbenen Wissens auf praxisnahe Aufgabenstellungen.	

Zugangsvoraussetzungen: keine	**Empfohlene Vorkenntnisse:** Grundkenntnisse in Controlling
Sprache: Deutsch	**Modulverantwortliche[r]:** Prof. Dr. Michael Wolff
Angebotshäufigkeit: jedes Wintersemester	**Dauer:** 1 Semester
Wiederholbarkeit: zweimalig	**Empfohlenes Fachsemester:** 1 - 2
Maximale Studierendenzahl: nicht begrenzt	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.WIWI-BWL.0133: Banking Supervision**	6 C 2 WLH

Learning outcome, core skills: After a successful completion of the course students are able to: • understand and explain how banking supervision has developed over time and how it differs across jurisdictions, • understand, explain and critically apply standard measures and methods of banking supervision, • understand and explain the Euro area banking union, • understand, explain and critically apply key concepts in banking regulation, • understand, explain and critically apply key measures and methods to assess the risks of financial institutions, • understand and explain micro-and macroprudential supervision and their differences.	**Workload:** Attendance time: 28 h Self-study time: 152 h

Course: Banking Supervision (Lecture) *Contents*: 1. Introduction (e.g. banking structure) 2. Foundations of banking supervision • Historical developments • Comparison across different jurisdictions 3. Banking Union – SSM 4. Banking Regulation • Basel III, CRDIV/CRR • ASFR model by Gordy • Further requirements on banks 5. SSM Guide on banking supervision • How is banking supervision applied? 6. Risk Analysis • Stress testing • Bank Rating 7. Microprudential versus macroprudential supervision	2 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: • Document an understanding how banking supervision has developed over time and how it differs across jurisdictions • Demonstrate a profound knowledge of standard measures and methods of banking supervision • Show an understanding of the Euro area banking union • Demonstrate the ability to explain and to some extent to apply key concepts in banking regulation	

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• Document the knowledge to apply key measures and methods to assess the risks of financial institutions and to interpret the obtained results appropriately • Document an understanding of micro-and macroprudential supervision and their differences	

Admission requirements: none	**Recommended previous knowledge:** M.WIWI-BWL.0001 Sustainable Finance M.WIWI-BWL.0004 Financial Risk Management
Language: English	**Person responsible for module:** Dr. Philipp Koziol
Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 3
Maximum number of students: not limited	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.WIWI-BWL.0134: Panel Data Analysis in Marketing**	6 C 2 WLH

Learning outcome, core skills: Panel data refers to observations from different individuals or units (consumers, stores, products, etc.) over several time periods (days, weeks, months, etc.). After successful attendance the students will understand the methodological principles of panel data analysis, especially in the context of consumer behavior and marketing-mix models. Further, they will be able to conduct own panel data analyses using the statistical programming language R.	**Workload:** Attendance time: 28 h Self-study time: 152 h

Course: Panel Data Analysis in Marketing (Lecture with exercise) *Contents*: • Introduction to R • Refreshment in Regression Analysis • Fixed Effects Models in Marketing • Random Effects Models in Marketing • Dynamic Panel Models in Marketing	2 WLH
Examination: Term Paper (max. 6000 words)	6 C

Examination requirements: A self-conducted empirical project. Students will be provided with empirical data, but are welcome to analyze own projects. Students are advised to use the statistical programming language R, but can be allowed to use different statistics software in exceptional cases. Theoretical, methodological and empirical elaboration of a selected topic in panel data analysis with focus on consumer behavior and/or marketing-mix modeling.	

Admission requirements: none	**Recommended previous knowledge:** Basics in Hypothesis testing & Regression analysis Previous knowledge in R is not required
Language: English	**Person responsible for module:** Ossama Elshiewy
Course frequency: irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2 - 4
Maximum number of students: 25	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.WIWI-QMW.0001: Generalized Regression**	6 C 4 WLH

