

Subdivided Module Catalogue for the Subject

Mathematics

as a Master's with 1 major with the degree "Master of Science" (120 ECTS credits)

Examination regulations version: 2019 Responsible: Faculty of Mathematics and Computer Science Responsible: Institute of Mathematics

JMU Würzburg • generated 19-Apr-2025 • exam. reg. data record 88|105|-|-|H|2019

Learning Outcomes

German contents and learning outcome available but not translated yet.

Wissenschaftliche Befähigung

- Die Absolventinnen und Absolventen sind geschult in analytischem Denken, besitzen ein stark ausgeprägtes Abstraktionsvermögen, universell einsetzbare Problemlösungskompetenz und die Fähigkeit, komplexe Zusammenhänge zu strukturieren.
- Die Absolventinnen und Absolventen sind in der Lage, sich selbständig mithilfe von Fachliteratur in aktuelle Forschungsgebiete der Mathematik einzuarbeiten.
- Die Absolventinnen und Absolventen sind in der Lage, ihre Kenntnisse, Ideen und Problemlösungen zu komplexen Sachverhalten einem Fachpublikum gegenüber verständlich zu präsentieren.
- Die Absolventinnen und Absolventen besitzen die für selbstständiges wissenschaftliches Arbeiten, insbesondere für ein Promotionsstudium erforderlichen Fachkenntnisse, Denk- und Arbeitsweisen und Methodenkenntnisse.
- Die Absolventinnen und Absolventen kennen die Regeln guter wissenschaftlicher Praxis und sind in der Lage, sie bei umfangreichen Arbeiten zu beachten.
- Die Absolventinnen und Absolventen besitzen weiterführende Kenntnisse aktueller Gebiete der Mathematik und können sicher mit fortgeschrittenen Methoden dieser Gebiete umgehen.
- Die Absolventinnen und Absolventen besitzen vertiefte Kenntnisse und Überblick über die aktuelle Forschung in mindestens einem Teilgebiet der Mathematik
- Die Absolventinnen und Absolventen kennen aktuelle Gebiete und moderne Methoden anderer Fächer in denen mathematische Methoden zum Einsatz kommen.

Befähigung zur Aufnahme einer Erwerbstätigkeit

- Die Absolventinnen und Absolventen sind geschult in analytischem Denken, besitzen ein stark ausgeprägtes Abstraktionsvermögen, universell einsetzbare Problemlösungskompetenz und die Fähigkeit, komplexe Zusammenhänge zu strukturieren.
- Die Absolventinnen und Absolventen sind in der Lage, ihre Kenntnisse, Ideen und Problemlösungen zielgruppenorientiert verständlich zu formulieren und zu präsentieren.
- Die Absolventinnen und Absolventen sind in der Lage, komplexe Probleme aus anderen Gebieten zu erkennen, strukturieren und modellieren, mit mathematischen Methoden Lösungswege zu entwickeln und diese Ergebnisse zu interpretieren und bewerten.
- Die Absolventinnen und Absolventen besitzen ein ausgeprägtes Durchhaltevermögen bei der Lösung komplexer Probleme.
- Die Absolventinnen und Absolventen sind in der Lage, konstruktiv und zielorientiert in Teams zu arbeiten und hierbei Verantwortung zu tragen.
- Die Absolventinnen und Absolventen sind in der Lage, sich neue Wissensgebiete und aktuelle Entwicklungen selbständig, effizient und systematisch zu erschließen.
- Die Absolventinnen und Absolventen besitzen die Fähigkeit, Projekte in interdisziplinär zusammengesetzten Teams im Bereich der Informatik, Natur- und Ingenieurswissenschaften verantwortlich mitzugestalten.

Persönlichkeitsentwicklung

- Die Absolventinnen und Absolventen sind geschult in analytischem Denken, besitzen ein stark ausgeprägtes Abstraktionsvermögen, universell einsetzbare Problemlösungskompetenz und die Fähigkeit, komplexe Zusammenhänge zu strukturieren.
- Die Absolventinnen und Absolventen sind in der Lage, in partizipativen Prozessen gestaltend mitzuwirken.
- Die Absolventinnen und Absolventen besitzen ein ausgeprägtes Durchhaltevermögen bei der Lösung komplexer Probleme.

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• Die Absolventinnen und Absolventen sind in der Lage, komplexe Ideen und Lösungsvorschläge allgemeinverständlich zu formulieren und professionell zu präsentieren.

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Abbreviations used

Course types: \mathbf{E} = field trip, \mathbf{K} = colloquium, \mathbf{O} = conversatorium, \mathbf{P} = placement/lab course, \mathbf{R} = project, \mathbf{S} = seminar, \mathbf{T} = tutorial, $\ddot{\mathbf{U}}$ = exercise, \mathbf{V} = lecture

Term: **SS** = summer semester, **WS** = winter semester

Methods of grading: **NUM** = numerical grade, **B/NB** = (not) successfully completed

Regulations: **(L)ASPO** = general academic and examination regulations (for teaching-degree programmes), **FSB** = subject-specific provisions, **SFB** = list of modules

Other: **A** = thesis, **LV** = course(s), **PL** = assessment(s), **TN** = participants, **VL** = prerequisite(s)

Conventions

Unless otherwise stated, courses and assessments will be held in German, assessments will be offered every semester and modules are not creditable for bonus.

Notes

Should there be the option to choose between several methods of assessment, the lecturer will agree with the module coordinator on the method of assessment to be used in the current semester by two weeks after the start of the course at the latest and will communicate this in the customary manner.

Should the module comprise more than one graded assessment, all assessments will be equally weighted, unless otherwise stated below.

Should the assessment comprise several individual assessments, successful completion of the module will require successful completion of all individual assessments.

In accordance with

the general regulations governing the degree subject described in this module catalogue:

ASPO2015

associated official publications (FSB (subject-specific provisions)/SFB (list of modules)):

27-Mar-2019 (2019-24)

This module handbook seeks to render, as accurately as possible, the data that is of statutory relevance according to the examination regulations of the degree subject. However, only the FSB (subject-specific provisions) and SFB (list of modules) in their officially published versions shall be legally binding. In the case of doubt, the provisions on, in particular, module assessments specified in the FSB/SFB shall prevail.

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The subject is divided into

Abbreviation	Module title		ECTS	Method of	nage
			credits	grading	P450
Compulsory Electives (90	ECTS credits	5)			
Subfield Mathematics (3	o ECTS cred	its)			
10-M=AAAN-161-m01	Applied An	alysis	10	NUM	127
10-M=AALG-161-m01	Topics in A	lgebra	10	NUM	129
10-M=ADGM-161-m01	Differentia	l Geometry	10	NUM	131
10-M=AFTH-161-m01	Complex A	nalysis	10	NUM	135
10-M=AGMS-161-m01	Geometric	Structures	10	NUM	137
10-M=AIST-161-m01	Industrial S	Statistics 1	10	NUM	141
10-M=ALTH-161-m01	Lie Theory		10	NUM	143
10-M=ANGG-161-m01	Numeric of	Large Systems of Equations	10	NUM	145
10-M=AOPT-161-m01	Basics in C	ptimization	10	NUM	147
10-M=ARTH-161-m01	Control The	eory	10	NUM	149
10-M=ASMR-161-m01	Stochastic	Models of Risk Management	10	NUM	151
10-M=ASTP-161-m01	Stochastic	al Processes	10	NUM	153
10-M=ATOP-161-m01	Topology		10	NUM	155
10-M=AVSM-161-m01	Insurance	Mathematics 1	10	NUM	157
10-M=AZRA-161-m01	Time Serie	s Analysis 1	10	NUM	159
10-M=AZTH-161-m01 Number T		eory	10	NUM	161
10-M=AGPCin-152-m01 Giovanni		rodi Lecture (Master)	5	NUM	139
10-M=VANA-161-mo1 Selected		opics in Analysis	10	NUM	243
10-M=VATP-161-mo1 Algebraic		opology	10	NUM	245
10-M=VFNM-161-mo1 Selected		opics in Financial Mathematics	10	NUM	255
10-M=VGDS-161-mo1 Groups ar		d their Representations	10	NUM	257
10-M=VGEM-161-mo1 Geometric		al Mechanics	10	NUM	259
10-M=VIST-161-m01 Industrial		Statistics 2	10	NUM	273
10-M=VKAR-161-m01	Field Arithr	netics	10	NUM	275
10-M=VNPE-161-m01	Numeric of	Partial Differential Equations	10	NUM	293
10-M=VOPT-161-m01	Selected To	opics in Optimization	10	NUM	295
10-M=VSTA-161-m01	Statistical	Analysis	10	NUM	303
10-M=VVSM-161-m01	Insurance	Mathematics 2	10	NUM	307
10-M=VZRA-161-m01	Time Series	s Analysis 2	10	NUM	311
10-M=VDIM-161-m01	Discrete M	athematics	5	NUM	251
10-M=VDSY-161-m01	Dynamical	Systems	5	NUM	253
10-M=VGEO-161-m01	Aspects of	Geometry	5	NUM	261
10-M=VKOM-161-m01	Mathemati	cal Continuum Mechanics	5	NUM	279
10-M=VMBV-161-m01	Mathemati	cal Imaging	5	NUM	283
10-M=VMPH-161-m01	Selected To	opics in Mathematical Physics	10	NUM	285
10-M=VTRT-161-m01	Selected To	opics in Control Theory	10	NUM	305
10-M=VIPR-161-m01	Inverse Pro	blems	5	NUM	271
10-M=VMTH-161-m01	Module Th	eory	5	NUM	287
10-M=VNAN-161-m01	Non-linear	Analysis	5	NUM	291
10-M=VOST-161-m01	Optimal Co	ontrol	5	NUM	297
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10-M=VVSY-161-m01	Networked Systems	5	NUM	309
10-M=VKGE-161-m01	Complex Geometry	10	NUM	277
10-M=VPDP-161-m01	Partial Differential Equations of Mathematical Physics	10	NUM	299
10-M=VPRG-161-m01	Pseudo Riemannian and Riemannian Geometry	10	NUM	301
10-M=AFAN-161-m01	Functional Analysis	10	NUM	133
10-M=VADG-161-m01	Applied Differential Geometry	10	NUM	239
10-M=VGPSin-152-mo1	Giovanni Prodi Lecture Selected Topics (Master)	10	NUM	269
10-M=VGPAin-152-mo1	Giovanni Prodi Lecture Advanced Topics (Master)	10	NUM	265
10-M=VGPMin-152-mo1	Giovanni Prodi Lecture Modern Topics (Master)	10	NUM	267
10-M=MP1-161-m01	Analysis and Geometry of Classical Systems	10	NUM	207
10-M=MP2-161-m01	Algebra and Dynamics of Quantum Systems	10	NUM	209
10-M=VGFT-192-m01	Geometric Complex Analysis	10	NUM	263
10-M=VNAM-192-m01	Selected Topics in Numerical and Applied Mathematics	10	NUM	289
10-M=VKRY-192-m01	Cryptography/Coding Theory	10	NUM	281
10-M=VCAL-192-m01	Computer Algebra	10	NUM	249
10-M=VAZT-192-m01	Algorithmic Number Theory	10	NUM	247
10-M=VAGE-192-m01	Algebraic Geometry	10	NUM	241
Subfield Research in Gro	ups and Seminars (10 ECTS credits)			
10-M=GALG-161-m01	Research in Groups - Algebra	10	NUM	168
10-M=GDIM-161-m01	Research in Groups - Discrete Mathematics	10	NUM	177
10-M=GDSC-161-m01	Research in Groups - Dynamical Systems and Control Theory	10	NUM	179
10-M=GCOA-161-m01	Research in Groups - Complex Analysis	10	NUM	170
10-M=GGMT-161-m01	Research in Groups - Geometry and Topology	10	NUM	181
10-M=GMCX-161-m01	Research in Groups - Mathematics in Context	10	NUM	188
10-M=GMSC-161-m01	Research in Groups - Mathematics in the Sciences	10	NUM	190
10-M=GMAI-161-m01	Research in Groups - Measure and Integral	10	NUM	184
	Research in Groups - Numerical Mathematics and Applied Ana-			
10-M=GNMA-161-M01	lysis	10	NUM	194
	Research in Groups - Robotics, Optimization and Control Theo-	10	NILINA	200
10-M=GROC-101-1101	ry	10	NOM	200
10-M=GTSA-161-m01	Research in Groups - Time Series Analysis	10	NUM	204
10-M=GSTA-161-m01	Research in Groups - Statistics	10	NUM	202
10-M=GNTH-161-m01	Research in Groups - Number Theory	10	NUM	196
10-M-GCOS-161-mo1	Research in Groups - Control Theory of Quantum Mechanical	10	NI IM	170
10-M=0000-101-1101	Systems	10	NOM	1/2
10-M=GDGE-161-m01	Research in Groups - Differential Geometry	10	NUM	175
10-M=GDFQ-161-m01	Research in Groups - Deformation Quantization	10	NUM	173
10-M=GNLA-161-m01	Research in Groups - Non-linear Analysis	10	NUM	192
10-M=GOPA-161-m01	Research in Groups - Operator Algebras	10	NUM	198
10-M=SADG-161-m01	Seminar in Applied Differential Geometry	5	NUM	211
10-M=SALG-161-m01	Seminar in Algebra	5	NUM	213
10-M=SDSC-161-m01	Seminar in Dynamical Systems and Control	5	NUM	219
10-M=SCOA-161-m01	Seminar in Complex Analysis	5	NUM	217
10-M=SFIM-161-m01	Seminar in Financial and Insurance Mathematics	5	NUM	221
10-M=SGTO-161-m01	Seminar in Geometry and Topology	5	NUM	225
10-M=SGPCin-152-m01	Giovanni Prodi Seminar (Master)	5	NUM	223
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10-M=SIDC-161-m01	Interdisciplinary Seminar	5	NUM	227
10-M=SMSC-161-m01	Seminar Mathematics in the Sciences	5	NUM	229
10-M=SNMA-161-m01	Seminar in Numerical Mathematics and Applied Analysis	5	NUM	233
10-M=SOPT-161-m01	Seminar in Optimization	5	NUM	235
10-M=SSTA-161-m01	Seminar in Statistics	5	NUM	237
10-M=SNLA-161-m01	Seminar in Non-linear Analysis	5	NUM	231
10-M=SAMA-192-m01	Seminar Applied Mathematics	5	NUM	215
10-M=GLIE-192-m01	Research in Groups - Lie Theory	10	NUM	183
10-M=GADG-192-m01	Research in Groups - Applied Differential Geometry	10	NUM	166
10-M=GMAP-192-m01	Research in Groups - Mathematical Physics	10	NUM	186
Subfield Learning and Te	aching			
10-M=ELT1-192-m01	Learning by Teaching 1	5	B/NB	163
10-M=ELT2-192-m01	Learning by Teaching 2	5	B/NB	164
Subfield Optional Applica	tion Subject and/or Intership			
Application Subject Bio	ogy			
07-MS2BI-152-m01	Bioinformatics	10	NUM	14
07-MS2BIF1-152-m01	Bioinformatics F1	10	NUM	16
07-MS2BIF2-152-m01	Bioinformatics F2	15	B/NB	18
07-MBI-B-152-m01	Bioinformatics B	5	B/NB	12
07-MS3S-152-m01	Systems Biology	10	NUM	20
07-MS3SYF1-152-m01	Systems Biology F1	10	NUM	22
07-MS3SYF2-152-m01	Systems Biology F2	15	B/NB	24
07-MS-B-152-m01	Systems Biology B	5	B/NB	26
Application Subject Che	mie			
08-PCM1a-161-m01	Laser Spectroscopy	5	NUM	28
08-PCM1b-161-m01	Advanced Physical Chemistry (Lab)	5	B/NB	30
08-PCM2-161-m01	Statistical Mechanics and Reaction Dynamics	5	NUM	32
08-PCM3-161-m01	Nanoscale Materials	5	NUM	34
08-PCM4-161-m01	Ultrafast spectroscopy and quantum-control	5	NUM	36
08-PCM5-161-m01	Physical Chemistry of Supramolecular Assemblies	5	NUM	38
08-PCM6-161-m01	Physical Chemistry (Advanced Lab)	5	B/NB	40
08-TCM2-161-m01	Basics and Applications of Quantum Chemistry	5	NUM	48
08-TCM3-161-m01	Numerical Methods and Programming	5	NUM	50
08-TCM4-161-m01	Quantum Dynamics	5	NUM	52
08-TCM1-161-m01	Selected Topics in Theoretical Chemistry	5	NUM	46
08-TCAP1-161-m01	Theoretical Chemistry - Project course quantum chemistry	5	B/NB	42
08-TCAP2-161-m01	Theoretical Chemistry - Project course quantum dynamics	5	B/NB	44
Application Subject Con	puter Science and Aerospace Computer Science			
10-I=SEM3-161-m01	Seminar 1 - Current Topics in Computer Science	5	NUM	118
10-I=APR-161-m01	Advanced Programming	5	NUM	74
10-I=AA-152-m01	Advanced Automation	8	NUM	62
10-I=AGIS-161-m01	Algorithms for Geographic Information Systems	5	NUM	66
10-l=AG-161-m01	Computational Geometry	5	NUM	64
10-I=APA-161-m01	Approximation Algorithms	5	NUM	72
10-I=AUT-161-m01	Automata Theory	5	NUM	76
10-I=AVS-161-m01	Avionics Systems	5	NUM	78
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10-HCI=MMUI-161-m01	Multimoda	l User Interfaces	5	NUM	58
10-I=BER-161-m01	Computabi	lity Theory	5	NUM	80
07-BI-161-m01	Bioinforma	tics	5	NUM	10
10-I=CB-161-m01	Compiler C	onstruction	5	NUM	82
10-I=DDB-161-m01	Deductive	Databases	8	NUM	84
10-l=EL-161-m01	E-Learning		5	NUM	85
10-MCS=HCI-161-m01	Introductio	n into Human-Computer Interaction	5	NUM	312
10-I=ES-161-m01	Embedded	Systems	8	NUM	87
10-I=PA-161-m01	Analysis ar	nd Design of Programs	5	NUM	103
10-I=IR-161-m01	Informatio	n Retrieval	5	NUM	89
10-HCl=3DUI-161-m01	3D User Int	erfaces	5	NUM	54
10-I=KT2-161-m01	Computatio	onal Complexity II	5	NUM	95
10-I=KI1-161-m01	Artificial In	telligence 1	5	NUM	91
10-I=Kl2-161-m01	Artificial In	telligence 2	5	NUM	93
10-I=LVS-161-m01	Performanc	ce Evaluation of Distributed Systems	8	NUM	96
10-I=ML-161-m01	Mathemati	cal Logic	5	NUM	100
10-I=MI-161-m01	Medical Inf	formatics	5	NUM	98
10-I=PFB-161-m01	Performanc	ce Engineering & Benchmarking of Computer Sy-	F	NIIM	105
	stems		2		105
10-I=RAM-161-m01	Computer /	Arithmetic	5	NUM	110
10-l=R01-152-m01	Robotics 1		8	NUM	112
10-I=RO2-152-m01	D1 Robotics 2		8	NUM	114
10-I=ST-161-m01	Discrete Ev	viscrete Event Simulation		NUM	121
10-HCI=RIS-161-m01	Real-Time I	Real-Time Interactive Systems		NUM	60
10-I=SAR-161-m01	Software A	Software Architecture		NUM	116
10-HCI=MLUI-161-m01	Machine Le	earning (for User Interfaces)	5	NUM	56
10-I=VG-161-m01	Visualizatio	on of Graphs	5	NUM	125
10-I=AKA-161-m01	Selected To	opics in Algorithms	5	NUM	68
10-I=AKT-161-m01	Selected To	opics in Theory	5	NUM	70
10-l=SSS-172-m01	Security of	Software Systems	5	NUM	119
10-I=NLP-182-m01	Machine Le	earning for Natural Language Processing	5	NUM	102
10-I=PM-182-m01	Profession	al Project Management	5	NUM	107
10-I=PRJAK-162-m01	Project - Cι	Irrent Topics in Computer Science	5	NUM	109
10-I=STM-162-m01	NLP and Te	xt Mining	5	NUM	123
Application Subject Phy	sik				
11-BSV-161-m01	Image and	Signal Processing in Physics	6	NUM	327
11-QUI-161-m01	Quantum li	nformation Technology	6	NUM	376
11-PMM-161-m01	Physics of <i>i</i>	Advanced Materials	6	NUM	366
11-SPI-161-m01	Spintronics	5	6	NUM	384
11-FK2-161-m01	Solid State	Physics 2	8	NUM	339
11-FKS-161-m01	Solid State	Spectrocopy	6	NUM	341
11-MAG-161-m01	Magnetism		6	NUM	358
11-HLPH-161-m01	Semicondu	actor Physics	6	NUM	350
11-HNS-161-m01	Optical Pro	perties of Semiconductor Nanostructures	6	NUM	352
11-QTH-161-m01	Quantum T	ransport	6	NUM	374
11-ASM-161-m01	Methods o	f Observational Astronomy	6	NUM	317
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11-TPE-161-m01	Experimental Particle Physics	6	NUM	398
11-ASP-161-m01	Introduction to Space Physics	6	NUM	319
11-MAS-161-m01	Multi-wavelength Astronomy	6	NUM	360
11-QM2-161-m01	Quantum Mechanics II	8	NUM	372
11-RTT-161-m01	Theory of Relativity	6	NUM	382
11-QVTP-161-m01	Many Body Quantum Theory	8	NUM	378
11-PKS-161-m01	Physics of Complex Systems	6	NUM	364
11-QIC-161-m01	Quantum Information and Quantum Computing	6	NUM	370
11-TFK-161-m01	Theoretical Solid State Physics	8	NUM	390
11-TFK2-161-m01	Theoretical Solid State Physics 2	8	NUM	392
11-FTFK-161-m01	Field Theory in Solid State Physics	8	NUM	345
11-TOPO-161-m01	Topological Order	6	NUM	396
11-TFP-161-m01	Topology in Solid State Physics	6	NUM	394
11-TSL-161-m01	Theory of Superconductivity	6	NUM	402
11-CMS-161-m01	Computational Materials Science (DFT)	8	NUM	331
11-KFT-161-m01	Conformal Field Theory	6	NUM	354
11-KFT2-161-m01	Conformal Field Theory 2	6	NUM	356
11-MSF-161-m01	Magnetism and Spin Fluids	6	NUM	362
11-TQP-161-m01	Topological Quantum Physics	6	NUM	400
11-CRP-161-m01	Renormalization Group and Critical Phenomena	6	NUM	333
11-BWW-161-m01	Bosonisation and Interactions in One Dimension	6	NUM	329
11-EIT-161-m01	Gauge Theories	6	NUM	337
11-GGD-161-m01	Introduction to Gauge/Gravity Duality	8	NUM	347
11-EFQ-161-m01	Introduction to Fractional Quantisation	6	NUM	335
11-TEF-161-m01	Topological Effects in Electronic Systems	6	NUM	386
11-FTAS-161-m01	Field Theoretical Aspects of Solid State Physics	6	NUM	343
11-AKM-161-m01	Cosmology	6	NUM	313
11-AST-161-m01	Theoretical Astrophysics	6	NUM	321
11-APL-161-m01	High Energy Astrophysics	6	NUM	315
11-RQFT-161-m01	Relativistic Quantum Field Theory	8	NUM	380
11-QFT2-161-m01	Quantum Field Theory II	8	NUM	368
11-TEP-161-m01	Theoretical Elementary Particle Physics	8	NUM	388
11-ATTP-161-m01	Selected Topics of Theoretical Elementary Particle Physics	6	NUM	323
11-BSM-161-m01	Models Beyond the Standard Model of Elementary Particle	6	NUM	325
Internship	· · · · · · · · · · · · · · · · · · ·		<u>I</u>	<u> </u>
10-M=EPRK-161-m01	Internship Mathematics	10	NUM	165
Thesis (30 ECTS credits)			<u> </u>	
10-M=MAAR-161-m01	Master Thesis Mathematics	30	NUM	206
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Module title			Abbreviation			
Bioinfo	ormatic	5			07-Bl-161-m01	
Modul	e coord	inator		Module offered by		
holder	of the (Chair of Bioinformatics		Faculty of Biology		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	undergraduate				
Conter	nts					
Fundar	mental	principles of bioinforma	atics.			
Intend	ed learı	ning outcomes				
Studer	nts are p	proficient in methods for	or the analysis of DNA a	and protein database	es.	
Course	s (type	number of weekly con	tact hours, language –	- if other than Germa	n)	
V (2) +	Ü (2)	,				
Metho	d of ass	essment (type_scope	 language — if other th	an German examina	ition offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		every serie
written	exami	nation (approx. 60 to 12	20 minutes).			
lf anno	unced	by the lecturer at the be	eginning of the course,	the written examina	tion may be replace	d by an oral
examir	nation o	of one candidate each (approx. 20 minutes) or	an oral examination	n in groups of 2 cand	idates (ap-
prox. 1	5 minut	es per candidate).	d/or English			
credita	creditable for bonus					
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	e				
Referre	ed to in	IPOI (examination res		degree programmes)		
Modul	0 20002	are in				
Mactor	e appea	ns m	Science (2016)			
Master	's degr	ee (1 major) Computer . ee (1 major) Mathemati	c_{2016}			
Master	's degri	ee (1 major) Mathemati	onal Mathematics (201	6)		
Master	's degr	ee (1 major) Computer 9	Science (2017)	0)		
Master	's degr	ee (1 major) Computer 9	Science (2018)			
Master	's degr	ee (1 major) Computatio	onal Mathematics (201	0)		
Master	's degr	ee (1 major) Mathemati	cs (2019)	<i>)</i>		
Master	's teach	ning degree Gymnasiun	n MINT Teacher Educat	ion PLUS. Elite Netw	ork Bavaria (ENB) (20	020)
Supple	ementar	y course MINT Teacher	Education PLUS. Elite	Network Bavaria (EN	B) (2020)	- /
Master	's degr	ee (1 major) Computatio	onal Mathematics (202	22)		
Master	's degr	ee (1 major) Mathemati	cs (2022)			
Master	's degr	ee (1 major) Computatio	onal Mathematics (202	24)		
Master	's degr	ee (1 major) Mathemati	cs (2024)	12		
Master	's teach	ning degree Gymnasiun	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (20	025)
Master's w	vith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 10 / 403



Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 11 / 403
	data record Master (120 ECTS) Mathematik - 2019	1

Modul	e title				Abbreviation	
Bioinfo	ormatic	s B			07-MBI-B-152-m01	
Modul	o coord	inator		Modulo offered by		
Modul						
nolder	of the C	hair of Bioinformatics	Out offer and an	Faculty of Biology		
ECIS	(not)	od of grading	Unly after succ. con	npl. of module(s)		
5						
Duratio	on	Module level	Other prerequisites			
Conter		glauuale				
Advon		aurrant regults of high		d and discussed this	ia includos roculto fr	
and se	and sequence analysis, protein domains and protein families, large-scale data analysis (e. g. net generation se- quences, proteomics data), analysis of different functional RNAs (e. g. miRNAs, lncRNAs).					
Intend	ed leari	ning outcomes		<u> </u>	,	
Unders	tand re	cent results in bioinfo	matics Discuss their i	molications Have an	advanced (Master)	level know-
ledge o	of typica	al technologies and res	earch questions in bio	informatics.	advanced (Master)	
Course	s (type	, number of weekly cor	itact hours, language –	- if other than Germa	n)	
V (2)						
Module taught in: German and/or English						
Metho ster, in	d of ass formati	s essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt	ten exai	nination (30 to 60 min	utes, including multipl	e choice questions) (or	
c) oral	examin	ation of one candidate	each (30 to 60 minute	s) or		
d) oral	examin	ation in groups of up t	o 3 candidates (30 to 6	o minutes)		
Langua	age of a	ssessment: German ar	id/or English			
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	oad					
150 h						
Teachi	ng cycl	e				
Referre	ed to in	LPO I (examination re	gulations for teaching-	degree programmes)		
Modul	e appea	nrs in				
Master	's degr	ee (1 major) Biology (20	015)			
Master	's degr	ee (1 major) Biomedici	ne (2015)			
Master	's degr	ee (1 major) Mathemat	ics (2016)			
Master	's degr	ee (1 major) Computati	onal Mathematics (201	6)		
Master	's degr	ee (1 major) Bioscience	es (2016)			
Master	's teach	ning degree Gymnasiu	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	016)
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	s degr	ee (1 major) Bioscience	25 (2017)			
Master	s aegri	ee (1 major) Biomedici	10(2018)			
Master	s uegi יכ אםסיי	ee (1 major) Diusciellus ee (1 major) Computati	onal Mathematics (201	ი)		
Master	's degr	ee (1 major) Mathemat	ics (2019)	21		
			× • //			,
Master's w	ith 1 majoi	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 12 / 403

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Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Biosciences (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

exchange program Biosciences (2022)

Master's degree (1 major) Biosciences (2023)

Master's degree (1 major) Biosciences (2024)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 13 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Bioinfo	Bioinformatics 07-MS2BI-152-m01					
Modul	e coord	inator		Module offered by	<u> </u>	
holder	of the (hair of Bioinformatics		Faculty of Biology		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade		<u> </u>		
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
Advand and se	ces and quence es, prot	current results of bioin analysis, protein dom eomics data), analysis	nformatics are explaine ains and protein famili of different functional	d and discussed, th es, large-scale data a RNAs (e. g. miRNAs,	is includes results fr analysis (e. g. net ge lncRNAs).	om genome neration se-
Intend	Intended learning outcomes					
Unders ledge o	Understand recent results in bioinformatics. Discuss their implications. Have an advanced (Master) level know- ledge of typical technologies and research questions in bioinformatics.					
Course	es (type,	number of weekly cor	itact hours, language –	- if other than Germa	ın)	
V (2) + Module	S (1) e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass Iformati	essment (type, scope, on on whether module	language — if other the can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt c) oral d) oral Langua	ten exar examin examin age of a	nination (30 to 60 min ation of one candidate ation in groups of up t ssessment: German ar	utes, including multiple each (30 to 60 minute o 3 candidates (30 to 6 nd/or English	e choice questions) s) or o minutes)	or	
Allocat	tion of p	olaces				
Additio	onal info	ormation				
Worklo	bad					
300 h						
Teachi	ng cycl	9				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
		· · · · · · · · · · · · · · · · · · ·	<u> </u>			
Modul	e appea	rs in				
Master	's degre	ee (1 maior) Biochemis	trv (2015)			
Master	's degre	ee (1 major) Biology (20	D15)			
Master	r's degre	ee (1 major) Mathemat	ics (2016)			
Master	r's degre	ee (1 major) Computati	onal Mathematics (201	6)		
Master	r's degre	ee (1 major) Bioscience	es (2016)			
Master	r's teach	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (20	016)
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	Master's degree (1 major) Biosciences (2017)					
Master	Master's degree (1 major) Biochemistry (2017)					
Master	s uegre	ee (1 major) BIOSCIENCE	:5 (2010) onal Mathematics (and	0)		
Master	s uegie s's deor	e (1 major) Computati	irs (2010)	<i>y</i> ,		
	- J ucgit	a majory mathemati				· · · · · · · · · · · · · · · · · · ·
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 14 / 403

Master's degree (1 major) Biochemistry (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Biosciences (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

exchange program Biosciences (2022)

Master's degree (1 major) Biosciences (2023)

Master's degree (1 major) Computer Science (2023)

Master's degree (1 major) Biosciences (2024)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Computer Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 15 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Bioinfo	Bioinformatics F1 07-MS2BIF1-152-m01				01	
Module	e coord	inator		Module offered by		
holder	of the (Chair of Bioinformatics		Faculty of Biology		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its	0				
Detaile mics (s proteo netic a a term	Detailed insight into methods in bioinformatics; depending on the topic selected, fields covered include: geno- mics (sequence-, domain analysis and annotation), omics data analysis (NGS, transcriptomics, metabolomics, proteomics), topological and structural analysis of biological interactions including statistical methods, phyloge- netic analysis, protein structure analysis. Results are documented in the form of a presentation, a publication or a term paper.					
Intend	ed learı	ning outcomes				
Studer are abl scienti	nts have e to de: fic prac	e gained knowledge on sign experiments, colle tice.	experimental setups a ct data and interpret th	nd methods used in nem statistically, adh	the field of bioinforr nering to the principl	natics. They es of good
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
P (14) +	+ S (1)					
Module	e taugh	t in: German and/or Eng	glish			
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
b) log (c) oral d) oral e) pres Langua	(15 to 30 examin examin entatio age of a	ation of one candidate ation of one candidate ation in groups of up to n (20 to 45 minutes) ssessment: German an	each (30 to 60 minute 9 3 candidates (30 to 6 d/or English	s) or o minutes) or	ור	
Allocat	tion of p	olaces				
Additic	onal inf	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	٩				
		•				
Referre	ed to in	LPOI (examination res		legree programmes)		
	<u></u>					
Module appears in						
Master's degree (1 major) Biology (2015)						
Master's degree (1 major) Biology (2015) Master's degree (1 major) Mathematics (2016)						
Master	's degr	ee (1 major) Computatio	onal Mathematics (201	6)		
Master's degree (1 major) Biosciences (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	's degr	ee (1 major) Bioscience	s (2017)			
Master	's degr	ee (1 major) Bioscience	s (2018)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 16 / 403

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Biosciences (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Biosciences (2023)

Master's degree (1 major) Biosciences (2024)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 17 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Bioinformatics F2 07-MS2BIF2-152-m01				01		
Modul	e coord	inator		Module offered by	<u> </u>	
holder	holder of the Chair of Bioinformatics		Faculty of Biology			
FCTS	Mothe	ad of grading	Only after succ. con			
15	(not)	successfully completed				
Durati	(1101) s		Othor proroquicitor			
1 seme	ster	graduate		•		
Conter	Its	0				
Advand mics (s proteo netic a ned an term pa	ced insi sequent mics), t nalysis d are m aper.	ght into methods in bio ce-, domain analysis ar opological and structu , protein structure anal nodified where necessa	pinformatics; dependir ad annotation), omics o ral analysis of biologic ysis. The techniques a ry. Results are docume	ng on the topic select data analysis (NGS, t al interactions incluc oplied are evaluated ented in the form of a	ted, fields covered ir ranscriptomics, met ling statistical metho on the basis of the presentation, a pub	nclude: geno- abolomics, ods, phyloge- results obtai- olication or a
Intend	ed lear	ning outcomes				
Proficio se a sc design	ency in ientific a resea	one or more methods i project in the field of b arch project and are pre	n bioinformatics that a ioinformatics and to d pared for working on a	llows students to inc ocument the results a scientific question f	dependently perform obtained. Students for their thesis.	and organi- are able to
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
P (29) Module	+ S (1) e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass formati	sessment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt b) log (c) oral d) oral e) pres Langua	a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes) Language of assessment: German and/or English					
Allocat	ion of p	DIACES				
Additio	onal inf	ormation				
Worklo	ad					
450 h	1					
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Module appears in						
Master	Master's degree (1 major) Biology (2015)					
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's degree (1 major) Biosciences (2016)						
Master	's teacl	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	016)
Supple	ementai	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	's degr	ee (1 major) Bioscience	s (2017)			
Master's w	ith 1 majo	r Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 18 / 403

Master's degree (1 major) Biosciences (2018)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Biosciences (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Biosciences (2023)

Master's degree (1 major) Biosciences (2024)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 19 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Systems Biology 07-MS3S-152-m01						
Module coordinator				Module offered by		
holder	of the (Chair of Bioinformatics		Faculty of Biology		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade		• • • •		
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conten	nts					
Advand sults fr as regu	ces and rom fun ulatory r	current results of com ctional genomics, dyna networks.	putational systems bio amics of the transcripto	logy are explained a me, of metabolism a	nd discussed, this ir and metabolic netwo	ncludes re- orks as well
Intend	ed learr	ning outcomes				
Unders ledge o	stand re of typica	cent results in systems al technologies and res	s biology. Discuss their search questions of sys	implications. Have a tems biology.	an advanced (Master	r) level know-
Course	es (type,	, number of weekly cor	itact hours, language –	- if other than Germa	in)	
V (2) + Module	S (1) e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass Iformati	e ssment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt c) oral d) oral Langua	a) written examination (30 to 60 minutes, including multiple choice questions) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes)					
Allocat	tion of p	olaces				
Additic	nal inf	ormation				
Additio						
Workle						
WORKIG	Jau					
300 h						
Teachi	ng cycl	9				
Referre	ed to in	LPO I (examination re	gulations for teaching-	degree programmes)		
		•				
Module	e appea	irs in				
Master	's degre	ee (1 major) Biochemis	try (2015)			
Master	's degre	ee (1 major) Biology (20	015) See (2004)			
Master	r's degre	ee (1 major) Mathemat	ICS (2016) anal Mathematics (aas	()		
Master	's degre	ee (1 major) Computati		0)		
Master	's toach	ving degree Gymnasiur	:S (2010) n MINT Teacher Educat	ion PLUS Elite Netw	ork Bayaria (FNB) (a	016)
Sunnle	mentar	v course MINT Teachei	Fducation PILIS Flite	Network Bayaria (FN	B) (2016)	010)
Master	r's degre	ee (1 major) Bioscience	es (2017)		_, (,	
Master	Master's degree (1 major) Biochemistry (2017)					
Master's degree (1 major) Biosciences (2018)						
Master	's degre	ee (1 major) Computati	onal Mathematics (201	9)		
Master	r's degre	ee (1 major) Mathemat	ics (2019)	-		
Master's w	vith 1 major	Mathematics (2019)	JMU Würzburg data record	g ● generated 19-Apr-2025 ● € Master (120 ECTS) Mathemati	ixam. reg. ik - 2019	page 20 / 403

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Master's degree (1 major) Biochemistry (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Biosciences (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Biosciences (2023)

Master's degree (1 major) Biosciences (2024)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 21 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module	e title				Abbreviation	
Systen	Systems Biology F1 07-MS3SYF1-152-m01					
Module	e coord	inator		Module offered by	<u> </u>	
holder of the Chair of Bioinformatics			Faculty of Biology			
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Duratio	on l	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its					
The pra ticular, protein namics ling).	actical o make s structu s of prot	course will provide stude students proficient in a ure analysis and protein cein-protein interactions	ents with advanced in dynamical method in folding, genome anal , modelling cellular re	sights into a field of systems biology (are ysis and evolution; o gulation; modelling	systems biology and as that may be selec lynamic network ana metabolism, statisti	l will, in par- ted include alysis, the dy- cal model-
Intend	ed learr	ning outcomes				
Studer They and ciples	nts have re able of good	e gained knowledge on e to design scientific rese scientific practice.	experimental setups a arch, to collect data a	nd methods used in nd to interpret them	the field of systems statistically, adherir	biology. Ig to the prin-
Course	s (type,	, number of weekly cont	act hours, language –	- if other than Germa	n)	
P (14) + Module	+ S (1)	t in German and /or Eng	lich			
Metho	d of acc	essment (type scope]	anguago — if other th	an Gorman, oyamina	tion offered — if not	avani sama-
ster, in	formati	on on whether module of	can be chosen to earn	a bonus)	tion onered — in not	every seme-
a) writt b) log (c) oral d) oral e) pres Langua	 a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes) 					
Allocat	ion of p	olaces				
Additio	onal info	ormation				
 Worklo			_			
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Module appears in						
Master	's degre	ee (1 major) Biology (20	15)			
Master's degree (1 major) FOKUS Life Sciences (2015)						
Master	's degre	ee (1 major) Mathematic	:s (2016)			
Master's degree (1 major) Computational Mathematics (2016)						
Master's degree (1 major) Biosciences (2016)						
Niaster	s teach	ning degree Gymnasium		Notwork Poweria (TN	DIK BAVARIA (ENB) (20 P) (2016)	J10)
Supple		y course minur reacher l	=uucation PLUS, Ellte	Network Bavaria (EN	D) (2010)	
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg	• generated 19-Apr-2025 • e	xam. reg.	page 22 / 403
			data record	Master (120 ECTS) Mathemati	k - 2010	