Learning outcome, core skills: The students • gain an overview on extended regression modelling techniques that allow to analyse data with non-normal responses. • learn about approaches for modeling nonlinear effects in scatterplot smoothing. • get an introduction to additive models and mixed models for complex regression analyses. • learn how to implement these approaches using statistical software packages.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Generalized Regression (Lecture) *Contents*: Generalized linear models (binary and Poisson regression, exponential families, maximum likelihood estimation, iteratively weighted least squares regression, tests of hypotheses, confidence intervals, model selection and model checking, categorical regression models), nonparametric smoothing techniques (penalized spline smoothing, local smoothing approaches, general properties of scatterplot smoothers, choosing the smoothing parameter, bivariate and spatial smoothing, generalized additive models), mixed models, quantile regression	2 WLH
Course: Generalized Regression (Tutorial) *Contents*: Generalized linear models (binary and Poisson regression, exponential families, maximum likelihood estimation, iteratively weighted least squares regression, tests of hypotheses, confidence intervals, model selection and model checking, categorical regression models), nonparametric smoothing techniques (penalized spline smoothing, local smoothing approaches, general properties of scatterplot smoothers, choosing the smoothing parameter, bivariate and spatial smoothing, generalized additive models), mixed models, quantile regression	2 WLH
Examination: Written examination (90 minutes) or oral examination (approx. 20 minutes)	6 C

Examination requirements: In the exam, the students demonstrate their ability to choose, fit and interpret extended regression modeling techniques. They show a general understanding of the derived estimates and their interpretation in various contexts. The students are able to implement complex regression models using statistical software and to interpret the corresponding results. The exam covers contents of both the lecture and the exercise class.	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of statistical modelling using linear regression models

nicht-amtliche Fassung

	M.WIWI-QMW.0002 Advanced Statistical Inference (Likelihood & Bayes)
Language: English	**Person responsible for module:** Prof. Dr. Thomas Kneib
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2
Maximum number of students: not limited	

Additional notes and regulations:
The actual examination will be published at the beginning of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.WIWI-QMW.0002: Advanced Statistical Inference (Likelihood & Bayes)**	6 C 4 WLH

Learning outcome, core skills: Upon completion of the module, the students have acquired the following competencies: • foundations and general properties of likelihood-based inference in statistics, • bayesian approaches to statistical learning and their properties, • implementation of both approaches in statistical software using appropriate numerical procedures.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Advanced Statistical Inference (Likelihood & Baye) (Lecture) *Contents*: The likelihood function and likelihood principles, maximum likelihood estimates and their properties, likelihood-based tests and confidence intervals (derived from Wald, score, and likelihood ratio statistics), expectation maximization algorithm, Bootstrap procedures (estimates for the standard deviation, the bias and confidence intervals), Bayes theorem, Bayes estimates, Bayesian credible intervals, prior choices, computational approaches for Bayesian inference, model choice, predictions	2 WLH
Course: Advanced Statistical Inference (Likelihood & Bayes) (Exercise) *Contents*: The likelihood function and likelihood principles, maximum likelihood estimates and their properties, likelihood-based tests and confidence intervals (derived from Wald, score, and likelihood ratio statistics), expectation maximization algorithm, Bootstrap procedures (estimates for the standard deviation, the bias and confidence intervals), Bayes theorem, Bayes estimates, Bayesian credible intervals, prior choices, computational approaches for Bayesian inference, model choice, predictions	2 WLH
Examination: Written examination (90 minutes) or oral examination (approx. 20 minutes)	6 C

Examination requirements: The students demonstrate their general understanding of likelihood-based and Bayesian inference for different types of applications and research questions. They know about the advantages and disadvantages as well as general properties of both approaches, can critically assess the appropriateness for specific problems, and can implement them in statistical software. The exam covers contents of both the lecture and the exercise class.	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of mathematics and statistics
Language: English	**Person responsible for module:** Prof. Dr. Thomas Kneib
Course frequency: every year	**Duration:** 1 semester[s]

nicht-amtliche Fassung

Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: not limited	

Additional notes and regulations:
The actual examination will be published at the beginning of the semester.

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.WIWI-QMW.0004: Econometrics I**	6 C 6 WLH

Learning outcome, core skills: This lecture provides a detailed introduction and discussion to the theory of several topics of econometrics. In a practical course the students will apply the methods discussed to real economic data and problems using the statistical software packages Eviews and R.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Econometrics I (Lecture) *Contents*: Multiple linear regression model: Estimation, Inference and Asymptotics. Maximum likelihood modeling. Generalized least squares. Stochastic regressors. Intrumental variable estimators. Generalized method of moments, likelihood based inference. Dynamic models, weak exogeneity, cointegration, stochastic integration.	2 WLH
Course: Econometrics I (Exercise) *Contents*: The practical deepens the understanding of the lecture topics by applying the methods from the lecture to economic problems and data, and reviewing and intensify theoretical concepts.	2 WLH
Course: Econometrics I (Tutorial) *Contents*: The tutorials are small classes with max. 20 students, which give room for applying the concepts to specific problem sets and discussing questions, that students might encounter regarding the concepts addressed in the lecture and practical. A part of the tutorial are hands-on computer exercises using the software R. This enables students to conduct regression analysis in practice and prepares them for others (applied) courses.	2 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: Linear regression models, generalized linear regression models. OLS, GLS, EGLS estimation. Multiplikative heteroskedasticity, autocorrelation. LM specification testing, Durbin Watson test. Convergence in probability, convergence in distribution. Asymptotics (consistency, asymptotic normality) of OLS estimators. IV estimation, GMM estimation.	

Admission requirements: none	**Recommended previous knowledge:** Required: Mathematics (linear algebra), statistics. Desirable: Introduction to Econometrics (or comparable lecture).
Language: English	**Person responsible for module:** Prof. Dr. Helmut Herwartz
Course frequency: each semester	**Duration:** 1 semester[s]

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Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: not limited	

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Georg-August-Universität Göttingen **Module M.WIWI-QMW.0005: Econometrics II**	6 C 4 WLH

Learning outcome, core skills: As the outcome of this advanced course the students are able to • identify problems of estimation and inference arising due to stochastic regressors, • establish finite sample and asymptotic properties of estimators under the assumption that the data generating process contains stochastic regressors, • model simple univariate stationary and non-stationary time series processes, • carry out and interpret test results of unit root and cointegration tests, • set up, and estimate (over-, under-) identified simultaneous equation models, • model simple multivariate time series with possible cointegration, • implement estimators and analyze real world datasets with the R programming language.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Econometrics (Lecture) *Contents*: Stochastic regressors in linear econometric models; OLS, IV, 2SLS, GMM estimators; Dynamic linear econometric models: stationary stochastic processes, ARMA models, (testing) unit roots, (testing) cointegration, spurious regression; Simultaneous equation models: Identification, estimation (GLS, IV, 2SLS, 3SLS, ILS) Vector autoregressive and error correction models: Interpretation, estimation, inference.	2 WLH
Course: Econometrics II (Exercise) *Contents*: Exercises deepening concepts from the lecture, and demonstrating practical applications. Simulations and data analysis exercises using the R programming language.	2 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: The students demonstrate their understanding of advanced econometric concepts. They show that they can apply these concepts to real economic problems.	

Admission requirements: none	**Recommended previous knowledge:** M.WIWI-QMW.0004 Econometrics I
Language: English	**Person responsible for module:** Prof. Dr. Helmut Herwartz
Course frequency: each summer semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2 - 3
Maximum number of students: not limited	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.WIWI-QMW.0009: Introduction to Time Series Analysis**	6 C 4 WLH

Learning outcome, core skills: The students: • learn concepts and techniques related to the analysis of time series and forecasting, • gain a solid understanding of the stochastic mechanisms underlying time series data, • learn how to analyse time series using statistical software packages and how to interpret the results obtained.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Introduction to Time Series Analysis (Lecture) *Contents*: Classical time series decomposition analysis (moving averages, transformations of time series, parametric trend estimates, seasonal and cyclic components), exponential smoothing, stochastic models for time series (multivariate normal distribution, autocovariance and autocorrelation function), stationarity,spectral analysis, general linear time series models and their properties, ARMA models, ARIMA models, ARCH and GARCH models.	2 WLH
Course: Introduction to Time Series Analysis (Tutorial) *Contents*: Practical and theoretical exercises covering the content of the lecture. Implementation of time series models and estimation by common statistical software (e.g. R or Matlab). Interpretation of estimation results.	2 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: The students show their ability to analyze time series using specific statistical techniques, can derive and interpret properties of stochastic models for time series, and can decide on appropriate models for given time series data. The students are able to implement time series analyses using statistical software and to interpret the corresponding results. The exam covers contents of both the lecture and the exercise class.	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge in statistics M.WIWI-QMW.0004 Econometrics I
Language: English	**Person responsible for module:** Prof. Dr. Helmut Herwartz
Course frequency: once a year	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2 - 3

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Maximum number of students: 50	

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.WIWI-QMW.0011: Advanced Statistical Programming with R**	9 C 2 WLH