Master's degree (1 major) Biosciences (2018)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Biosciences (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Biosciences (2023)

Master's degree (1 major) Biosciences (2024)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 23 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Systems Biology F2 07-MS3SYF2-152-m01				01		
Module coordinator Module offered			Module offered by	<u> </u>		
holder of the Chair of Bioinformatics			Faculty of Piology			
FCTS	Moth	d of grading	Only after succ. con			
15	(not)	successfully completed				
Duratio		Module level	Other prerequisites	4		
1 seme	ster	graduate				
Conter	its		-			
The pra ticular, proteir namics ling). T sary. R	The practical course will provide students with advanced insights into a field of systems biology and will, in par- ticular, make students proficient in a dynamical method in systems biology (areas that may be selected include protein structure analysis and protein folding, genome analysis and evolution; dynamic network analysis, the dy- namics of protein-protein interactions, modelling cellular regulation; modelling metabolism, statistical model- ling). The techniques applied are evaluated on the basis of the results obtained and are modified where neces- saty. Results are documented in the form of a presentation, a publication or a term paper.					
Intend	ed lear	ning outcomes				
Proficie nise a design	ency in scientif a resea	one or more methods in ic project in the field of arch project and are pre	n systems biology that bioinformatics and to pared for working on a	allows students to in document the result a scientific question f	ndependently perfor is obtained. Student for their thesis.	m and orga- s are able to
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
P (29) Module	+ S (1) e taugh	t in: German and/or En	glish			
Metho ster. in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt b) log (c) oral d) oral e) pres Langua	 a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (15 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) or e) presentation (20 to 45 minutes) l anguage of assessment: German and/or English 					
Allocat	ion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
450 h						
Teachi	ng cycl	e				
Referre	ed to in	LPO I (examination reg	gulations for teaching-	degree programmes)		
Module appears in						
Master	's degr	ee (1 major) Biology (20	15)			
Master	's degr	ee (1 major) Mathemati	cs (2016)			
Master's degree (1 major) Computational Mathematics (2016)						
Master's degree (1 major) Biosciences (2016)						
Master	's teacl	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	016)
Supple	ementai	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	's degr	ee (1 major) Bioscience	S (2017)			
waster's w	iin 1 majo	watnematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	ik - 2019	page 24 / 403

Master's degree (1 major) Biosciences (2018)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Biosciences (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Biosciences (2023)

Master's degree (1 major) Biosciences (2024)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 25 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Systen	Systems Biology B 07-MS-B-152-m01					
Module	e coord	inator		Module offered by	<u> </u>	
holdor	of tho (hair of Bioinformatics		Eaculty of Biology		
FCTS	Moth	d of grading	Only offer succ. con	raculty of Blology		
	(not)	successfully completed				
Durati						
1 seme	on ester	graduate				
Conten	its	3.00000				
Advano sults fr as regu	ces and om fun Ilatory I	current results of com ctional genomics, dyna networks.	butational systems bio mics of the transcripto	logy are explained a me, of metabolism a	nd discussed, this ir and metabolic netwo	ncludes re- orks as well
Intended learning outcomes						
Understand recent results in systems biology. Discuss their implications. Have an advanced (Master) level know- ledge of typical technologies and research questions of systems biology.						
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
V (2) Module taught in: German and/or English						
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt c) oral d) oral Langua	a) written examination (30 to 60 minutes, including multiple choice questions) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (30 to 60 minutes) Language of assessment: German and/or English					
Allocat	ion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	e				
Referre	ed to in	LPO I (examination reg	ulations for teaching-	degree programmes)		
			<u> </u>	<u> </u>		
Module	e appea	urs in				
Master	's degr	ee (1 major) Biology (20	15)			
Master	's degr	ee (1 major) Biomedicir	ie (2015)			
Master	's degr	ee (1 major) Mathemati	cs (2016)			
Master	's degr	ee (1 major) Computatio	onal Mathematics (201	6)		
Master's degree (1 major) Biosciences (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Biosciences (2017)						
Master's degree (1 major) Biomedicine (2018)						
Master's degree (1 major) Biosciences (2018)						
Master's degree (1 major) Computational Mathematics (2019)						
master	s aegr	ee (1 major) Mathemati	LS (2019)			
Master's w	ith 1 majo	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 26 / 403

UNIVERSITÄT WÜRZBURG

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Biosciences (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Biosciences (2023)

Master's degree (1 major) Biosciences (2024)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 27 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Laser Spectroscopy of the second sec	Module title					Abbreviation		
Module coordinator Module offered by lecturer of seminar "Laserspektroskopie" (Laser Spectros- copy) Institute of Physical and Theoretical Chemistry copy) ECTS Method of grading Only after succ. compl. of module(s) 5 numerical grade Duration Module level Other prerequisites 1 semester graduate This module introduces students to the fundamental principles of laser spectroscopy. It discusses absorption and emission spectroscopy. Intended learning outcomes Students are able to explain the components and operating principles of lasers as well as the optical principles of laser technology. They are able to describe the principles of absorption and emission spectroscopy. Courses (type, number of weekly contact hours, language — if other than German) S (2) + 0 (1) Module taught in: German or English Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus) a) written examination of one candidate each (approx. 20 minutes) Language of assessment: German and/or English Additional information Vorkload 150 h Teaching cycle	Laser S	pectro	scopy		08-PCM1a-161-m01			
lecturer of seminar "Laserspektroskopie" (Laser Spectros- copy) ECTS Method of grading Only after succ. compl. of module(s) S inumerical grade	Module	e coord	inator		Module offered by			
ECTS Method of grading Only after succ. compl. of module(s) 5 num=rical grade Duration Module level Other prerequisites Isemester graduate Contents Contents Contents Students are able to explain the components and operating principles of laser sawell as the optical principles of laser (pp. number of weekly contact hours, language – if other than German) S (2) + 0 (1) Module taught in: German or English Method of assessment (type, scope, language – if other than German, examination offered – if not every semester, information on whether module can be chosen to earn a bonus) a) withen examination (approx. 90 minutes) or b) or al examination of acadidate each (approx. 20 minutes) Language of assessment (type, scope, language – if other than German, examination offered – if not every semester, information of acadidate each (approx. 20 minutes) Language of assessment: German and/or English Allocation of place Allocation of place Facehing cycle Referred to in LPO I (examination regulations for teaching-degree programmes) <td>lecture copy)</td> <td>r of ser</td> <td>ninar "Laserspektrosko</td> <td>pie" (Laser Spectros-</td> <td colspan="4">s- Institute of Physical and Theoretical Chemistry</td>	lecture copy)	r of ser	ninar "Laserspektrosko	pie" (Laser Spectros-	s- Institute of Physical and Theoretical Chemistry			
5 numerical grade Duration Module tevel Other prerequisites 1 semester graduate This module introduces students to the fundamental principles of laser spectroscopy. It discusses absorption and emission spectroscopy. Intended Beaming outcomes	ECTS	Metho	od of grading	Only after succ. con	. compl. of module(s)			
Duration Module level Other prerequisites 1 semester graduat Contents Content =	5	nume	rical grade					
1 semester graduate Concerts This module introduces students to the indamental principles of laser spectroscopy. It discusses absorption and emission spectroscopy. Intended lear-ing outcomes	Duratio	on	Module level	Other prerequisites				
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Additional information Additional information Additional information Additional information Additional information Additional information Additional Additional Additional Additional Additional Additional Additional Additional Addited Addi	Allocat	ion of _l	olaces					
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Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022)	Master's degree (1 major) Computational Mathematics (2010)							
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022)	Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2010)							
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022)	Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENR) (2020)						
Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022)	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)							
Master's degree (1 major) Functional Materials (2022)	Master's degree (1 major) Computational Mathematics (2022)							
	Master	Master's degree (1 major) Functional Materials (2022)						
Master's with 1 major Mathematics (2019) JMU Würzburg • generated 19-Apr-2025 • exam. reg. page 28 / 403	Master's wi	ith 1 majo	r Mathematics (2019)	JMU Würzburg	• generated 19-Apr-2025 • e	xam. reg.	page 28 / 403	

Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Chemistry (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Functional Materials (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 29 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Advanced Physical Chemistry (Lab)				08-PCM1b-161-m01		
Module	e coord	inator		Module offered by		
lecture copy)	r of ser	ninar "Laserspektroskoj	bie" (Laser Spectros-	Institute of Physical and Theoretical Chemistry		
ECTS	Methe	od of grading	Only after succ. con	npl. of module(s)		
5	(not) s	successfully completed				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
This module gives students the opportunity to use modern experimental methods in physical chemistry in the la- boratory. After a safety briefing, the students autonomously conduct experiments in the laboratory. Students will be expected to take tests and write lab reports to demonstrate their knowledge.						
Intende	ed lear	ning outcomes				
Studen They ar	ts have e able	e developed a high level to analyse the resulting	of proficiency in mod measurements and w	ern experimental me rite a lab report.	thods in physical ch	emistry.
Course	s (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
P (4) Module	e taugh	t in: German or English				
Method	d of ass	sessment (type, scope, l	anguage — if other th	an German, examina	tion offered — if not	every seme-
ster, in	format	ion on whether module	can be chosen to earn	a bonus)		
Vortestate/Nachtestate (pre and post-experiment examination talks approx. 15 minutes each, log approx. 5 to 10 pages each) and assessment of practical performance (2 to 4 random examinations)						
Allocat	ion of	places				
Additio	nal inf	ormation				
Additio	nal inf	ormation on module du	ration, block taught la	h course with approx	20 working days	
Worklo	ad				. 20 Working duys.	
450 h	au					
150 m						
Teachin	ng cycl	e				
Referre	d to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Module	e appea	ars in				
Master	's degr	ee (1 major) Chemistry (2016)			
Master	's degr	ee (1 major) Mathematio	cs (2016)			
Master	's degr	ee (1 major) Computatio	nal Mathematics (201	6)		
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computational Mathematics (2010)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS. Flite Network Bavaria (FNB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Computational Mathematics (2022)						
Master	's degr	ee (1 major) Mathematio	.s (2022)			
Master's wi	ith 1 maio	r Mathematics (2010)	IMII Wiirzburg	g • generated 10-Apr-2025 • A	xam, reg.	page 30 / 402
			data record	Master (120 ECTS) Mathemati	k - 2019	F-0- Jo / 40J

Master's degree (1 major) Chemistry (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 31 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Statist	ical Me	chanics and Reaction	Dynamics		08-PCM2-161-m01	
Module	e coord	inator		Module offered by		
lecture	r of ser	ninar "Chemische Dyna	mik" (Chemical Dyna-	Institute of Physical	and Theoretical Ch	emistry
mics)	1 01 3 61					ennstry
ECTS	Methe	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Contents						
This mo clude t reactio	odule c he func ns as v	iscusses selected topi lamental principles of vell as charge and ener	cs in statistical mechar statistical thermodynar gy transfer.	nics and reaction dyr nics, the transition s	namics. Topics to be tate theory, uni- and	covered in- l bimolecular
Intend	ed lear	ning outcomes				
Studen	its have d and a	e become familiar with re able to apply the fur	selected topics in stati Idamental principles of	stical mechanics and statistical thermody	d reaction dynamics. mamics.	. They have
Course	s (type	, number of weekly con	itact hours, language –	- if other than Germa	n)	
S (2) + Module	Ü (1) e taugh	t in: German or English			,	
Metho	d of as	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	format	on on whether module	can be chosen to earn	a bonus)		
a) writt b) oral c) talk Langua	en exa examir (approx age of a	mination (approx. 90 m nation of one candidate k. 30 minutes) ssessment: German ar	ninutes) or e each (approx. 20 minu nd/or English	utes) or		
Allocat	ion of _l	olaces				
Additio	onal inf	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
			<u></u>			
Module	e annea	urs in				
Master	's dear	ee (1 maior) Chemistry	(2016)			
Master	's degr	ee (1 major) Mathemati	(2010) ics (2016)			
Master's degree (1 major) Mathematics (2010) Master's degree (1 major) Computational Mathematics (2016)						
Master's degree (1 major) Functional Materials (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Chemistry (2018)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master Supple	's teac menta	ning degree Gymnasiur y course MINT Teacher	n MINT Teacher Educat Education PLUS, Elite	ion PLUS, Elite Netwo Network Bavaria (EN	ork Bavaria (ENB) (20 B) (2020)	020)
Master's w	ith 1 majo	r Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 32 / 403

Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Chemistry (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Functional Materials (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 33 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title				Abbreviation	
Nanoscale Materials 08-PCM3-161-m01						
Modul	e coord	inator		Module offered by		
lecture	er of the	seminar "Nanoskalige	Materialien"	Institute of Physica	l and Theoretical Ch	emistrv
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	and metretical ch	y
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
This m on, mo	odule d dern ch	iscusses advanced top aracterisation method	bics in nanoscale mater s and application area	rials. It focuses on th s of nanoscale mater	e structure, properti rials.	es, fabricati-
Intend	Intended learning outcomes					
Studer on area	Students are able to characterise nanoscale materials. They are able to name analytical methods and applicati-					
Course	es (type	number of weekly cor	ntact hours, language –	- if other than Germa	n)	
S (2) +	Ü (1)	,			,	
Modul	e taugh	t in: German or English				
Metho ster. in	d of ass Iformati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt	ten exar	nination (approx_oo_m	ninutes) or			
b) oral	examin	ation of one candidate	e each (approx. 20 min	utes) or		
c) talk	(approx	x. 30 minutes)				
Langua	age of a	ssessment: German ar	nd/or English			
credita	ible for	bonus				
Allocat	tion of p	olaces				
Additio	onal info	ormation				
Worklo	pad					
150 h	_					
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
		-				
Modul	e appea	irs in				
Master	's degre	ee (1 major) Chemistry	(2016)			
Master	r's degre	ee (1 major) Mathemati	ICS (2016) onal Mathematics (201	()		
Master	's degre	ee (1 major) Computati	Materials (2016)	0)		
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENR) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Chemistry (2018)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)					
Гвасреі	ior's deg	gree (1 major) Quantun	1 IECNNOLOGY (2021)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 34 / 403

Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Chemistry (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Functional Materials (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 35 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation				
Ultrafa	Ultrafast spectroscopy and quantum-control 08-PCM4-161-m01							
Modul	e coord	inator		Module offered by				
lecture	er of the	seminar "Nanoskalige	Materialien"	Institute of Physica	l and Theoretical Ch	emistry		
FCTS	Metho	d of grading	Only after succ. con	nol of module(s)		ennistry		
5	nume	rical grade						
Durati	on	Modulo loval	Other prorequisites	Other prorequisites				
	ostor	graduate	Prior completion of	modules 08-PCM12 :	and o8-PCM1b recon	amended		
Conter	nts	graduate	I nor completion of			imended.		
This m	odule d	iscusses advanced top	bics in ultrafast spectro	scopy and quantum	control. It focuses o	n ultrashort		
Intend	Intended learning outcomes							
plain the theory of time-resolved laser spectroscopy and name experimental methods. They can describe the principles and applications of quantum control.								
Course	es (type	, number of weekly cor	itact hours, language –	- if other than Germa	ın)			
S (2) + Modul	Ü (1) e taugh	t in: German or English						
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	ition offered — if not	everv seme-		
ster, ir	nformati	on on whether module	can be chosen to earn	a bonus)		,		
a) writ	ten exai	mination (approx. 90 m	ninutes) or					
b) oral	examin	ation of one candidate	e each (approx. 20 mini	utes) or				
c) talk	(approx	x. 30 minutes) scossment: Cormon or	d /or English					
Langua	age of a							
Alloca	tion of p	olaces						
Additi	onal info	ormation						
Worklo	oad							
150 h								
Teachi	ing cycl	9						
Referr	ed to in	LPO I (examination re	gulations for teaching-	degree programmes)	I			
		· · · · · ·	<u> </u>					
Modul	e appea	rs in						
Maste	r's degr	ee (1 maior) Chemistry	(2016)					
Maste	r's degr	ee (1 major) Mathemat	ics (2016)					
Master	r's degr	ee (1 major) Physics (2)	016)					
Maste	r's degr	ee (1 major) Nanostruc	ture Technology (2016)					
Master's degree (1 major) Computational Mathematics (2016)								
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)								
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)								
Master's degree (1 major) Chemistry (2018)								
Master's degree (1 major) Computational Mathematics (2019)								
Master's degree (1 major) Mathematics (2019)								
Master's degree (1 major) Nanostructure Technology (2020)								
Maste	r's degr	ee (1 major) Physics (20	020)					
Master's w	vith 1 majoı	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 36 / 403		


Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Physics International (2020) Master's degree (1 major) Quantum Engineering (2020) Master's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Quantum Engineering (2024) Master's degree (1 major) Physics International (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Computational Mathematics (2024)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 37 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Physical Chemistry of Supramolecular Assemblies			08-PCM5-161-m01			
Module	e coord	inator		Module offered by		
lecture	r of the	seminar "Physikalisch	e Chemie Supramole-	Institute of Physica	l and Theoretical Ch	emistry
kularer	Strukt	uren"				ennistry
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	Its					
This mo cal pro	odule e perties	examines the basic inte of aggregates as well a	ractions between mole is key applications of s	cules. It discusses th upramolecular chem	ne formation and ph iistry.	ysical-chemi-
Intende	ed lear	ning outcomes				
Studen in the f dern ap	its are a ield. Th oplicati	able to explain the basi ney can describe the for ons of supramolecular	c interactions between mation and physical-c chemistry.	n molecules demonst hemical properties o	rating a high degree f aggregates. They c	of expertise an name mo-
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
S (2) + Module	Ü (1) e taugh	t in: German or English				
Method	d of ass	sessment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	format	ion on whether module	can be chosen to earn	a bonus)		
a) writt b) oral c) talk Langua	a) written examination (approx. 90 minutes) or b) oral examination of one candidate each (approx. 20 minutes) or c) talk (approx. 30 minutes) Language of assessment: German and/or English					
Allocat	ion of _l	places				
Additio	onal inf	ormation				
Worklo	ad					
150 h						
Teeshi						
Teacini	ing cyci	e				
	• • •					
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Module	e appea	ars in				
Master	's degr	ee (1 major) Chemistry	(2016)			
Master	's degr	ee (1 major) Mathemati	cs (2016)			
Master	's degr	ee (1 major) Computatio	onal Mathematics (201	6)		
Master's degree (1 major) Functional Materials (2016)						
Master's teaching degree Gymnasium MiNT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Chemistry (2018)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master Supple	's teacl ementa	hing degree Gymnasiun ry course MINT Teacher	n MINT Teacher Educat Education PLUS, Elite	ion PLUS, Elite Netwo Network Bavaria (EN	ork Bavaria (ENB) (20 B) (2020)	020)
Master's wi	ith 1 majo	r Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 38 / 403