Learning outcome, core skills: The students acquire advanced understanding of programming concepts in the statistical programming environment R. They learn how to independently implement advanced statistical methodology and how to structure a large programming project. They furthermore develop abilities in debugging and optimizing R code and to present and document the results of their programming project.	**Workload:** Attendance time: 28 h Self-study time: 242 h

Course: Advanced Statistical Programming with R (Seminar) *Contents*: The students work on advanced statistical programming projects using methods and techniques they got to know in the "Introduction to R". This involves implementation of advanced statistical methodology, utilising tools for debugging and profiling code and documenting the code. The progress of the projects is documented in a presentation and a written report.	2 WLH
Examination: Term paper (max. 20 pages) or project work (project documentation in group work (max. 10 pages)) or development of a prototype (prototypical programming development including documentation (max. 20 pages)) **Examination prerequisites:** Two presentations (each ca. 20 minutes), regular attendance	9 C

Examination requirements: The students work on a programming project with the goal of implementing a given statistical approach in an R package. The programming project is worked on in groups of up to three students. The students document their work in terms of the documentation for their R package and a written report of approximately 15 pages.	

Admission requirements: none	**Recommended previous knowledge:** M.WIWI-QMW.0021 Introduction to Statistical Programming M.WIWI-QMW.0002 Advanced Statistical Inference (Likelihood & Bayes) M.MED.0001 Linear Models and their Mathematical Foundations
Language: English	**Person responsible for module:** Prof. Dr. Thomas Kneib
Course frequency: once a year	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2
Maximum number of students:	

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Georg-August-Universität Göttingen **Module M.WIWI-QMW.0012: Multivariate Time Series Analysis**	6 C 4 WLH

Learning outcome, core skills: The students: • learn concepts and techniques related to the analysis of multivariate time series and the forecasting thereof. • learn to characterize the dynamic interrelationship between the variables of dynamic systems, • learn to relate economic models with restrictions implied by its empirical counterpart, • learn how to analyse multivariate time series using by means of statistical software packages and to interpret the results obtained.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Multivariate Time Series Analysis (Lecture) *Contents*: Vector Autoregressive and Vector Moving Average representations Model selection and estimation, Unit roots in vector processes, Vector autoregressive vs. vector error correction modeling, structural vectorautoregressions, Impulse response analysis, forecasting, forecast error variance decomposition	2 WLH
Course: Multivariate Time Series Analysis (Tutorial) *Contents*: Practical and theoretical exercises covering the content of the lecture. Implementation of multivariate time series models and estimation in common statistical software (e.g. R or Matlab). Interpretation of estimation results.	2 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: The students show their ability to analyze systems of time series using specific statistical techniques, can derive and interpret properties of stochastic models for time series, and can decide on appropriate models for given data. The students are able to implement time series analyses using statistical software and to interpret the corresponding results. The exam covers contents of both the lecture and the exercises.	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledgin in statistics M.WIWI-QMW.0004 Econometrics I M.WIWI-QMW.0009 Introduction to Time Series Analysis
Language: English	**Person responsible for module:** Prof. Dr. Helmut Herwartz
Course frequency: once a year	**Duration:** 1 semester[s]
Number of repeat examinations permitted:	**Recommended semester:**

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twice	3 - 4

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Georg-August-Universität Göttingen **Module M.WIWI-QMW.0041: Stochastic Processes**	6 C 4 WLH

Learning outcome, core skills: Upon completion of the module, the students have acquired the following competencies: • familiarity with concepts of different stochastic processes, • experience in the practical analysis of modeling data via stochastic processes, • interpretation of the results of such models.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Stochastic Processes (Lecture) *Contents*: Stochastic processes in discrete and continuous time such as Wiener processes, Poisson processes, Markov chains, Markov processes.	2 WLH
Course: Stochastic Processes (Exercise) *Contents*: In the accompanying exercise, students deepen and expand the knowledge and skills acquired in the lecture.	2 WLH
Examination: Written examination (90 minutes) or oral examination (approx. 25 minutes)	6 C

Examination requirements: The students show in the exam that they have learned to perform the steps and calculations involved in analyses of stochastic processes. They can choose the most appropriate model for a given problem and can implement this model in statistical software. In addition, the resulting estimates can be interpreted and the results can be critically evaluated. The exam covers contents of both the lecture and the exercise class.	

Admission requirements: none	**Recommended previous knowledge:** Basic knowledge of statistical modelling, M.WIWI-QMW.0002 Advanced Statistical Inference (Likelihood & Bayes)
Language: English	**Person responsible for module:** Prof. Dr. Elisabeth Bergherr
Course frequency: once a year	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2 - 3

nicht-amtliche Fassung

Georg-August-Universität Göttingen **Module M.WIWI-QMW.0042: Computational Statistics**	6 C 4 WLH

Learning outcome, core skills: At the conclusion of the course, students will have the ability to know fundamental concepts in statistical computing and address large-scale problems by employing efficient methods, considering the computational resources available. In addition, students will have the competence to select appropriate methodologies for approximating solutions, either by formulating their own computational expressions or by utilizing advanced computation libraries codified within the statistical software R. Furthermore, the students will be capable of creating probabilistic models using the platforms of modelling Template Model Builder (TMB) and Stan.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Computational Statistics (Lecture) *Contents*: 1. Introduction to statistical computing 2. Numerical linear algebra 3. Optimization 4. The EM algorithm 5. Laplace approximation 6. Monte Carlo method 7. Markov Chain Monte Carlo	2 WLH
Course: Computational Statistics (Exercise) *Contents*: In the practical session, knowledge will be extended and intensified theoretically and practically in the statistical software R. Additionally, probabilistic models will be developed utilizing the interfaces offered by TMB and Stan within the environment of R.	2 WLH
Examination: Written examination (90 minutes) **Examination prerequisites:** Successful completion of homework exercises	6 C

Examination requirements: • Demonstration of understanding basic concepts of linear algebra, computational methods and programming, • implementing statistical methods in the software R, • implementation of simple statistical models in C++ (TMB and Stan), • theory (solving exercises by hand) and programming statistical models.	

Admission requirements: none	**Recommended previous knowledge:** Statistical modelling using linear regression models, M.WIWI-QMW.0002 Advanced Statistical Inference (Likelihood & Bayes)
Language: English	**Person responsible for module:** Dr. Joaquin Cavieres
Course frequency:	**Duration:**

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each summer semester	1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2 - 4

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Georg-August-Universität Göttingen **Module M.WIWI-VWL.0001: Advanced Microeconomics**	6 C 4 WLH

Learning outcome, core skills: This course covers advanced microeconomic models. In this regard students are provided with the skills required to understand these models including advanced methods of calculus and basic proof techniques. Students learn how to formalize and analyze individual decision making and strategic interactions. They will get acquainted with models of individual choice under certainty and uncertainty. Students will be able to analyze decision problems of firms. They can distinguish between partial analysis of isolated markets and a general analysis considering mutual dependencies of markets. Finally, students will be able to formalize strategic interactions and to predict their theoretical outcomes based on a variety of solution concepts.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Advanced Microeconomics (Lecture) *Contents*: This course presents a formal treatment of microeconomic theory. 1. Rational choice under certainty 2. Consumer theory 3. Rational choice under uncertainty 4. Partial equilibrium 5. General equilibrium 6. Game theory	2 WLH
Course: Advanced Microeconomics (Exercise) *Contents*: The exercise deepens the understanding of concepts presented in the lecture. Students will receive problem sets, which they are requested to prepare at home. The solutions of these problem sets will be discussed in class.	2 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements: • Demonstrate the capability to understand advanced economic models • Demonstrate the understanding of the main concepts of individual choice theory • Apply techniques developed in the lecture and in the exercise such as the method of Lagrange multipliers or the Edgeworth Box • Demonstrate the basic knowledge of the theory of partial and general equilibrium • Prove the ability to solve analytical exercises • Find the game theoretical solutions to strategic interactions • Conduct advanced calculations	

Admission requirements: none	**Recommended previous knowledge:** BA level microeconomics and mathematics
Language: English	**Person responsible for module:** Prof. Dr. Claudia Keser Prof. Marcela Ibanez Diaz

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Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: not limited	

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Georg-August-Universität Göttingen **Module M.WIWI-VWL.0041: Panel Data Econometrics**	6 C 4 WLH