Julius-Maxir UNIVERSITÄT WÜRZBURG

Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Chemistry (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Biofabrication (2025)

Master's degree (1 major) Functional Materials (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 39 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation						
Physic	al Chen	nistry (Advanced Lab)			08-PCM6-161-m01	
Modul	e coord	inator		Module offered by	<u> </u>	
lecture	lecturers Physikalische Chemie (Physical Chemistry)			Institute of Physica	Institute of Physical and Theoretical Chemistry	
FCTS	Mothe	d of grading	Only after succ. con	nl of module(s)		emistry
	(not)	successfully completed				
Durati		Modulo loval	Other prorequisites			
1 seme	ester	graduate				
Conter	nts	0				
This m the Ins	odule g stitute o	ives students the oppo f Physical Chemistry an	tunity to get involved d learn some advance	in the work of one of d synthesis and ana	^t the research groups lytical methods.	s based at
Intended learning outcomes						
Studer	nts have	become proficient in t	ne research methods t	vnically used by the	relevant physical ch	emistry rese-
arch gi	roup. Th	ey are able to analyse t	heir findings and thus	help answer topical	questions in physic	al chemistry.
Course	es (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
P (4) Modul	e taugh	t in: German or English				
Metho	Method of assessment (type, scope, language — if other than German, examination offered — if not every seme-					
Ster, II				a Dollus)		
preser	presentation (approx. 20 minutes)					
Langua						
Alloca	tion of p	llaces				
Additio	onal inf	ormation				
Additio	onal info	ormation on module du	ration: block taught la	b course with approx	. 20 working days.	
Worklo	oad		_			
150 h						
Teachi	ng cycl	e				
Poforr	ad to in	IPOL (examination reg	ulations for teaching	degree programmes)		
Referre				degree programmes)		
 Modul	0 20002	rc in				
Mactor	e appea	ns m	2016)			
Master	r's dogr	ee (1 major) Chemistry (oo (1 major) Mathomativ	2010)			
Master	r's dogr	ee (1 major) Mathematic	.5 (2010) Inal Mathematics (201	6)		
Master	r's toach	ving dogroo Gympacium	MINT Toochor Educat	ion PLUS Elito Notw	ork Bayaria (ENB) (a	016)
Supple	montar	ning degree Gynniasiun	Education PLUS Elito	Notwork Bayaria (EN	DIN Davalla (LND) (21 B) (2016)	010)
Masto	r's dogr	y course milit reacher		Network Davaria (Liv	D) (2010)	
Master	r's degr	ee (1 major) Chemistry (2010) Inal Mathematics (201	0)		
Master's degree (1 major) Computational Mathematics (2019)						
Master	r's teach	ning degree Gymnasium	MINT Teacher Educat	ion PLUS Elite Netwo	ork Bavaria (FNB) (2	020)
Supplementary course MINT Teacher Education PLUS. Flite Network Bayaria (FNB) (2020)						
Maste	Master's degree (1 major) Computational Mathematics (2022)					
Master's degree (1 major) Mathematics (2022)						
Maste	Master's degree (1 major) Chemistry (2024)					
Maste	r's degre	ee (1 major) Computatio	nal Mathematics (202	24)		
Maste	r's degr	ee (1 major) Mathematio	cs (2024)			
Master's w	/ith 1 majo	Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e	xam. reg.	page 40 / 403



Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 41 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Theore	Theoretical Chemistry - Project course quantum chemistry 08-TCAP1-161-m01					
Module	e coord	inator		Module offered by		
head of the research group offering the module		Institute of Physical	and Theoretical Che	emistrv		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	(not) s	successfully completed				
Duratio	n	Module level	Other prerequisites			
1 Seme	ster	graduate				
Conten	ts	Sidduite				
This mo the Ins will be	odule g titute o on qua	ives students the oppo f Theoretical Chemistry ntum chemistry.	tunity to get involved and learn some of the	in the work of one of methods typically us	the research groups sed in the discipline.	based at The focus
Intend	ed learı	ning outcomes				
Studen tum ch	Students have learned some of the methods typically used in theoretical chemistry and, in particular, in quan- tum chemistry. They are able to explain issues that are relevant to the field of quantum chemistry.					
Course	s (type	, number of weekly cont	act hours, language –	if other than Germa	n)	
P (5)						
Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)						
presentation (approx. 30 minutes)						
Language of assessment: German and/or English						
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Additio	onal info	ormation on module du	ration: block taught la	o course with approx	. 20 working days.	
Worklo	ad					
150 h						
Teachi	ng cycl	۹				
reaction	5	•				
Referre	d to in	IPOL (examination reg	ulations for teaching.	legree programmes)		
Module	e appea	irs in				
Master	's degr	ee (1 major) Chemistry (2016)			
Master	's degr	ee (1 major) Mathematio	cs (2016)			
Master	's degr	ee (1 major) Computatio	nal Mathematics (201	6)		
Master	's teacl	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supple	mentar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (ENI	B) (2016)	
Master	's degr	ee (1 major) Chemistry (2018)			
Master	's degr	ee (1 major) Computatio	nal Mathematics (201	9)		
Master	's degr	ee (1 major) Mathematio	cs (2019)			
Master	's teach	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20)20)
Supple	mentar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (ENI	3) (2020)	
Master's degree (1 major) Computational Mathematics (2022)						
Master's degree (1 major) Mathematics (2022)						
Master	Master's degree (1 major) Chemistry (2024)					
Master	's degr	ee (1 major) Computatio	nal Mathematics (202	4)		
Master	s degr	ee (1 major) Mathematio	25 (2024)			
Master's w	ith 1 majoi	Mathematics (2019)	JMU Würzburg	• generated 19-Apr-2025 • e	xam. reg.	page 42 / 403



Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 43 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Theore	Theoretical Chemistry - Project course quantum dynamics 08-TCAP2-161-m01					
Module coordinator			Module offered by			
head of the research group offering the module		Institute of Physical	and Theoretical Che	mistry		
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)		
5	(not) s	successfully completed				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts	3.44446				
This mo the Ins will be	odule g titute o on qua	ives students the oppo f Theoretical Chemistry ntum dynamics.	rtunity to get involved and learn some of the	in the work of one of methods typically us	the research groups sed in the discipline.	based at The focus
Intend	ed learı	ning outcomes				
Studen tum dy	Students have learned some of the methods typically used in theoretical chemistry and, in particular, in quan- tum dynamics. They are able to explain issues that are relevant to the field of quantum dynamics.					
Course	s (type	, number of weekly con	act hours, language –	if other than Germa	n)	
P (5)						
Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)						
presentation (approx. 30 minutes)						
Langua	Language of assessment: German and/or English					
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Additio	nal info	ormation on module du	ration: block taught la	o course with approx	. 20 working days.	
Worklo	ad					
150 h						
Teachi	ng cycl	۹				
reaction	5	•				
Referre	d to in	IPOI (examination reg	ulations for teaching.	legree programmes)		
Module	e appea	irs in				
Master	's degr	ee (1 major) Chemistry (2016)			
Master	's degr	ee (1 major) Mathematio	cs (2016)			
Master	's degr	ee (1 major) Computatio	nal Mathematics (201	6)		
Master	's teacl	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supple	mentar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (ENI	B) (2016)	
Master	's degr	ee (1 major) Chemistry (2018)			
Master	's degr	ee (1 major) Computatio	onal Mathematics (201	9)		
Master	's degr	ee (1 major) Mathematio	cs (2019)			
Master	's teach	ning degree Gymnasium	MINT Teacher Educat	on PLUS, Elite Netwo	ork Bavaria (ENB) (20)20)
Supple	mentar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (ENI	8) (2020)	
Master	Master's degree (1 major) Computational Mathematics (2022)					
Master's degree (1 major) Mathematics (2022)						
Master	Master's degree (1 major) Chemistry (2024)					
Master	's degr	ee (1 major) Computatio	onal Mathematics (202	4)		
Master	s degr	ee (1 major) Mathematio	CS (2024)			
Master's w	ith 1 majoi	Mathematics (2019)	JMU Würzburg	• generated 19-Apr-2025 • e	xam. reg.	page 44 / 403



Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 45 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Selected Topics in Theoretical Chemistry 08-TCM1-16				08-TCM1-161-m01		
Module		nator		Module offered by		
lecture	r of lect	ure "Theoretische Chei	mie"	Institute of Physica	l and Theoretical Ch	emistry
ECTS	Metho	d of grading	Only after succ. cor	npl. of module(s)		
5	numer	ical grade				
Duratio	on	Module level	Other prerequisites	i		
1 seme	ster	graduate				
Conten	nts					
This mo	odule in	troduces students to t	he fundamental princi	ples of theoretical ch	iemistry.	
Intende	Intended learning outcomes					
Studen	Students are able to describe the mathematical and physical principles underlying the quantum chemical and					
quantu	ım dyna	mical approaches of th	neoretical chemistry.			
Course	es (type,	number of weekly con	tact hours, language –	- if other than Germa	ın)	
S(2) +	Ü (2)				•	
Metho	d of ass	essment (type_scope		an German, examina	tion offered — if not	every seme-
ster, in	formatio	on on whether module	can be chosen to earn	a bonus)	alon oncica in not	every senie
a) writt	en exan	nination (approx, oo to	180 minutes) or			
b) oral	examin	ation of one candidate	each (20 to 30 minute	es) or		
c) oral	c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) or					
d) log ((approx.	20 pages) or				
e) pres	entatio	ו (approx. 30 minutes)				
Langua	age of as	ssessment: German an	d/or English			
Allocat	tion of p	laces				
			_			
Additio	onal info	ormation				
Worklo	bad					
150 h						
Teachi	ng cycle	9				
Referre	ed to in	LPOI (examination res	gulations for teaching-	degree programmes)		
Module	o 20002	rs in				
Mactor	e appea	o (1 major) Chomistry	(2016)			
Master	's dogre	e (1 major) Chemistry	(2010)			
Master	's degre	e (1 major) (Computation	cs (2010) anal Mathematics (201	6)		
Master	's degre	e (1 major) Functional	Materials (2016)	0)		
Master	's teach	ing degree Gymnasium	n MINT Teacher Educat	ion PLUS, Flite Netwo	ork Bavaria (FNB) (20	016)
Supple	ementar	v course MINT Teacher	Education PLUS. Elite	Network Bavaria (EN	B) (2016)	
Master	Master's degree (1 major) Chemistry (2018)					
Master	Master's degree (1 major) Computational Mathematics (2010)					
Master	Master's degree (1 major) Mathematics (2019)					
Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)					
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)					
Master	's degre	e (1 major) Computatio	onal Mathematics (202	22)		
Master	's degre	ee (1 major) Functional	Materials (2022)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e	exam. reg.	page 46 / 403
Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022) Master's with 1 major Mathematics (2019) Master's with 1 major Mathematics (2019) Master's degree (1 constraints) Master's degree (1 major) Functional Materials (2022) Master's with 1 major Mathematics (2019) Master's degree (1 constraints) Master's degree (1 constraints) Master						

Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Chemistry (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Functional Materials (2025)

 Master's with 1 major Mathematics (2019)
 JMU Würzburg • generated 19-Apr-2025 • exam. reg.
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 data record Master (120 ECTS) Mathematik - 2019
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Module title Abbreviation						
Basics and Applications of Quantum Chemistry			08-TCM2-161-m01			
Module	e coord	inator		Module offered by		
lecture	r of lect	ure "Computational Ch	emistry"	Institute of Physica	l and Theoretical Ch	emistry
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	Its					
This m	odule ir	ntroduces students to t	he fundamental princi	oles of computationa	al chemistry.	
Intend	Intended learning outcomes					
Studer	nts are a	able to explain the theo	retical principles of co	mputational chemist	try and to apply met	hods in com-
putatio	onal che	emistry.		•		
Course	s (type)	, number of weekly con	tact hours, language –	- if other than Germa	n)	
S (2) +	Ü (2)	· · ·				
Metho	d of ass	essment (type_scope		an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		every serife
a) writt	en exar	mination (approx, 90 to	180 minutes) or			
b) oral	examin	ation of one candidate	each (20 to 30 minute	s) or		
c) oral	examin	ation in groups of up to	o 3 candidates (approx	. 15 minutes per cano	didate) or	
d) log (approx	. 20 pages) or				
e) pres	entatio	n (approx. 30 minutes)				
Langua	age of a	ssessment: German an	d/or English			
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Worklo	ad					
150 h						
Teachi	ng cvcl	2				
		-				
Poforra	d to in	IPOL (examination rec	ulations for teaching	degree programmes)		
Kelent						
		•				
Module	e appea	irs in	· · · ·			
Master	's degre	ee (1 major) Chemistry	(2016)			
Master	's degre	ee (1 major) Mathemati	cs (2016)			
Master	's degre	ee (1 major) Computatio	onal Mathematics (201	6)		
Master	's degre	ee (1 major) Functional	Materials (2016)			
Master	s teacr	ning degree Gymnasiun	The section DLUS Flits	ION PLUS, Elite Netwo	DIK BAVAIIA (ENB) (2)	016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	Master's degree (1 major) Chemistry (2018)					
Master's degree (1 major) Computational Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education DLUS, Elite Network Bayaria (ENR) (2020)						
Supplementary course MINT Teacher Education PLUS Flite Network Ravaria (ENR) (2020)						
Master	's deor	e (1 major) Computatio	anal Mathematics (202		0, (2020)	
Master	's degre	ee (1 major) Functional	Materials (2022)	,		
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 48 / 403

Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Chemistry (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Functional Materials (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 49 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Numeri	ical Me	thods and Programmin	g		08-TCM3-161-m01	
Module	e coord	inator		Module offered by		
lecture mie"	r of lec	ture "Programmieren in	Theoretischer Che-	Institute of Physical and Theoretical Chemistry		
ECTS Method of grading Only after succ.				npl. of module(s)		
5	nume	rical grade		• • • •		
Duratio	on	Module level	Other prerequisites	5		
1 seme	ster	graduate				
Contents						
This module provides an introduction to the fundamentals of programming in theoretical chemistry and discusses its application areas.						
Intende	ed lear	ning outcomes				
Studen as well	its are a as to r	able to explain and use name its application are	one of the programmi	ng languages typical	ly used in theoretica	l chemistry
Course	s (type	, number of weekly con	tact hours, language –	– if other than Germa	n)	
S (2) +	Ü (2)					
Metho ster, in	d of as format	sessment (type, scope, ion on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
b) oral c) oral d) log (e) pres Langua	examir examir approx entatio age of a	nation of one candidate nation in groups of up to 20 pages) or n (approx. 30 minutes) ssessment: German an	each (20 to 30 minute 3 candidates (approx d/or English	es) or 15 minutes per cano	didate) or	
Allocat	ion of	olaces				
Additio	onal inf	ormation				
Worklo	ad					
150 h	uu					
Toochi		•				
Teacini	ing cyci	e				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Module	e appea	ars in				
Master	's degr	ee (1 major) Chemistry	(2016)			
Master	's degr	ee (1 major) Mathemati	CS (2016)			
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gympasium MINT Teacher Education DLUS, Elite Network Payaria (ENP) (2006)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Chemistry (2018)						
Master's degree (1 major) Computational Mathematics (2019)						
Master Master Supple	's degr 's teac menta	ee (1 major) Mathemati hing degree Gymnasiur ry course MINT Teacher	cs (2019) n MINT Teacher Educat Education PLUS, Elite	ion PLUS, Elite Netwo Network Bavaria (EN	ork Bavaria (ENB) (2 B) (2020)	020)
Master's w	ith 1 majo	r Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 50 / 403

Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Chemistry (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Functional Materials (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 51 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Quantu	Quantum Dynamics 08-TCM4-161-m01					
Modul	e coord	inator		Module offered by		
locturo	r of loct	uro "Ouantondynamik'		Institute of Physical and Theoretical Chemistry		
	Mothe	d of grading	Only after succ. con	nl of module(s)		ennstry
5	nume	rical grade				
Duratio	n		Other prerequisites			
1 seme	ster	graduate				
Conter	its	0				
Time-d diabat	epende ic and a	nt Schrödinger equation diabatic states, non-ag	on, propagators, time-c diabatic dynamics, mix	lependent perturbati ed quantum-classica	on theory, adiabatic al dynamics.	theorem,
Intend	ed learr	ning outcomes	,			
The sti	idents r	ossess knowledge ab	out the time-dependen	t description of the r	uclear and electron	ic dynamics
in mole in the f	ecules.	Their insight into the m theoretical chemistry.	ethods and the numer	ical realizations allo	w them to carry out a	applications
Course	e s (type,	number of weekly con	tact hours, language –	- if other than Germa	n)	
S (2) +	Ü (2)					
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt	en exar	mination (approx, 90 to	180 minutes) or	-		
b) oral	examin	ation of one candidate	e each (20 to 30 minute	s) or		
c) oral	examin	ation in groups of up to	o 3 candidates (approx	. 15 minutes per cano	didate) or	
d) log (approx	. 20 pages) or				
e) pres	entatio	n (approx. 30 minutes) scossmont: Corman an	d /or English			
	ion of r					
		naces				
Additio	onal info	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	9				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Modul	e appea	rs in				
Master	's degre	ee (1 major) Chemistry	(2016)			
Master	Master's degree (1 major) Mathematics (2016)					
Master's degree (1 major) Computational Mathematics (2016)						
Master's degree (1 major) Functional Materials (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Chemistry (2018)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Supple	s teach ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	ык ваvaria (ENB) (2 В) (2020)	020)
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 52 / 403

Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Chemistry (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Functional Materials (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 53 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module	Module title				Abbreviation		
3D Use	er Interf	aces			10-HCI=3DUI-161-m	101	
Module	e coord	inator		Module offered by			
holder	of the C	Chair of Computer Scie	nce IX	Institute of Comput	er Science		
ECTS	Metho	od of grading	Only after succ. con	Only after succ. compl. of module(s)			
5	numer	rical grade					
Duratio	on	Module level	Other prerequisites				
1 seme	ster	graduate					
Conten	lts						
This me lopmer to learn ques. I on, the tegratin practic deo. Pr betwee and htt Intende After th spatial spatial put dev V (2) + Methoo ster, in presen Langua	Contents This module will give students the opportunity to learn about the specificities of 3D User Interfaces (3DUI) development using Virtual, Augmented or Mixed Reality technologies. The module content will be mainly dedicated to learn and practice the skills essential to the design and implementation of high-quality 3D interaction techniques. Design guidelines as well as classical and innovative 3D Interaction techniques will be studied. In addition, the course will address novel research themes such as 3D interaction for large displays and games; and integrating 3DUIs with mobile devices, robotics, and the environment. Students will be assessed through a group practical project (team work), which will consist of a program, a presentation, a technical report (2 ages) and a video. Previous years, the assignment replicated the IEEE 3DUI Contest 2011, where teams of students competed between each other to find the best solution (see results at https://www.youtube.com/watch?v=gYs-pBW7Agc Intended learning outcomes After the course, the students will gain a solid background on the theory and the methods to create your own 3D spatial interfaces. They will have a broad understanding of the particular difficulties of designing and developing spatial interfaces, as well as evaluating then. Students will also learn about traditional and novel 3D input/output devices (e.g., motion tracking system and Head-mounted Display). Courses (type, number of weekly contact hours, language — if other than German) V (2) + Ü (2) Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)						
Allocat	ion of r						
		haces					
Additio	onal info	ormation					
Focuse HCI,GE	s availa	able for students of the	Master's programme I	nformatik (Computer	Science, 120 ECTS o	credits):	
Worklo	ad						
150 h							
Teachi	ng cycle	9					
Referred to in LPO I (examination regulations for teaching-degree programmes)							
§ 22 II Nr. 3 b)							
Module appears in							
Master's degree (1 major) Computer Science (2016)							
Master's degree (1 major) Mathematics (2016)							
Master's degree (1 major) Computational Mathematics (2016)							
Master's degree (1 major) Computer Science (2017)							
Master	's degre	ee (1 major) Computer	Science (2018)				
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 54 / 403	

Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Computer Science (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Computer Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 55 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title					Abbreviation
Machin	ne Learr	ing (for User Interfaces)			10-HCI=MLUI-161-m01
Module	e coordi	nator		Module offered by	
holder of the Chair of Computer Science		e IX	Institute of Comput	er Science	
ECTS Method of grading		Only after succ. con	Dnly after succ. compl. of module(s)		
5	numer	ical grade			
Duratio	on	Module level	Other prerequisites	6	
1 seme	ster	graduate			
Conten	ts				
vastly in ly use in all area gesture wards h In this of plemen but also Finally, and Al. This con Topics in nels, ne deep le learning how to standin, dat	nachine mprove t dozen as where e, speec human- course, nting the o gain t they le urse pre include eural ne earning) g and A apply lo ng (web tabase	Ing is the science of gett e learning has given us p d understanding of the h s of times a day without e the understanding of u th, or eye-gaze, is param level AI. students will learn abou em and getting them to v he practical know-how n arn about some of Silico ovides a broad introduct : (i) Supervised learning etworks). (ii) Unsupervise . (iii) Best practices in m I). The course will also d earning algorithms to bu search, anti-spam), sma mining, and other areas.	ractical speech recognuman genome. Mac knowing it. It is one of ser input of high vari ount. Many research the most effective r vork. Students not or eeded to quickly and n Valley's best practi ion to machine learn (parametric/non-par ed learning (clusterin achine learning (bias raw from numerous of ilding gesture-based art robots (perception	intion, effective web hine learning is so pro of today's prominent ability, specifically for ers also think it is the machine learning tec hy learn the theoretic powerfully apply the ices in innovation as ing, data-mining, and rametric algorithms, g, dimensionality rec s/variance theory; in case studies and app and multimodal inter h, control), computer	An a search, self-driving cars, and a ervasive today that you probab- paradigms in HCI applicable in or natural interactions using, e.g., e best way to make progress to- hniques, and gain practice im- cal underpinnings of learning, ese techniques to new problems. it pertains to machine learning d statistical pattern recognition. support vector machines, ker- duction, recommender systems, novation process in machine olications, so that you'll also learn erfaces, text and speech under- vision, medical informatics, au-
Intende	ed learn	ing outcomes			
After th gies, e. Studen rious ar	ie cours .g., like its will b pplicati	e, the students will be a Octave. In addition, they be able to choose the ap on area, specifically in H	ble to solve machine will be able to deriv propriate approach a ICI.	learning tasks on th e main principles an nd tools to solve a g	eir own using assistive technolo- d apply these in own programs. iven machine learning task in va-
Course	s (type,	number of weekly conta	ct hours, language –	- if other than Germa	in)
V (2) +	Ü (2)				
Method ster, inf	d of ass formati	essment (type, scope, la on on whether module ca	nguage — if other than an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
present Langua credital	presentation of project results (approx. 40 minutes) Language of assessment: German and/or English creditable for bonus				
Allocation of places					
Additio	onal info	ormation			
Focuse: HCI,GE.	s availa	ble for students of the N	laster's programme l	nformatik (Computer	r Science, 120 ECTS credits):
Worklo	ad		· · · · · · · · · · · · · · · · · · ·		
150 h					

Teaching cycle

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Referred to in LPO I (examination regulations for teaching-degree programmes)

§	22	II	Nr.	3	b)	
_						

Module appears in
Master's degree (1 major) Computer Science (2016)
Master's degree (1 major) Mathematics (2016)
Master's degree (1 major) Computational Mathematics (2016)
Master's degree (1 major) Computer Science (2017)
Master's degree (1 major) Computer Science (2018)
Master's degree (1 major) Computational Mathematics (2019)
Master's degree (1 major) Mathematics (2019)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Master's degree (1 major) Computer Science (2021)
Master's degree (1 major) Computational Mathematics (2022)
Master's degree (1 major) Mathematics (2022)
Master's degree (1 major) Computer Science (2023)
Master's degree (1 major) Computational Mathematics (2024)
Master's degree (1 major) Mathematics (2024)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Master's degree (1 major) Computer Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 57 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title		Abbreviation			
Multin	nodal Us	ser Interfaces			10-HCI=MMUI-161-1	m01
Modul	e coord	inator		Module offered by		
holder	of the C	Chair of Computer Scie	nce IX	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
The multimodal interaction paradigm simultaneously uses various modalities like speech, gesture, touch, or ga- ze, to communicate with computers and machines. Basically, multimodal interaction includes the analysis as well as the synthesis of multimodal utterances. This course concentrates on the analysis, i.e., the input proces- sing. Input processing has the goal to derive meaning from signal to provide a computerized description and un- derstanding of the input and to execute the desired interaction. In multimodal systems, this process is interlea- ved between various modalities and multiple interdependencies exist between simultaneous utterances neces- sary to take into account for a successful machine interpretation. In this course, students will learn about the necessary steps involved in processing unimodal as well as multimo- dal input. The course will highlight typical stages in multimodal processing. Using speech processing as a prima- ry example, they learn about: 1. A/D conversion 2. Segmentation 3. Syntactical analysis 4. Semantic analysis 5. Pragmatic analysis 6. Discourse analysis 6. Discourse analysis 7. Aspecific emphasize will be on stages like morphology and semantic analysis. Typical aspects of multimodal in- terdependencies, i.e., temporal and semantic interrelations are highlighted and consequences for an algorithmic processing are derived. Prominent multimodal integration (aka multimodal fusion) approaches are described, in-					ultimodal in- in algorithmic described, in-	
After th	ne cours	se, the students will be	able to build their owr	n multimodal interfac	ces. They will have a	broad under-
standi dent w	ng of all vill learn	the necessary steps i about available tools	nvolved and will know for reoccurring tasks ar	prominent algorithm ad their pros and cor	ic solutions for each ns.	of them. Stu-
Course	es (type,	number of weekly co	ntact hours, language –	- if other than Germa	nn)	
V (2) +	Ü (2)					
Metho ster, in	d of ass Iformati	essment (type, scope on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-
presen Langua credita	itation c age of a able for l	f project results (appr ssessment: German ai bonus	ox. 40 minutes) nd/or English			
Alloca	tion of p	laces				
Additional information						
Focuses available for students of the Master's programme Informatik (Computer Science, 120 ECTS credits): HCLGF.						
Workload						
150 h						
Teaching cycle						
	ing cycli	-				
Master's w	/ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 58 / 403

Referred to in LPO I (examination regulations for teaching-degree programmes)
§ 22 II Nr. 3 b)
Module appears in
Master's degree (1 major) Computer Science (2016)
Master's degree (1 major) Mathematics (2016)
Master's degree (1 major) Computational Mathematics (2016)
Master's degree (1 major) Computer Science (2017)
Master's degree (1 major) Computer Science (2018)
Master's degree (1 major) Computational Mathematics (2019)
Master's degree (1 major) Mathematics (2019)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Master's degree (1 major) Aerospace Computer Science (2020)
Master's degree (1 major) Computer Science (2021)
Master's degree (1 major) Aerospace Computer Science (2021)
Master's degree (1 major) Computational Mathematics (2022)
Master's degree (1 major) Mathematics (2022)
Master's degree (1 major) Computer Science (2023)
Master's degree (1 major) Aerospace Computer Science (2023)
Master's degree (1 major) Computational Mathematics (2024)
Master's degree (1 major) Mathematics (2024)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Master's degree (1 major) Computer Science (2025)

Modul	Module title			Abbreviation	
Real-T	Real-Time Interactive Systems 10-HCI=RIS-161-m01				
Modul	e coordinator		Module offered by	- -	
holder	of the Chair of Computer Scie	ence IX	Institute of Comput	er Science	
ECTS	Method of grading	Only after succ. cor	npl. of module(s)		
5	numerical grade				
Duratio	on Module level	Other prerequisites	5		
1 seme	ester graduate				
This co human Reality tive Sy The co hands- concer What a RIS? W tual mo stem's and the part in Along to This in compo solutio and res Intend	purse provides an introduction procomputer systems. Such systems (RIS) due to their communications and cyber stems (RIS) due to their communications theoretical mode on and novel solutions necessing the conceptual print are the main requirements? Head with the main requirements? Head of the mission-critical as behavior. The third part intro- e consequences these require troduces some potential solutions and prominent cludes pipeline systems, sce- ment models, and others. No- ons. The theoretical and conce- search systems, e.g., X3D, inse- ed learning outcomes	n into the requirements stems are typically foun -physical systems. Late non aspects. Is derived from the requissary to tackle and fulfil ciples characterizing rea tow do we handle multip e have to do to assure to pects of time, latencies duces the application se ements have on decoup tions to data redundant to state-of-the-art appro- ne graphs, application se vel concepts like actor reptual discussions will stant reality, Unity3d,	, concepts, and engine d in perceptual comp ly, these systems are alrements of the appl l these requirements al-time interactive sys- ble modalities? How of timeliness? The secon- timeliness? The secon- timelines? The secon-timelines? The secon- timelines? The secon-timel	neering art of highly buting, Virtual, Augm e often termed Real- ication area as well s. The first part of the stems. Questions an do we define the time nd part will introduce the first part of the stems necessary to des ts of distribution and hronization, and inter engineering tasks a ting), event systems es will be covered as al context of today's simulator X.	interactive nented, Mixed Fime Interac- as common e course will swered are: eliness of e a concep- scribe a sy- d coherence, eral. The last eroperability. re discussed. , entity and alternative commercial
After th physio gical cl can ex to solv to deve	ne course, the students will h logical and psychological cha haracteristics of today's com pect from today's technologic e a given engineering task in elop alternative approaches f	ave a solid understandi aracteristics of the hum outer systems. Participa cal solutions. They will b this application area ar or future real-time inter-	ng of the boundary c an users as well as b ints will gain a solid i be able to choose the ind they will have a we active systems.	onditions defined by y the architectures a understanding abou e appropriate approa ell-founded basis en	y both, the ind technolo- t what they ich and tools abling them
Course	es (type, number of weekly co	ntact hours, language –	– if other than Germa	ın)	
V (2) +	Ü (2)				
Metho ster, in	d of assessment (type, scope formation on whether modul	, language — if other th e can be chosen to earr	an German, examina a bonus)	ition offered — if not	every seme-
written examination (approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus					
Allocation of places					
Additio	Additional information				
Worklo	bad				
150 h					
Master's w	ith 1 major Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 60 / 403

Teaching cycle

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Master's degree (1 major) Computer Science (2016)

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's degree (1 major) Computer Science (2017)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 61 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Advanced Automation 10			10-l=AA-152-m01			
Modul	o coord	inator		Modulo offered by		
Modul			\ //I			
holder	of the C	hair of Computer Scier		Institute of Comput	er Science	
ECIS	Metho	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its					
Advand the fiel	the field of sensor data processing, actuators, cooperating systems, mission and trajectory planning.					
Intend	ed learr	ning outcomes				
The stument a	ıdents l dvance	nave an advanced know d automation systems.	ledge of selected topi	cs in automation sys	tems. They are able	to imple-
Course	s (type	number of weekly con	tact hours language -	- if other than Germa	n)	
$V(\mu)$ +	<u>і</u> (урс.			n other than oerna	1)	
Metho	d of acc	assment (type scope	 language if other th	an German, evamina	tion offered — if not	avary sama-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		every serife
written credita	examir ble for	1ation (approx. 60 to 12 bonus	o minutes)			
Allocation of places						
	-					
Additio	onal info	ormation				
Focuse	s availa	able for students of the	Master's programme l	nformatik (Computer	Science, 120 ECTS	credits):
IT,IS,ES	S,LR,GE		_			
Worklo	oad					
240 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
§ 22	Nr. 3 b)					
Module	e appea	irs in				
Master	's degre	ee (1 major) Space Scie	nce and Technology (2	.015)		
First st	ate exa	mination for the teaching	ng degree Gymnasium	Computer Science (2	2015)	
Master	's degre	ee (1 major) Computer S	cience (2016)			
Master	's degre	ee (1 major) Mathemati	cs (2016)			
Master	's degre	ee (1 major) Computatio	onal Mathematics (201	6)		
Master	's teach	ning degree Gymnasium	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	016)
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master's degree (1 major) Computer Science (2017)						
Master's degree (1 major) Computer Science (2018)						
Module	e studie	es (Master) Computer S	cience (2019)			
Master	's degre	ee (1 major) Computatio	onal Mathematics (201	9)		
Master	Master's degree (1 major) Mathematics (2019)					
Master	's teach	ning degree Gymnasium	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	020)
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2020)	
Master	's degre	ee (1 major) Computatio	onal Mathematics (202	22)		
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 62 / 403



Master's degree (1 major) Mathematics (2022)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 63 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Compu	Computational Geometry 10-I=AG-161-m01					
Module coordinator				Module offered by		
holder	of the (Chair of Computer Scien	ce l	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade		• • • •		
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its		•			
In man format algoritl gorithn ve.	In many areas of computer science for example robotics, computer graphics, virtual reality and geographic in- formation systems it is necessary to store, analyse, create or manipulate spatial data. This class is about the algorithmic aspects of these tasks: We will acquire techniques that are needed to plan and analyse geometric al- gorithms and data structures. Every technique will be illustrated with a problem in the practical areas listed abo- ve					
Intend	ed learr	ning outcomes				
The stu metric based	idents a probler on the o	are able to decide which n. The students are able concepts and technique	algorithms or data st to analyse new probl s acquired in the lectu	ructures are suitable ems and to come up ure.	e for the solution of a with their own effici	a given geo- ient solutions
Course	s (type,	, number of weekly conta	act hours, language –	- if other than Germa	n)	
V (2) +	Ü (2)					
Metho ster, in written	d of ass formati examir	essment (type, scope, la on on whether module c nation (approx. 60 to 120	anguage — if other th an be chosen to earn o minutes).	an German, examina a bonus)	tion offered — if not	every seme-
If anno examir prox. 1 Langua credita	unced l nation o 5 minut age of a ble for	by the lecturer at the beg f one candidate each (a es per candidate). ssessment: German and bonus	ginning of the course, pprox. 20 minutes) or I/or English	the written examina an oral examination	tion may be replaced in groups of 2 cand	d by an oral idates (ap-
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Focuse AT,HCI	s availa ,GE	able for students of the <i>I</i>	Master's programme l	nformatik (Computer	r Science, 120 ECTS (credits):
Worklo	ad					
150 h						
Teachi	ng cvcl	9	-			
	0 . 7	-				
Roforra	d to in	IPOI (examination reg	lations for teaching.	degree programmes)		
Module	e appea	irs in				
Master	's degre	ee (1 major) Computer S	cience (2016)			
Master	's degre	ee (1 major) Mathematic	s (2016)			
Master	's degre	ee (1 major) Computation	nal Mathematics (201	6)		
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	Master's degree (1 major) Computer Science (2017)					
Master	's degre	ee (1 major) Computer S	cience (2018)			
Master	's degre	ee (1 major) Computation	nal Mathematics (201	9)		
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 FCTS) Mathemati	xam. reg. k - 2010	page 64 / 403

Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Aerospace Computer Science (2020) Master's degree (1 major) Computer Science (2021) Master's degree (1 major) Aerospace Computer Science (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Aerospace Computer Science (2023)

 Master's with 1 major Mathematics (2019)
 JMU Würzburg • generated 19-Apr-2025 • exam. reg.
 page 65 / 403

 data record Master (120 ECTS) Mathematik - 2019
 Description
 Description

Modul	e title				Abbreviation	
Algorit	hms fo	r Geographic Informat	ion Systems		10-I=AGIS-161-m01	
Modul	e coord	inator		Module offered by	<u> </u>	
holder	of the (hair of Computer Scie	ncel	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites	;		
1 seme	ester	graduate				
Conter	nts					
Algorit sition, misatio tial pla	hmic fo proces on. App inning a	undations of geograph sing, analysis and pres lications such as the c is well as cartographic	nic information systems sentation of spatial info reation of digital heigh generalisation.	and their applicatio rmation. Processes of t models, working wi	n in selected proble of discrete and conti th GPS trajectories,	ms of acqui- nuous opti- tasks of spa-
Intend	ed lear	ning outcomes				
The stu to sele	udents ct and i	are able to formalise al mprove suitable appro	lgorithmic problems in baches to solving these	the field of geograph problems.	ic information syste	ms as well as
Course	es (type	, number of weekly cor	ntact hours, language –	- if other than Germa	in)	
V (2) +	Ü (2)					
Metho ster. in	d of ass formati	essment (type, scope, on on whether module	, language — if other th e can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-
Langua credita	age of a ble for	ssessment: German ar bonus	nd/or English			
Additio	onal inf	ormation				
Focuse	es availa	able for students of the	e Master's programme I	nformatik (Compute	r Science, 120 ECTS (credits):
Worklo	bad					
150 h	-					
Teachi	ng cycl	6				
Referre	ed to in	LPO I (examination re	gulations for teaching-	degree programmes)	I	
			<u> </u>			
Modul	e appea	irs in				
Master	's degr	ee (1 major) Computer	Science (2016)			
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT leacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computer Science (2017)						
Master's degree (1 major) Computer Science (2018)						
Master	Master's degree (1 major) Computational Mathematics (2019)					
Master	r's degr	ee (1 major) Mathemat	ics (2019)			
Master's w	vith 1 majo	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 66 / 403

Master's degree (1 major) Information Systems (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Aerospace Computer Science (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 67 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Select	ed Topi	cs in Algorithms		_	10-I=AKA-161-m01	
Modul	<u>a coord</u>	inator		Modulo offered by	ļ	
holder			I			
nolder	orthec	Linair of Computer Scier		Institute of Comput	erScience	
ECIS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	Inume					
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter						
Selecte	ed topic	s in algorithmics.				
Intend	ed learı	ning outcomes				
The stu solutio	udents u	understand the basic a omplex problems in thi	pproach of algorithmic s area and apply them	computer science. 1 to similar questions	hey are able to unde.	erstand the
Course	es (type	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
V (2) +	Ü (2)					
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
written If anno examir prox. 1 Langua	written examination (approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate).				d by an oral idates (ap-	
credita	ble for	bonus				
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Focuse AT	es availa	able for students of the	Master's programme I	nformatik (Compute	r Science, 120 ECTS (credits):
Worklo	bad					
150 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination res	gulations for teaching-	degree programmes)		
			<u></u>			
Modul	e annea	urs in				
Master	r's degr	ee (1 major) Computer 9	Science (2016)			
Master	's degr	ee (1 major) Mathemati	cs (2016)			
Master	's degr	ee (1 major) Computatio	onal Mathematics (201	6)		
Master	's degr	ee (1 major) Computer S	Science (2017)	- /		
Master's degree (1 major) Computer Science (2018)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS. Elite Network Bavaria (ENB) (2020)						
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2020)	
Master	r's degre	ee (1 major) Aerospace	Computer Science (20	20)		
Master	's degr	ee (1 major) Computer S	Science (2021)			
Master	r's degr	ee (1 major) Aerospace	Computer Science (20	21)		
Master's w	vith 1 major	r Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • 6 Master (120 ECTS) Mathemat	exam. reg. ik - 2019	page 68 / 403



Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 69 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Select	ed Topi	cs in Theory			10-I=AKT-161-m01	
Modul	e coord	inator		Module offered by	<u>.</u>	
holder	of the (Chair of Computer Scie	nce l	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade		-		
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts	3.00000				
Select	ed topic	s in theory.				
Intend	ed lear	ning outcomes				
The stu	idonte i	inderstand the basis a	nproach of theoretical	computer science. T	how are able to unde	victored the
solutio	ons of co	omplex problems in thi	s area and apply them	to similar questions		
Course	es (type	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
V (2) +	Ü (2)					
Metho ster, in	d of ass Iformati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
writter If anno examin prox. 1 Langua credita	examin ounced l nation o 5 minut age of a oble for	nation (approx. 60 to 1: by the lecturer at the b f one candidate each (es per candidate). ssessment: German ar bonus	20 minutes). eginning of the course, approx. 20 minutes) or d/or English	the written examina an oral examinatior	tion may be replace in groups of 2 cand	d by an oral lidates (ap-
Allocat	tion of r	laces				
•						
Additio		ormation	Mastaria nyagyamma l	nformatile (Compute		aradita).
AT		able for students of the	master's programme i	nformatik (Compute	r Science, 120 ECTS	
Worklo	oad					
150 h						
Teachi	ng cycl	9				
Roforr	d to in	IPOL (examination reg		degree programmes)		
Keleitt						
		•				
Modul	e appea	irs in				
Master	's degr	ee (1 major) Computer	Science (2016)			
Master	's degr	ee (1 major) Mathemati	CS (2016)			
Master	r's degre	ee (1 major) Computati	onal Mathematics (201	6)		
Master	's degr	ee (1 major) Computer	Science (2017)			
Master's degree (1 major) Computational Mathematics (2010)						
Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2010)						
Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS Flite Network Bavaria (ENR) (2020)					
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2020)	,
Master	's degr	ee (1 major) Aerospace	Computer Science (20	20)		
Master	's degr	ee (1 major) Computer	Science (2021)	·		
Master	r's degre	ee (1 major) Aerospace	Computer Science (20	21)		
Master's w	vith 1 majoi	Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg.	page 70 / 403



Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 71 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation	
Approximation Algorithms				10-I=APA-161-m01	
Module coordinator			Module offered by		
holder of	the Chair of Computer Scier	nce l	Institute of Computer Science		
ECTS M	ethod of grading	Only after succ. con	npl. of module(s)		
5 numerical grade					
Duration Module level Other prerequisites					
1 semeste	semester graduate				
Contents					
The task of finding the optimal solution for a given problem is omnipresent in computer science. Unfortunately, there are many problems without an efficient algorithm for an optimal solution. As a result, in practice, methods					
are used which do not always give the optimal solution but always give good solutions. This lecture will discuss					
drafting and analysing techniques for algorithms which have a proven approximation quality. With the help of					
practical optimisation problems, the lecture will introduce students to important drafting techniques such as					
greedy, local search, scaling as well as methods based on linear programming.					
Intended learning outcomes					
The students are able to analyse easy approximation methods in terms of their quality. They understand fun-					
damental drafting techniques such as greedy, local search and scaling as well as methods based on linear pro- gramming and are able to apply these to new problems.					
Courses (type, number of weekly contact hours, language — if other than German)					
V (2) + Ü (2)					
Method of assessment (type, scope, language — if other than German, examination offered — if not every seme-					
ster, information on whether module can be chosen to earn a bonus)					
written examination (approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate).					
creditable for bonus					
Allocation of places					
Additional information					
Focuses available for students of the Master's programme Informatik (Computer Science, 120 ECTS credits):					
AT,IT,GE					
Workload					
150 h					
Teaching cycle					
Referred to in LPO I (examination regulations for teaching-degree programmes)					
§ 22 II Nr. 3 b)					
Module appears in					
Master's degree (1 major) Computer Science (2016)					
Master's degree (1 major) Mathematics (2016)					
Master's degree (1 major) Computational Mathematics (2016)					
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Supplementary course MINI Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Master's degree (1 major) Computer Science (2017)					
Master's degree (1 major) Computer Science (2018)					
Master's with 1	major Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 72 / 403
Module studies (Master) Computer Science (2019)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Computer Science (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Computer Science (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Computer Science (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 73 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Advanced Programming			10-I=APR-161-m01			
Modul	<u>a coord</u>	inator		Module offered by		
nolder	of the C	Lhair of Computer Scie		Institute of Comput	erScience	
ECIS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conten	its					
With th	ie know	ledge of basic prograr	nming, taught in introd	uctory lectures, it is I	possible to realize si	mpler pro-
grams.	If more	e complex problems ar	e to be tackled, subopt	imal results like long	, incomprehensible	functions
de a se	ue uup ensihle	structure Also further	tonics in the areas of s	software security and	l narallel programmi	ng are dis-
cussed	1.	Structure: Auso, further	topies in the areas of s	Software Security and	i parattet programmi	
Intend	ed lear	ning outcomes				
Studer	nts learr	n advanced programmi	ng paradigms especial	ly suited for space a	oplications. Differen	t patterns are
then in	npleme	nted in multiple langua	ages and their efficienc	y measured using st	andard metrics. In a	ddition, par-
allel pr	ocessir	ng concepts are introdu	iced culminating in the	use of GPU architec	tures for extremely q	uick proces-
sing.						
Course	s (type	, number of weekly cor	ntact hours, language –	- if other than Germa	ın)	
V (2) +	Ü (2)					
Metho	d of ass	sessment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
written	exami	nation (approx. 60 to 1	20 minutes).			
If anno	ounced	by the lecturer at the b	eginning of the course,	the written examination	tion may be replace	d by an oral
	5 minut	es per candidate)	approx. 20 minutes) of		i ili gioups oi 2 callu	iuales (ap-
Langua	age of a	ssessment: German ar	nd/or English			
credita	ble for	bonus				
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Focuse	es availa	able for students of the	Master's programme l	nformatik (Compute	r Science, 120 ECTS	credits):
SE,IS,L	R, HCI,	ES,GE				
Worklo	bad					
150 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Module appears in						
Master	Master's degree (1 major) Computer Science (2016)					
Master	's degr	ee (1 major) Mathemat	ics (2016)			
Master	's degr	ee (1 major) Computati	onal Mathematics (201	.6)		
Master	Master's degree (1 major) Computer Science (2017)					
Master	's degr	ee (1 major) Computer	Science (2018)			
Master	's degr	ee (1 major) Computati	onal Mathematics (201	.9)		
Master	's degr	ee (1 major) Mathemat	ics (2019)			,
waster's w	nin 1 majo	i watnematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	ik - 2019	page 74 / 403

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Aerospace Computer Science (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 75 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module	e title				Abbreviation
Automa	Automata Theory 10-I=AUT-161-m01				
Module coordinator A				Module offered by	
Dean o	f Studi	es Informatik (Computer	Science)	Institute of Comput	er Science
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
5	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
Finite a words, on of re	utoma langua egular l	ta, regular languages, sta ge acceptance through n anguages and star-free la	rr-free languages, nat nonoids, syntactic mo anguages, two-way at	tural equivalence rel onoid, predicate logi utomata.	ations, predicate logic with cal and algebraic characterisati-
Intende	ed lear	ning outcomes			
The stu ges, sta monoic two-wa	idents ar-free ds, synt iy autor	possess a fundamental a languages, natural equiva ractic monoid, predicate l nata.	nd applicable knowle alence relations, pree logical and algebraic	edge in the areas of f dicate logic with wor characterisation of r	finite automata, regular langua- ds, language acceptance through regular and star-free languages,
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)
V (2) +	Ü (2)				
Method ster, in written If anno examin prox. 19 Langua credita Allocat Additio Focuse IT, ES, I Worklo	d of ass formati examin unced nation co 5 minut age of a ble for ion of p ion al info s availa HCI, GE	sessment (type, scope, la on on whether module ca nation (approx. 60 to 120 by the lecturer at the beg of one candidate each (ap es per candidate). ssessment: German and, bonus blaces	Inguage — if other that an be chosen to earn minutes). inning of the course, oprox. 20 minutes) or /or English	an German, examina a bonus) the written examina an oral examination	tion offered — if not every seme- tion may be replaced by an oral in groups of 2 candidates (ap-
150 h					
Teachi	ng cycl	e			
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)	
Module	e appea	ars in			
Master Master Master Supple Master Master Master	"s degru 's degru 's teach ementar 's degru 's degru	ee (1 major) Computer Sc ee (1 major) Mathematics ee (1 major) Computation hing degree Gymnasium / y course MINT Teacher Ec ee (1 major) Computer Sc ee (1 major) Computer Sc ee (1 major) Computation	ience (2016) 5 (2016) Ial Mathematics (201 WINT Teacher Educat ducation PLUS, Elite I ience (2017) ience (2018) Ial Mathematics (201	6) ion PLUS, Elite Netwo Network Bavaria (EN 9)	ork Bavaria (ENB) (2016) B) (2016)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	
	data record Master (120 ECTS) Mathematik - 2019	



Master's degree (1 major) Mathematics (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 77 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title		Abbreviation				
Avionics Systems			10-I=AVS-161-m01			
Module coordinator Module offered by			Module offered by			
holder	of the C	Chair of Computer Scier	nce VIII	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	numei	rical grade		• • • •		
Duratio	on (Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its	-				
The cou commu control	urse <i>Avi</i> inicatio , 4. sen	<i>ionik-Systeme</i> (Avionics n of airplanes and sate sors and actuators, 5. s	<i>Systems</i>) offers an ov Illites: 1. software mod Sensor fusion, 6. reliab	erview of software, h ule and the software ility	ardware, sensors, a structure 2. control	ctuators and 3. ground
Intende	ed learr	ning outcomes				
At the e and air	end of t planes.	he course, the students They should be able to	s should be familiar wi o design these. They sł	th typical structures hould be able to prog	of avionic systems for gram simple controls	or satellites 5.
Course	s (type,	number of weekly con	tact hours, language –	- if other than Germa	n)	
V (2) +	Ü (2)	,				
Metho ster, in	Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)					
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus						
Allocation of places						
Additio	onal info	ormation				
Focuse ES,LR	s availa	able for students of the	Master's programme l	nformatik (Computer	Science, 120 ECTS o	credits):
Worklo	ad					
150 h						
Toochi						
Teacini	ing cycli	2				
 Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
		, ,		<u> </u>		
Module	e appea	rs in				
Master	's degre	ee (1 major) Computer S	Science (2016)			
Master	's degre	ee (1 major) Mathemati	cs (2016)			
Master	Master's degree (1 major) Computational Mathematics (2016)					
Master	's teach	ning degree Gymnasiun	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supple	mentar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	's degre	ee (1 major) Computer S	Science (2017)			
Master	's degre	ee (1 major) Computer S	science (2018)	、 、		
Master	's degre	ee (1 major) Computatio	onal Mathematics (201	9)		
Master	's degre	ee (1 major) Mathemati	cs (2019)			,
Master	's teach	ling degree Gymnasiun	NMINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	020)
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 78 / 403

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Computer Science (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Computer Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 79 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Computability Theory 10-I=BER-16			10-I=BER-161-m01			
Module	e coord	inator		Module offered by		
Doon o	f Studie	os Informatik (Compute	or Science)	Institute of Comput	or Science	
	Mathe			Institute of Comput		
ECIS	metho	rical grading	Only after succ. con	npl. of module(s)		
5	Inume					
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	Its					
Gödel ı and pro	numbeı oductiv	ing, computable funct e sets, relative comput	ons, decidable and co ability, Turing reductio	untable sets, halting n, countable degrees	problem, m-reducib s, arithmetic hierarcl	oility, creative ny.
Intend	ed learı	ning outcomes				
The stu ons, de tability	idents j ecidable , Turing	possess a fundamenta e and countable sets, h reduction, countable	l and applicable knowl nalting problem, m-red degrees, arithmetic hie	edge in the areas of ucibility, creative and rarchy.	Gödel numbers, cou d productive sets, re	ntable functi- lative compu-
Course	s (type	, number of weekly cor	itact hours, language –	- if other than Germa	ın)	
V (2) +	Ü (2)					
Metho ster, in	d of ass formati	e ssment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-
If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate). Language of assessment: German and/or English						
Allocation of places						
Additio	onal inf	ormation				
Focuse AT,SE,I	s availa T,IS,GE	able for students of the	Master's programme I	nformatik (Compute	r Science, 120 ECTS (credits):
Worklo	ad					
150 h						
Teachi	ng cycl	•				
Teacini	ing cycl	5				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Module	e appea	irs in				
Master	's degr	ee (1 major) Computer	Science (2016)			
Master	's degr	ee (1 major) Mathemat	cs (2016)			
Master	Master's degree (1 major) Computational Mathematics (2016)					
Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	's degr	ee (1 major) Computer	Science (2017)			
Master	's degr	ee (1 major) Computer	Science (2018)			
Master	's degr	ee (1 major) Computati	onal Mathematics (201	9)		
Master	's degr	ee (1 major) Mathemati	ics (2019)			
Master	's teacl	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	020)
Master's w	ith 1 majoı	Mathematics (2019)	JMU Würzburş data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 80 / 403



Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 81 / 403
	data record Master (120 ECTS) Mathematik - 2019	1

Module title		Abbreviation				
Compi	ler Cons	truction		_	10-l=CB-161-m01	
Modul	e coordi	nator		Module offered by		
holder	older of the Chair of Computer Science II		Institute of Computer Science			
FCTS	Metho	d of grading		nl of module(s)		
5	numer	ical grade				
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts	0				
Lexica	l analysi	s syntactic analysis	semantics compiler ge	nerators code gener	rators code ontimis	ation
Intend	ed learn	ing outcomes	<u>ennancies, compiler se</u>			
The st	udents n	ossess knowledge in	the formal description	of programming lang	ruages and their con	nnilation
They a	re able t	o perform transformat	ions between them wit	h the help of finite a	utomata, push-dowr	n automata
Course	s (type	number of weekly cor	ntact hours language -	- if other than Germa	un)	
V(2) +	<u>ії (2)</u>	number of weekty cor		n other than define		
Metho	d of ass	essment (type scope	language — if other th	an German, examina	tion offered — if not	every seme-
ster, ir	formatio	on on whether module	can be chosen to earn	a bonus)		every senie-
writter	n examin	ation (approx. 60 to 1	20 minutes).			
If anno	punced b	by the lecturer at the b	eginning of the course,	the written examination	tion may be replace	d by an oral lidates (an-
prox. 1	5 minute	es per candidate).				luttes (up
Langua	age of as	sessment: German ar	nd/or English			
credita	able for b	onus				
Alloca	Allocation of places					
Additi	onal info	rmation				
Focuse SE.IT.I	es availa S.GE	ble for students of the	e Master's programme I	nformatik (Compute	r Science, 120 ECTS	credits):
Worklo	oad					
150 h						
Teachi	ing cycle	1				
Referr	ed to in l	POI (examination re	gulations for teaching-	degree programmes)		
Modul	e appea	rs in				
Maste	r's degre	e (1 major) Computer	Science (2016)			
Maste	r's degre	e (1 major) Mathemat	ics (2016)			
Maste	r's degre	e (1 major) Computati	onal Mathematics (201	6)		
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supple	ementary	/ course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	r's degre	e (1 major) Computer	Science (2017)			
Master	r's aegre	e (1 major) Computer	Science (2018) anal Mathematics (aas	0)		
Master	r's degre	e (1 major) Computati e (1 major) Mathemat	irs (2010)	<i>91</i>		
Master	r's degre	e (1 major) Informatio	n Systems (2010)			
Master	r's teach	ing degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	020)
Master's w	vith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemat	exam. reg. ik - 2019	page 82 / 403

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Information Systems (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 83 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Deduct	ive Dat	abases			10-I=DDB-161-m01	
Module	e coord	inator		Module offered by		
Dean o	f Studie	es Informatik (Computer :	Science)	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
8	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
Syntax cal met	and se thods fo	mantics of logic program or Datalog; negation and	s; data structures, pr stratification; disjund	ogram structures an tive logic programs.	d applications for Prolog; analyti-	
Intende	ed learı	ning outcomes				
The stu	idents i	oossess expertise in worl	king with Prolog and I	Datalog (including ne	egation and disjunction).	
Course	s (type	, number of weekly conta	ct hours. language —	if other than Germa	n)	
V(4) +	<u> </u> (2)	,			,	
Methor ster, in	d of ass formati	s essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
If anno examin prox. 19 Langua credita	unced l nation o 5 minut nge of a ble for	by the lecturer at the beg of one candidate each (ap es per candidate). ssessment: German and, bonus	inning of the course, oprox. 20 minutes) or /or English	the written examina an oral examination	tion may be replaced by an oral in groups of 2 candidates (ap-	
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Focuse AT,SE,I	s availa T,IS	able for students of the M	laster's programme Ir	nformatik (Computer	Science, 120 ECTS credits):	
Worklo	ad					
240 h						
Teachi	ng cycl	e				
	<u> </u>					
Referre	d to in	IPOI (examination regu	lations for teaching-c	legree programmes)		
Module	 Module appears in					
Master	's degr	ee (1 maior) Computer Sc	ience (2016)			
Master	Master's degree (1 major) Computer Science (2010) Master's degree (1 major) Mathematics (2016)					
Master	's degr	ee (1 major) Computation	al Mathematics (2010	6)		
Master	's teach	ning degree Gymnasium I	WINT Teacher Educati	on PLUS, Elite Netwo	ork Bavaria (ENB) (2016)	
Supple	mentar	y course MINT Teacher E	ducation PLUS, Elite N	letwork Bavaria (ENI	B) (2016)	
Master	's degr	ee (1 major) Computation	al Mathematics (2019	9)		
Master	's degr	ee (1 major) Mathematics	(2019)			

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 84 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
E-Learr	ning				10-I=EL-161-m01	
Module	e coord	inator		Module offered by	<u> </u>	
holder	of the (Chair of Computer Scie	nce VI	Institute of Computer Science		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on l	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its	•				
Learnir intellig stems,	Learning paradigms, learning system types, author systems, learning platforms, standards for learning systems, intelligent tutoring systems, student models, didactics, problem-oriented learning and case-based training systems, adaptive tutoring systems, computer-supported cooperative learning, evaluation of learning systems.					
Intend	ed learı	ning outcomes				
The stu plicatio	idents j ons.	possess a theoretical a	nd practical knowledge	e about eLearning an	d are able to assess	possible ap-
Course	s (type	, number of weekly cor	itact hours, language –	- if other than Germa	ın)	
V (2) +	Ü (2)					
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
If anno examir prox. 19 Langua credita	ation of a minut age of a ble for	by the lecturer at the b f one candidate each (es per candidate). ssessment: German ar bonus	eginning of the course, approx. 20 minutes) or nd/or English	the written examina an oral examination	tion may be replace in groups of 2 cand	d by an oral idates (ap-
Allocat	tion of r	places				
Additio	nal inf	ormation				
Focuse	s availa S.HCI.G	able for students of the	Master's programme I	nformatik (Computer	r Science, 120 ECTS (credits):
Worklo	ad					
150 h						
Toochi	ng cycl	•				
Teacini	ing cycu	5				
Referre	ed to in	LPUT (examination re	gulations for teaching-	degree programmes)		
Module	e appea	irs in				
Master	's degr	ee (1 major) Computer	Science (2016)			
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	networк Bavaria (EN	в) (2016)	
Master	Master's degree (1 major) Computer Science (2017)					
waster	Master's degree (1 major) Computer Science (2018)					
Master	Master's degree (1 major) Computational Mathematics (2019)					
Master	s degr	ee (1 major) Mathemati	CS (2019)			
waster	s aegr	ee (1 major) Media Con	imunication (2019)			
Master's w	ith 1 majoi	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. ik - 2019	page 85 / 403