Learning outcome, core skills: • This course aims to study panel data econometric techniques in an intuitive and practical way and to provide the skills and understanding to read and evaluate empirical literature and to carry out empirical research. Empirical evaluation of economic models is an important feature of the study and application of economics. • The course is concerned with the *application* of econometric methods, with little emphasis on the mathematical aspects of the subject (which may be studied in other modules). The computer software package STATA will be used for practical work. Previous knowledge of intermediate econometrics is required.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: Panel Data Econometrics (Lecture) *Contents*: *Linear Panel Data Models* 1. Static Linear Panel Data Models 1.1 Introduction to Panel Data 1.2 Assumptions 1.3 Estimation and Testing *1.3.1 Pooled OLS* *1.3.2 Random Effects Estimation* *1.3.3 Fixed Effects Estimation. Testing for Serial Correlation* *1.3.4 First-Differencing Estimation* 1.4. Comparison of Estimators and Testing the Assumptions 1.5 Correlated Random Effects (CRE) or Mundlak's Approach 2. Endogeneity and Dynamics in Linear Panel Data Models 2.1. Equivalence Between GMM 3SLS and Standard Estimators 2.2 Chamberlain's Approach to UE Models 2.3. RE and FE Instrumental Variables Methods 2.4. Hausman and Taylor Models 2.5. First Differencing and IV 2.6. Dynamic Panel Data Models. Estimation under Sequential Exogeneity 3. Special Topics 3.1 Heterogeneous Panels 3.2 Random Trend Models 3.3 General Models with Specific Slopes	2 WLH

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3.4 Robustness of Standard Fixed Effects Estimators 3.5 Testing for Correlated Random Slopes *Non-linear Panel Data Models* 4. Panel Data Models for Discrete Variables 4.1 Introduction. Binary Response Panel Data Models with Strictly Exogenous Variables 4.2 Linear Probability Model 4.3 Fixed versus Random Effects 4.4 Other issues: Endogenous explanatory variables/Selection Bias The course is organized as a series of lectures complemented with tutorials.	
Course: Panel Data Econometrics (Tutorial) *Contents*: The computer software package STATA will be used for practical work.	2 WLH
Examination: Term Paper (max. 10 pages, based on the tutorial)	2 C
Examination: Written examination (120 minutes)	4 C

Examination requirements: • Show a deep knowledge of the econometric techniques covered in the course • Show ability to select the adequate econometric model for a give economic empirical application • Understanding of the economic logic behind the panel data models introduced in the course • Being able to interpret tables of empirical results available in published economic research

Admission requirements: none	**Recommended previous knowledge:** Previous knowledge of intermediate econometrics is required.
Language: English	**Person responsible for module:** Prof. Dr. Inmaculada Martinez-Zarzoso
Course frequency: irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 2 - 4
Maximum number of students: 30	

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Georg-August-Universität Göttingen **Module M.WIWI-VWL.0092: International Trade**	6 C 4 WLH

Learning outcome, core skills: After a successful completion of the course students should be able to: • give an overview of the core theoretical concepts explaining international trade patterns by means of various sources of trade flows like different technologies or factor endowments. • understand and apply the concepts of comparative and absolute advantage. • analyze the effects of international trade on the trading partners with respect to (i) their production and overall welfare, (ii) the reallocation of resources in the production process, (iii) the change in nominal factor prices, and (iv) on changes in the purchasing power of consumers. • evaluate and critically reflect the gains and losses of international trade. • evaluate the consequences of different trade policies like tariffs and subsidies. • understand, summarize, and critically assess recent approaches to explain international trade patterns that are observed today based on scientific publications.	**Workload:** Attendance time: 56 h Self-study time: 124 h

Course: International Trade (Lecture) *Contents*: 1. Introduction to International Trade 2. The Ricardian model Graphical and mathematical analysis of trade effects on changes production and consumption, nominal and real wages. Evaluation of empirical relevance by means of case studies. 3. The specific-factors model Graphical and mathematical analysis of trade effects on changes in production and consumption, nominal and real factor prices. Evaluation of empirical relevance by means of case studies. 4. The Heckscher-Ohlin model Graphical and mathematical analysis of trade effects on changes in production and consumption, nominal and real factor prices. Evaluation of empirical relevance by means of case studies. 5. Testing Trade Theory Mathematical derivation of the factor content of trade by means of the Heckscher-Ohlin-Vanek model. Empirical tests of the HOV model. Modelling different technologies across countries. 6. Movements of factors Graphical and mathematical analysis of short-run and long-run effects of migration and FDI. Empirical relevance by means of case studies.	2 WLH