Master's degree (1 major) Information Systems (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 86 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Embed	ded Sy	stems			10-l=ES-161-m01	
Module	e coord	inator		Module offered by	<u>I</u>	
Dean o	of Studio	es Informatik (Compute	er Science)	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
8	nume	rical grade		1 (7		
Duratio	on	Module level	Other prerequisites	5		
1 seme	ester	graduate				
Conten	nts		1			
Models of embedded systems, implementation methods (ASIC, AISIP, micro controller), verification of embedded systems, implementation planning static, periodic and dynamic, binding problems, hardware synthesis, software synthesis.						
Intend	ed lear	ning outcomes				
The stu most ir softwa	udents a nportar re.	are familiar with the ten nt techniques for the m	chnical possibilities fo odelling, verification a	r the design of embeond of the design of embeond of such a second structure of such as the second structure of s	dded systems and m uch systems in hardv	aster the ware and
Course	s (type	, number of weekly cor	ntact hours, language -	– if other than Germa	ın)	
V (4) +	Ü (2)					
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	, language — if other th e can be chosen to earr	an German, examina 1 a bonus)	tion offered — if not	every seme-
prox. 19 Langua credita	5 minut age of a ble for	es per candidate). ssessment: German ar bonus	nd/or English			
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Focuse AT,SE,E	es availa ES,LR,G	able for students of the E	e Master's programme	Informatik (Compute	r Science, 120 ECTS o	credits):
Worklo	ad					
240 h						
Teachi	ng cycl	e				
	0 .)	-				
Referre	d to in	IPOI (examination re	gulations for teaching-	degree programmes)		
Referre						
Modul	0 20002	vrc in				
Module appears In						
Master's degree (1 major) Computer Science (2016) Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Mathematics (2010) Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computer Science (2017)						
Master	Master's degree (1 major) Computer Science (2018)					
Master	's degr	ee (1 major) Computati	onal Mathematics (201	19)		
Master	's degr	ee (1 major) Mathemat	ICS (2019)			
Master's w	vith 1 majo	Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 87 / 403

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Aerospace Computer Science (2020) Master's degree (1 major) Computer Science (2021) Master's degree (1 major) Aerospace Computer Science (2022) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Aerospace Computer Science (2023)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 88 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation				Abbreviation		
Informati	Information Retrieval 10-I=IR-161-m01					
Module c	coordinator		Module offered by			
Dean of S	Studies Informatik (Computer S	Science)	Institute of Computer Science			
ECTS N	Aethod of grading	Only after succ. con	pl. of module(s)			
5 n	numerical grade					
Duration	Module level	Other prerequisites				
1 semest	er graduate					
Contents	i					
IR models data stru- ges and p thods to s	s (e.g. Boolean and vector spa ctures (e.g. inverted index), q paradigms, structured queries support IR (e.g. recommendat	ace model, evaluatio uery elements (e. g. c), search engine (e. g tion systems, text clu	n), processing of tex query operations, rel . architecture, crawli stering and classific	t (tokenising, text properties), evance feedback, query langua- ng, interfaces, link analysis), me- ation, information extraction).		
Intended	learning outcomes					
The stude the techn	ents possess theoretical and p nical know-how to create a sea	oractical knowledge i rch engine.	n the area of informa	ation retrieval and have acquired		
Courses	(type, number of weekly conta	ct hours, language –	- if other than Germa	n)		
V (2) + Ü	(2)					
Method o	of assessment (type, scope, la	nguage — if other tha	an German, examina	tion offered — if not every seme-		
ster, info	rmation on whether module ca	an be chosen to earn	a bonus)			
lf annour examinat prox. 15 r Language creditabl	nced by the lecturer at the beg tion of one candidate each (ap minutes per candidate). e of assessment: German and/ e for bonus	inning of the course, pprox. 20 minutes) or /or English	the written examina an oral examination	tion may be replaced by an oral in groups of 2 candidates (ap-		
Allocatio	n of places					
Additiona	al information					
Focuses a IT,IS,HCI,	available for students of the M GE	laster's programme l	nformatik (Computer	Science, 120 ECTS credits):		
Workload	d					
150 h						
Teaching	; cycle					
Referred	to in LPO I (examination regu	lations for teaching-o	degree programmes)			
Module a	appears in					
Master's	degree (1 major) Computer Sc	ience (2016)				
Master's	Master's degree (1 major) Mathematics (2016)					
Master's	degree (1 major) Computation	al Mathematics (201	6)			
Master's	toaching dogree (1 major) Digital Huma	nitles (2016) MINT Toochor Educati	ion DILIC Elita Notur	ork Rovaria (END) (2016)		
Sunnlam	entary course MINT Teacher F	ducation PLUS Flite	Network Ravaria (FNI	DIK DAVAHA (END) (2016) R) (2016)		
Master's	degree (1 major) Computer Sc	ience (2017)		2, (2010)		
Master's	degree (1 major) Computer Sc	ience (2018)				
Master's	Master's degree (1 major) Computational Mathematics (2019)					

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 89 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Information Systems (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 90 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Artific	al Intel	ligence 1			10-l=Kl1-161-m01	
Modul	e coord	inator		Module offered by		
holder	of the	Thair of Computer Scie		Institute of Comput	er Scienco	
FCTS	Moth	and of grading	Only after succ. con	nistitute of Comput		
5	nume	rical grade				
Durati	on	Module lovel	Other prorequisites			
1 Seme	ester	graduate				
Conter	nts]			
Intellig	gent age	ents, uninformed and h	euristic search, constra	aint problem solving	, search with partial	information,
Intend	ed lear	ning outcomes		representation.		
The st	idents i	possess theoretical and	h practical knowledge a	about artificial intelli	gence in the area of	agents
search	and log	gic and are able to asso	ess possible applicatio	ns.	Sence in the area of	ugents,
Course	es (type	, number of weekly cor	tact hours, language –	- if other than Germa	un)	
V (2) +	Ü (2)					
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	ition offered — if not	every seme-
ster, ir	ıformati	on on whether module	can be chosen to earn	a bonus)		
writter	ı examiı	nation (approx. 60 to 1	20 minutes).	the country is		d have a state
If anno	ounced l	by the lecturer at the b	eginning of the course,	the written examination	tion may be replace	d by an oral Idates (ap-
prox. 1	5 minut	es per candidate).	approx. 20 minutes) of		r in groups of 2 cand	iluales (ap-
Langua	age of a	ssessment: German ar	d/or English			
credita	ble for	bonus	-			
Alloca	tion of p	olaces				
Additi	onal inf	ormation				
Focuse AT,SE,	es availa IS,HCI	able for students of the	Master's programme I	nformatik (Compute	r Science, 120 ECTS	credits):
Workle	oad					
150 h						
Teachi	ng cycl	e				
Referr	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Modul	e appea	ars in				
Maste	r's degr	ee (1 major) Computer	Science (2016)			
Maste	r's degr	ee (1 major) Mathemat	cs (2016)			
Master's degree (1 major) Physics (2016)						
Master's degree (1 major) Nanostructure Technology (2016)						
Master	Master's degree (1 major) Computational Mathematics (2016)					
Master	r's teach	ning degree Gymnasiur	n MINI Teacher Educat	Ion PLUS, Elite Netwo	ork Bavaria (ENB) (2 B) (2246)	016)
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Master	Master's degree (1 major) Computer Science (2017)					
Master	Master's degree (1 major) Computer Science (2018)					
Master	r's degr	ee (1 major) Mathemati	CS (2019)	7/		
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 91 / 403

Master's degree (1 major) Information Systems (2019)

Master's degree (1 major) Nanostructure Technology (2020)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Aerospace Computer Science (2020)

Master's degree (1 major) Physics International (2020)

Master's degree (1 major) Quantum Engineering (2020)

Master's degree (1 major) Quantum Technology (2021)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 92 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Artifici	al Intel	ligence 2			10-l=Kl2-161-m01	
Module	e coord	inator		Module offered by		
holder	of the (Chair of Computer Scie	nce VI	Institute of Computer Science		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on l	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its					
Plannir observ ning, p	Planning, probabilistic closure and Bayesian networks, utility theory and decidability problems, learning from observations, knowledge while learning, neural networks and statistical learning methods, reinforcement learning, processing of natural language.					
Intend	ed learı	ning outcomes				
The stu closure	ıdents ı e, learni	possess theoretical and ing and language proce	d practical knowledge a essing and are able to a	about artificial intelli assess possible appl	gence in the area of ications.	probabilistic
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (2) +	Ü (2)	,				
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
If anno examir prox. 1 Langua credita	unced l nation o 5 minut age of a ble for	by the lecturer at the bo f one candidate each (es per candidate). ssessment: German ar bonus	eginning of the course, approx. 20 minutes) or Id/or English	the written examina an oral examination	tion may be replace in groups of 2 cand	d by an oral idates (ap-
Allocat	tion of r	olaces				
	· · · ·					
Additic	nal inf	ormation				
Focuse	s availa S,HCI,G	able for students of the	Master's programme I	nformatik (Computer	Science, 120 ECTS	credits):
Worklo	ad					
150 h						
Teachi	ng cycl	•				
Teacin	ing cycu	5				
	1					
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Module	e appea	irs in				
Master	's degr	ee (1 major) Computer	Science (2016)			
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	Master's degree (1 major) Computer Science (2017)					
Master	Master's degree (1 major) Computer Science (2018)					
Master's degree (1 major) Computational Mathematics (2019)						
Master	's degr	ee (1 major) Mathemati	cs (2019)			
Master	's degr	ee (1 major) Informatio	n Systems (2019)			
Master's w	ith 1 majoi	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 93 / 403

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Aerospace Computer Science (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 94 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Compu	Computational Complexity II 10-I=KT2-161-m01					
Modul	e coord	inator		Module offered by	<u> </u>	
Dean	of Studie	s Informatik (Compute	ar Science)	Institute of Computer Science		
FCTS	Mothe	d of grading		nl of module(s)		
5	nume	rical grade				
Durati	on	Madula loval	Othor proroquisitos			
1 Seme	oster	graduate				
Conter	nts	Sidduite				
Proper ty of p	Properties of NP-complete sets, autoreducibility, interactive proof systems, polynomial time hierarchy, complexi-					
Intend	ed leari	ning outcomes				
The stu	udents i	ossess a fundamental	and applicable knowl	edge in the areas of	properties of NP-con	nplete sets.
autore	ducibili	ty, interactive proof sys	stems, polynomial time	hierarchies, comple	exity of probabilistic	algorithms.
Course	es (type	number of weekly con	tact hours, language –	- if other than Germa	un)	
V(2) +	Ü (2)	, <u>, , , , , , , , , , , , , , , , , , </u>				
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	ition offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
writter	ı examiı	nation (approx. 60 to 1	20 minutes).			
If anno	ounced	by the lecturer at the b	eginning of the course,	the written examina	tion may be replace	d by an oral
examir	nation o	f one candidate each (approx. 20 minutes) or	an oral examination	in groups of 2 cand	idates (ap-
prox. 1	5 minut	es per candidate).	d /ox English			
credita	age of a	honus	iu/or English			
Allocat	tion of r					
Alloca		naces				
Additio				a		
Focuse SE, IT,	es availa ES	able for students of the	Master's programme I	nformatik (Compute	r Science, 120 ECTS	credits): AT,
Worklo	oad					
150 h						
Teachi	ng cycl	9				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Modul	e appea	rs in				
Master	r's degr	ee (1 major) Computer :	Science (2016)			
Master	r's degro	ee (1 major) Mathemati	cs (2016)			
Master	r's degre	ee (1 major) Computati	onal Mathematics (201	6)		
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	Master's degree (1 major) Computer Science (2017)					
Master's degree (1 major) Computer Science (2018)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master Supple	r's teach ementar	ning degree Gymnasiur y course MINT Teacher	n MINT Teacher Educat Education PLUS, Elite	ion PLUS, Elite Netw Network Bavaria (EN	ork Bavaria (ENB) (2 B) (2020)	020)
Master's w	vith 1 major	Mathematics (2019)	JMU Würzburg data record	g ● generated 19-Apr-2025 ● € Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 95 / 403

Module title			Abbreviation			
Perform	Performance Evaluation of Distributed Systems			10-I=LVS-161-m01		
Modula	e coord	inator		Module offered by		
holder	of the (hair of Computer Scie	nce III	Institute of Comput	er Science	
FCTS	Metho	od of grading	Only after succ. con	nnl of module(s)		
8	nume	rical grade				
Duratio	nn		Other prerequisites	4		
1 seme	ester	graduate				
Conter	nts	0				
Traffic	theoret	ic models, fundament	al concepts of theory of	probability, transfor	mation techniques.	stochastic
proces	ses, me	ethods for performance	e analysis of technical s	systems, queue-/traf	fic theory, analysis c	of Markov,
non-Ma	arkov a	nd time critical system	s, matrix analytical me	thod, practical exam	ples for performance	e analysis of
compu	ter syst	ems and networks: th	roughput and goodput	analysis and other cl	naracteristics.	
Intend	ed lear	ning outcomes				
The stu means	dents of the	possess the methodic theory of probability a	knowledge and the pra nd mathematical statist	ctical skills necessa ics.	ry to model technica	l systems by
Course	s (type	, number of weekly co	ntact hours, language –	- if other than Germa	n)	
V (4) +	Ü (2)					
Metho ster. in	d of ass formati	sessment (type, scope on on whether module	, language — if other th e can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-
lf anno examir	ounced nation c	by the lecturer at the b	eginning of the course, (approx. 20 minutes) or	the written examina an oral examinatior	tion may be replace i in groups of 2 cand	d by an oral idates (ap-
Langua credita	5 minut age of a ible for	ssessment: German al bonus	nd/or English			
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Focuse AT.IT.G	es availa E	able for students of the	e Master's programme l	nformatik (Compute	r Science, 120 ECTS	credits):
Worklo	ad					
240 h						
Teachi	ng cycl	<u>م</u>				
	ing cyce					
Poforra	d to in	IPOL (examination re	gulations for teaching.	degree programmes)		
Kelent						
Modulo appears in						
Master's degree (1 major) Computer Science (2016)						
Master's degree (1 major) Computer Science (2010) Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computer Science (2017)						
Master's degree (1 major) Computer Science (2018)						
Master's degree (1 major) Computational Mathematics (2019)						
Master	's degr	ee (1 major) Mathemat	ics (2019)			
Master's w	ith 1 majo	r Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemat	exam. reg. ik - 2019	page 96 / 403

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Aerospace Computer Science (2020) Master's degree (1 major) Computer Science (2021) Master's degree (1 major) Aerospace Computer Science (2022) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 97 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title					Abbreviation	
Medica	al Inforr	natics			10-l=Ml-161-m01	
Module	e coord	inator		Module offered by	I	
holder	of the (Chair of Computer Scie	nce VI	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ıts	-				
Electro mary a cal res	Electronic patient folder, coding of medical data, hospital information systems, operation of computers in infir- mary and functional units, medical decision making and assistance systems, statistics and data mining in medi- cal research, case-based training systems in medical training.					
Intend	ed learı	ning outcomes				
The stu medici	ıdents ı ne.	oossess theoretical and	d practical knowledge a	about the application	n of computer scienc	e methods in
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
V (2) +	Ü (2)					
Metho ster, in	d of ass formati	e ssment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-
If anno examir prox. 1 Langua credita	ation of a minut age of a ble for	by the lecturer at the by f one candidate each (es per candidate). ssessment: German ar bonus	eginning of the course, approx. 20 minutes) or nd/or English	the written examina an oral examination	tion may be replace a in groups of 2 cand	d by an oral idates (ap-
Allocat	tion of r	places				
Additio	onal inf	ormation				
Focuse SE,IT,IS	s availa S,HCI,G	able for students of the E	Master's programme I	nformatik (Computer	r Science, 120 ECTS (credits):
Worklo	ad					
150 h						
Teachi	ng cycl	a				
	ing cyce	•				
Doforre	d to in	IPOL (avamination ro		dagraa programmac)		
Releffe				degree programmes)		
 Modula	annea	ins in				
Master	's dear	e (1 maior) Computer	Science (2016)			
Master	's degri	ee (1 major) Mathemati	(2016)			
Master	's degr	ee (1 major) Computati	onal Mathematics (201	6)		
Master's teaching degree Gymnasium MINT Teacher Education PLUS Flite Network Ravaria (ENR) (2016)						
Supple	Supplementary course MINT Teacher Education PLUS Flite Network Bayaria (ENB) (2016)					
Master	's degr	ee (1 major) Computer	Science (2017)		/ \ -/	
Master	Master's degree (1 major) Computer Science (2017)					
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master	's degr	ee (1 major) Informatio	n Systems (2019)			
Master's w	ith 1 majoi	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 98 / 403



Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 99 / 403
	data record Master (120 ECTS) Mathematik - 2019	1

Module title			Abbreviation			
Mathe	Mathematical Logic 10-I=ML-161-m01					
Module	e coord	inator		Module offered by		
Dean o	f Studie	es Informatik (Compute	er Science)	Institute of Comput	er Science	
FCTS	Metho	od of grading	Only after succ. con	nnl. of module(s)		
5	nume	rical grade				
Duratic		Madula laval	Other prerequisites			
	ni ctor	graduato				
Canton		graduate				
Propos rem, Gö	itional ödel's i	logic, first-order predic ncompleteness theore	ate logic, proof and de m, undecidability and r	duction, Gödel's con nonaxiomatisability o	npleteness theorem, of elemental arithme	Tarski theo- tic.
Intende	ed learı	ning outcomes				
The stu predica theorer	idents p ate logi m, unde	oossess a fundamenta c, proof and deduction ecidability and nonaxic	and applicable knowl Gödel's completeness matisability of elemen	edge in the areas of 5 theorem, Tarski the tal arithmetic.	propositional logic, f orem, Gödel's incon	first-order npleteness
Course	s (type	, number of weekly cor	tact hours, language –	- if other than Germa	n)	
V (2) +	Ü (2)					
Methor ster, in	d of ass formati	e ssment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
written examination (approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English						
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Focuse AT,SE,I	s availa S,ES	able for students of the	Master's programme I	nformatik (Computer	Science, 120 ECTS o	credits):
Worklo	ad					
150 h						
Teesh		-				
Teachin		e				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Module	e appea	irs in				
Master	's degr	ee (1 major) Computer	Science (2016)			
Master	Master's degree (1 major) Mathematics (2016)					
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computer Science (2017)						
Master's degree (1 major) Computer Science (2018)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master	's teach	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	020)
Master's w	ith 1 majoı	Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e Master (120 FCTS) Mathemati	xam. reg. k - 2010	page 100 / 403



Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 101 / 403
	data record Master (120 ECTS) Mathematik - 2019	1