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7. The Krugman model of monopolistic competition an increasing returns to scale and the Gravity equation /New trade theory. Graphical analysis of short- and long-run effects of trade under monopolistic competition. Comparative statics in Krugman's equilibrium model. 8. Project work: trade policy, recent explanations of trade patterns within the frame of student presentations	
Course: International Trade (Exercise) *Contents*: In the accompanying practice session students deepen and broaden their knowledge from the lectures.	2 WLH
Examination: Written examination (90 minutes)	6 C

Examination requirements:

- Demonstrate a profound knowledge of the core theoretical concepts in international trade.
- Show the ability to analyze the welfare and distributional effects of international trade by means of graphical and mathematical tools.
- Show the ability to analyze the effects of trade policies.
- Students should be able to assess the theoretical models with respect to empirical applications.

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Udo Kreickemeier
Course frequency: each semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: not limited	

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Georg-August-Universität Göttingen **Module M.WIWI-VWL.0099: Poverty & Inequality**	6 C 3 WLH

Learning outcome, core skills: The goal of this course is to provide students with a general understanding of poverty, inequality, and related economic issues. By the end of the course, students will be able to: • describe concepts of poverty and inequality, • describe drivers of poverty and inequality, • describe interlinkages between poverty, inequality, and socio-economic outcomes, • discuss development policy targeting poverty and inequality, • calculate measures of poverty and inequality.	**Workload:** Attendance time: 42 h Self-study time: 138 h

Course: Poverty & Inequality (Lecture) *Contents*: This course provides an in-depth analysis of inequality, poverty and related economic issues at the graduate level. The course covers • theories of justice, • methodological aspects of poverty and inequality measurement, • global aspects of poverty and inequality, • effects of inequality on socio-economic outcomes and growth, • gender inequalities, • inequality and poverty in rich countries, • development policy targeting poverty.	2 WLH
Course: Poverty & Inequality (Tutorial) *Contents*: The tutorial provides practical skills in poverty and inequality measurement. It includes lab sessions where poverty and inequality measures are calculated using statistical software (Stata).	1 WLH
Examination: Written examination (90 minutes) **Examination requirements:** Demonstrating skills related to the measurement of poverty and inequality. Demonstrating an understanding of the concepts, drivers and consequences of poverty and inequality and their interlinkages based on the most recent scientific literature.	4 C
Examination: Practical examination (max. 5 pages) **Examination requirements:** Application of theoretical concepts to measure poverty and inequality using real data from developing countries and statistical software (Stata).	2 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Sebastian Vollmer

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Course frequency: each winter semester	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 2
Maximum number of students: not limited	

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Georg-August-Universität Göttingen **Module M.WIWI-VWL.0128: Deep Determinants of Growth and Development**	6 C 2 WLH

Learning outcome, core skills: After a successful participation, students have a deeper understanding of the mechanisms that lead to long-run economic growth and development. They learn about the forces that are linked to economic development like governance, corruption, institutions, democracy, inequality, culture, and social capital.	**Workload:** Attendance time: 28 h Self-study time: 152 h

Course: Deep Determinants of Growth and Development (Lecture) *Contents*: In this course, we will study long-run trends in economic development. We will analyze questions such as • Why are some countries richer than others? • Why is a country today richer than several generations ago? • How can historical events affect the economy today? • What are the mechanisms that lead to the transition from stagnation towards sustained growth? Contents: 1) (Bio-)Geography and Economic Development 2) Institutions 3) Government 4) Culture and Economic Development 5) The Deep Roots of Economic Development 6) Population and Economic Growth 7) Economic Growth in the Very Long Run **Literature:** The course is based upon selected research articles. Further information on the relevant literature is announced in the syllabus.	2 WLH
Examination: Oral exam (ca. 20 minutes) or written exam (90 minutes)	6 C

Examination requirements: Demonstrate: • a profound knowledge of the causes and consequences of long-run economic development • a deep understanding of standard models of economic growth • the ability to solve problems in a verbal, graphical and analytical manner	

Admission requirements: none	**Recommended previous knowledge:**

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	Macroeconomics, Mathematics for Economists, Economic Growth, Econometrics as taught in the Bachelor courses
Language: English	**Person responsible for module:** Prof. Dr. Holger Strulik
Course frequency: irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:** 1 - 4

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