Module title Abbreviation						
Machine Learning for Natural Language Processing 10-I=NLP-182-mo1						
Modul	e coord	inator		Module offered by	<u> </u>	
Dean o	of Studi	es Informatik (Computer	Science)	Institute of Computer Science		
FCTS	Meth	od of grading		nl of module(s)		
5	nume	rical grade				
Durati	on	Module level	Other prorequisites			
1 seme	ester	graduate				
Conter	nts					
The lecture conveys advanced knowledge about methods in computational text processing. To this end, it presents state of the art models and techniques in the area of machine learning, as well as their technical back- ground, and their respective applications in Natural Language Processing. As one important building block of almost all modern NLP-models, different techniques for learning representations of words, so called Word Em- beddings, are presented. Starting from this we cover, among others, models from the area of Deep Learning, li- ke CNNs, RNNs and Sequence-to-Sequence architectures. The theoretical foundations of these models, like their training with Backpropagation, are also covered in depth. For all models presented in the lecture, we show their application to problems like sentiment analysis, text generation and machine translation in practice. Intended learning outcomes The participants have solid knowledge on problems and methods in the area of computational text processing and are able to identify and apply suitable methods for a specific task. Courses (type, number of weekly contact hours, language — if other than German) V(2) + U(2) Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus) written examination (approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral						
prox. 1 Langua	5 minut age of a	es per candidate). ssessment: German and	d/or English			
credita	ible for	bonus				
Alloca	tion of p	olaces				
Additio	onal inf	ormation				
Focuse IS, HCI	es availa	able for students of the	Master's programme I	nformatik (Computer	Science, 120 ECTS o	redits): AT,
Worklo	bad					
150 h						
Teachi	ng cycl	e				
Referr	Referred to in LPO I (examination regulations for teaching-degree programmes)					
Modul	e appea	ars in				
Master's degree (1 major) Computer Science (2018)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master's degree (1 major) Information Systems (2019)						
Maste	r's teacl	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	020)
Supple	ementai	y course MINT Teacher I	Education PLUS, Elite	Network Bavaria (EN	B) (2020)	
Master's w	ith 1 majo	r Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 FCTS) Mathemati	xam. reg. k - 2010	page 102 / 403

Module title			Abbreviation		
Analys	is and Design of Programs			10-I=PA-161-m01	
Modul	e coordinator		Module offered by	<u> </u>	
holder	of the Chair of Computer Sci	ence ll	Institute of Comput	er Science	
ECTS	Method of grading	Only after succ. cor	npl. of module(s)		
5	numerical grade				
Duratio	on Module level	Other prerequisites			
1 seme	ester graduate				
Conter	its				
Progra	m analysis, model creation i	n software engineering,	program quality, test	of programs, proces	ss models.
Intend	ed learning outcomes		0 1 //		
Tho stu	idents are able to analyse p	cograms to use testing fu	ramoworks and motri	ics as well as to jude	o program
quality			aneworks and meth		
Course	es (type, number of weekly co	ontact hours, language –	- if other than Germa	ın)	
V (2) +	Ü (2)				
Metho	d of assessment (type_scon	e language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formation on whether modu	le can be chosen to earn	a bonus)		every serie
written	examination (approx. 6o to	120 minutes).			
lf anno	unced by the lecturer at the	beginning of the course,	the written examina	tion may be replace	d by an oral
examir	nation of one candidate each	i (approx. 20 minutes) oi	r an oral examination	i in groups of 2 cand	idates (ap-
prox. 1	5 minutes per candidate).	and /or English			
credita	ble for bonus	anu/or English			
Allocat	tion of places				
Additio	onal information				
Focuse	es available for students of the	ne Master's programme I	nformatik (Computer	r Science, 120 ECTS o	credits):
Worklo	ad				
150 h					
Teachi	ng cycle				
reactin					
Referre	d to in IPO I (examination	equilations for teaching-	degree programmes)		
Modul	e appears in				
Master	's degree (1 major) Compute	r Science (2016)			
Master	's degree (1 major) Mathema	atics (2016)			
Master	's degree (1 major) Physics (2016)			
Master	Master's degree (1 major) Nanostructure Technology (2016)				
Master's degree (1 major) Computational Mathematics (2016)					
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Master's degree (1 major) Computer Science (2017)					
Master's degree (1 major) Computer Science (2018)					
Master's degree (1 major) Computational Mathematics (2019)					
Master's degree (1 major) Mathematics (2019)					
Master	's degree (1 major) Informat	on Systems (2019)			
Master's w	ith 1 major Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 103 / 403

Master's degree (1 major) Nanostructure Technology (2020) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Physics International (2020) Master's degree (1 major) Quantum Engineering (2020) Master's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 104 / 403
	data record Master (120 ECTS) Mathematik - 2019	1

Module title			Abbreviation			
Performance Engineering & Benchmarking of Computer Systems				10-I=PEB-161-m01		
Modul	e coord	inator		Module offered by		
holder	of the (Chair of Computer Scie	nce II	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade		, ,,		
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conter	its					
Introdu ques, l	uction to penchm	o performance enginee arking of commercial s	ring of commercial soft oftware systems, mode	ware systems, perfo elling for performanc	rmance measureme e prediction, case st	nt techni- tudies.
Intend	ed learı	ning outcomes	·		<u> </u>	
The stu ment to queue	ıdents ı echniqu networ	oossess a fundamenta ies, multi-factorial vari ks, modelling methods	l and applicable knowl ance analysis, data ana , resource demand app	edge in the areas of alysis with R, benchn proximation, petri ne	performance metrics nark approaches, mo ts.	, measure- odelling with
Course	s (type	, number of weekly cor	itact hours, language –	- if other than Germa	ın)	
V (2) +	Ü (2)					
Metho ster, in	d of ass formati	e ssment (type, scope, on on whether module	language — if other the can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
If anno examir prox. 1 Langua	ounced nation o 5 minut age of a ble for	for a provide the second secon	eginning of the course, approx. 20 minutes) or nd/or English	the written examina an oral examination	tion may be replace i in groups of 2 cand	d by an oral idates (ap-
Allocat	tion of r	laces				
Additio	onal inf	ormation				
Focuse SE,IT,E	s availa S.HCI.G	able for students of the E	Master's programme I	nformatik (Computer	r Science, 120 ECTS (credits):
Worklo	ad					
150 h						
Toochi	ng aval	•				
Teacin	ing cycl	e				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Modul	e appea	irs in				
Master	's degr	ee (1 major) Computer	Science (2016)			
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) computer science (2017) Master's degree (1 major) Computer Science (2018)						
Master's degree (1 major) Computational Mathematics (2010)						
Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2010)						
Master	's degr	ee (1 major) Informatio	n Systems (2019)			
	-					
waster's w	iin 1 majoi	watnematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	ik - 2019	page 105 / 403

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Aerospace Computer Science (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 106 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Professional Project Management			10-I=PM-182-m01			
Module coordinator			Module offered by	fered by		
holder of the Chair of Computer Science III		nce III	Institute of Computer Science			
ECTS	Metho	od of grading	Only after succ. con	Only after succ. compl. of module(s)		
5	nume	rical grade		-		
Durati	on	Module level	Other prerequisites	Other prerequisites		
1 seme	ster	graduate	We recommend completing module 10-I=PRJAK in parallel.			
Conter	nts					
Project goals, project assignment, project success criteria, business plan, environment analysis and stakeholder management, initialisation, definition, planning, execution/control, finishing of projects, reporting, project communication and marketing, project organisation, team building and development, opportunity and risk management; conflict and crisis management, change and claim management; contract and procurement management, quality management, work techniques, methods and tools; leadership and social skills in project management, projects, agile project management, combination of classic and agile methods.						
Intend	ed learı	ning outcomes				
The students possess practically relevant knowledge about the topics of production management and/or pro- fessional project management. They are familiar with the critical success criteria and are able to initiate, define, plan, control and review projects.						
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (4)						
Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)						
written examination (approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus						
Alloca	tion of p	olaces				
Additio	onal inf	ormation				
Focuse IT, IS, I	es availa ES, LR, H	able for students of the ICI, GE.	Master's programme l	nformatik (Computer	Science, 120 ECTS o	credits): SE,
Workload						
150 h						
Teachi	ng cycl	a				
	ing cyce	•				
Referred to in LFOT (examination regulations for teaching-degree programmes)						
Module appears in						
Master's degree (1 major) Computer Science (2018)						
Master's degree (1 major) Management (2018)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master	Master's degree (1 major) Information Systems (2019)					
Master	's teacl	ning degree Gymnasiun	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	020)
Master's w	rith 1 major	Mathematics (2019)	JMU Würzburg data record	• generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 107 / 403



Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) exchange program Business Management and Economics (2022)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 108 / 403				
	data record Master (120 ECTS) Mathematik - 2019					
Module title				Abbreviation		
---	--	---	---	--	--	--
Project - Current Topics in Computer Science				10-I=PRJAK-162-m01		
Module	e coord	inator		Module offered by		
Dean o	f Studi	es Informatik (Computer S	Science)	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
5	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
Comple	etion of	a project task (in Teams)).			
Intende	ed lear	ning outcomes				
The pro	ject all	lows participants to work	on a problem in com	puter science in tea	ms.	
Course	s (type	, number of weekly conta	ct hours, language —	if other than Germa	n)	
P (4)						
Methoo ster, in	l of ass formati	sessment (type, scope, la ion on whether module ca	nguage — if other tha an be chosen to earn	in German, examina a bonus)	tion offered — if not every seme-	
project Each pr same to Langua Assess	report roject is opic. As ge of a ment o	(10 to 15 pages) and pres s offered one time only. T ssessment can, therefore ssessment: German and, ffered: In the semester in	entation of project (1 he project will not be , only be offered for t (or English which the course is o	5 to 30 minutes) repeated; there will he project offered in offered	not be another project with the the respective semester.	
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Focuse SE, IT, I	s availa S, ES, I	able for students of the N LR, HCI, GE.	laster's programme Ir	nformatik (Computer	Science, 120 ECTS credits): AT,	
Worklo	ad					
150 h						
Teachi	ng cycl	e				
Referre	d to in	LPO I (examination regu	lations for teaching-d	legree programmes)		
				<u> </u>		
Module	e appea	ars in				
Master	's degr	ee (1 major) Computer Sc	ience (2016)			
Master	Master's degree (1 major) Computer Science (2017)					
Master	Master's degree (1 major) Computer Science (2018)					
Master	Master's degree (1 major) Management (2018)					
Master	Master's degree (1 major) Computational Mathematics (2019)					
Master	Master's degree (1 major) Mathematics (2019)					
Master	Naster's degree (1 major) Media Communication (2019)					
Master	's degr	ee (1 major) Information S	Systems (2019)			
Master	's teacl	ning degree Gymnasium I	WINT Teacher Education	on PLUS, Elite Netwo	ork Bavaria (ENB) (2020) B) (2020)	
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)					

Module title			Abbreviation			
Compu	uter Arit	hmetic			10-I=RAM-161-m01	
Modul	e coord	inator		Module offered by		
holdor	of the (Thair of Computer Scien		Institute of Comput	or Science	
FCTS	Mothe	d of grading		nistitute of Comput		
	nume	rical grade				
) Durati		Madula laval				
	on	graduate	Other prerequisites			
Conter	nts	Siduate				
Spaces tic and	s of nun l interva	nerical computation, ra	ster and rounding, def	inition and impleme	ntation of computati	onal arithme-
Intend	ed learr	ning outcomes				
The sti	idents r	ossess knowledge ab	out the spaces of nume	erical computation, r	aster and roundings	definition
and im rithms	iplemen	itation of computationa	al arithmetic and interv	al calculation. They	master the application	on of algo-
Course	es (type,	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
V (2) +	Ü (2)					
Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)						
If anno examin prox. 1 Langua credita	If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus					
Alloca	tion of p	olaces				
Additio	onal info	ormation				
Focuse AT,ES	es availa	able for students of the	Master's programme I	nformatik (Computer	r Science, 120 ECTS (credits):
Worklo	oad					
150 h						
Teachi	ing cycl	e				
		-				
Referre	ed to in	IPOI (examination reg		degree programmes)		
Modul	e appea	irs in				
Master	r's degre	ee (1 maior) Computer :	Science (2016)			
Master	r's degre	ee (1 major) Mathemati	cs (2016)			
Master	r's degre	ee (1 major) Computati	onal Mathematics (201	6)		
Master's teaching degree Gymnasium MINT Teacher Education PLUS. Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computer Science (2017)						
Master	Master's degree (1 major) Computer Science (2018)					
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master	r's teach	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	020)
Master's w	vith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 110 / 403

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 111 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Roboti	CS 1				10-I=RO1-152-mo1	
Modula	e coord	inator		Module offered by	<u> </u>	
holder	of the (hair of Computer Scie	nce XVII	Institute of Computer Science		
FCTS	Metho	od of grading	Only after succ. con	nnl. of module(s)		
8	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 semester graduate						
Conten	Its		I			
History homog tor con Worksp se dyna lonome Moverr Sensor	History, applications and properties of robots, direct kinematics of manipulators: coordinate systems, rotations, homogenous coordinates, axis coordinates, arm equation. Inverse kinematics: solution properties, end effec- tor configuration, numerical and analytical approaches, examples of different robots for analytical approaches. Workspace analysis and trajectory planning, dynamics of manipulators: Lagrange-Euler model, direct and inver- se dynamics. Mobile robots: direct and inverse kinematics, propulsion system, tricycle, Ackermann steering, ho- lonomes and non-holonome restrictions, kinematic classification of mobile robots, posture kinematic model. Movement control and path planning: roadmap methods, cell decomposition methods, potential field methods. Sensors: position sensors, speed sensors, distance sensors.					
		ing outcomes			ana in nanticular fan	
their ki	inemati	naster the fundamenta	als of robot manipulato ell as the planning of pa	aths and task execut	are, în particular, far ion.	nillar with
Course	s (type	, number of weekly cor	ntact hours, language –	- if other than Germa	in)	
V (4) +	Ü (2)	,			,	
Metho ster, in	d of ass formati	s essment (type, scope, on on whether module	, language — if other th e can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
written credita	exami ble for	nation (approx. 60 to 9 bonus	oo minutes)			
Allocat	ion of p	olaces				
Additio	onal inf	ormation				
Focuse IS,ES,L	s availa R,HCI	able for students of the	e Master's programme I	nformatik (Compute	r Science, 120 ECTS (credits):
Worklo	ad					
240 h						
Teachi	ng cycl	e				
Referre	ed to in	LPO I (examination re	gulations for teaching-	degree programmes)		
§ 22	Nr. 3 b)		<u> </u>			
Module	e appea	urs in				
Master's degree (1 major) Space Science and Technology (2015)						
First state examination for the teaching degree Gymnasium Computer Science (2015)						
Master's degree (1 major) Computer Science (2016)						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computer Science (2017)						
Master	's degr	ee (1 major) Satellite To	echnology (2017)			
		· · · · · · · · · · · · · · · · · · ·				
Master's w	ith 1 majo	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 112 / 403



Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 113 / 403
	data record Master (120 ECTS) Mathematik - 2019	1

Module title				Abbreviation		
Roboti	CS 2				10-l=R02-152-m01	
Module	e coord	inator		Module offered by	<u> </u>	
holder	of the (Chair of Computer Scie	nce XVII	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Duratio	n	Module level	Other prerequisites	i i i i i i i i i i i i i i i i i i i		
1 seme	ster	graduate				
Conten	ts					
Founda	ations o	f dynamic systems, co	ntrollability and observ	ability, controller de	sign through pole as	ssignment:
feedba	ck and	feed-forward, state ob	server, feedback with s	tate observer, time o	liscrete systems, sto	chastic sy-
stems:	stems: foundations of stochastics, random processes, stochastic dynamic systems, Kalman filter: derivation, in-					
Intende	ig, app					
Intende	ed learn	ing outcomes			<u>(1)</u>	
The stu	idents i f roboti	naster all fundamental	is that are necessary to	understand Kalman	filters and their use	in applica-
se the	connec	tions between the dua	l nairs controllability - (bservability as well	as controller design	and observer
design	. They a	llso recognise the relat	ionship between the K	alman filter as a stat	e estimator and an c	bserver.
Course	s (type	, number of weekly cor	itact hours, language –	- if other than Germa	ın)	
V (4) +	Ü (2)	,			·	
Metho	d of ass	essment (type_scope	language — if other th	an German, examina	tion offered — if not	everv seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		every serie
written	exami	nation (approx. 60 to 9	o minutes)			
credita	ble for	bonus				
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Focuse	s availa	able for students of the	Master's programme I	nformatik (Compute	r Science, 120 ECTS	credits): IT,
ES, LR						
workto						
240 h						
Teachi	ng cycl	9				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
§ 22	Nr. 3 b)					
Module	e appea	irs in				
Master	's degr	ee (1 major) Space Scie	ence and Technology (2	015)		
First sta	ate exa	mination for the teachi	ng degree Gymnasium	Computer Science (2	2015)	
Master	Master's degree (1 major) Computer Science (2016)					
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) computer science (2017) Master's degree (1 major) Computer Science (2018)						
Master's degree (1 major) Computational Mathematics (2010)						
Master	's degr	ee (1 major) Mathemati	ics (2019)	71		
		. , ,	× 2/			
Master's w	ith 1 majoi	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 114 / 403



Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 115 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Softwa	re Arch	itecture			10-I=SAR-161-m01	
Module	e coord	inator		Module offered by		
holder	of the C	hair of Computer Scien	ce ll	Institute of Comput	er Science	
ECTS	Metho	d of grading	Only after succ. con	npl. of module(s)		
5	numei	rical grade				
Duratio	n l	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts	0	1			
Introdu tural st	iction to yles, so	o software architecture, ftware components, int	architectural styles ar erface models and de	nd patterns, software sign guidelines, des	e metrics, evaluation ign-by-contract, com	of architec- ponent-ba-
cloud-native and serverless computing, continuous integration, continuous delivery, continuous deployment, model-driven architecture						
Intend	ed learr	ning outcomes				
The stu with a f ring.	The students possess a fundamental and applicable knowledge about advanced topics in software engineering with a focus on modern software architectures and fundamental approaches to model-driven software engineering					
Course	s (type,	number of weekly cont	act hours, language –	- if other than Germa	n)	
V(2) +	<u> </u>	,				
Metho ster, in	d of ass formati	essment (type, scope, l on on whether module o	anguage — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
written If anno examir prox. 1 Langua credita	written examination (approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English creditable for benus					
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Focuse SE,IT,E	s availa S	ble for students of the <i>l</i>	Master's programme l	nformatik (Computer	Science, 120 ECTS	credits):
Worklo	ad					
150 h						
Toochi			-			
Teacin	ig cycu	-				
Referre	ed to in	LPOI (examination reg	lations for teaching-	degree programmes)		
§ 22	Nr. 3 b)					
Module appears in						
Master's degree (1 major) Computer Science (2016)						
Master's degree (1 major) Computer Science (2010) Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS. Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computer Science (2017)						
Master's degree (1 major) Computer Science (2018)						
Module	e studie	s (Master) Computer Sc	ience (2019)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 116 / 403

Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Information Systems (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Computer Science (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Information Systems (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Management (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Information Systems (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Information Systems (2025) Master's degree (1 major) Management (2025) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Economathematics (2025)

UNIVERSITÄT

WÜRZBURG

Module title				Abbreviation		
Semina	Seminar 1 - Current Topics in Computer Science				10-I=SEM3-161-m01	
Module	e coord	inator		Module offered by		
Dean o	f Studie	es Informatik (Computer S	Science)	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
5	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
Indepe with wr	ndent r itten ar	review of a current topic ind oral presentation.	n computer science b	ased on literature a	nd, where applicable, software	
Intende	ed learı	ning outcomes				
The stu aspects	dents a s in wri	are able to independently tten form and to orally pr	/ review a current top esent these in an app	ic in computer scien propriate way.	ce, to summarise the main	
Course	s (type	, number of weekly conta	ct hours, language —	if other than Germa	n)	
S (2)						
Methoo ster, in	l of ass formati	sessment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	in German, examina a bonus)	tion offered — if not every seme-	
term pa field of Langua	aper (10 compu ge of a	o to 15 pages) and presen iter science ssessment: German and,	tation (30 to 45 minu) /or English	tes) with subsequer	nt discussion on a topic from the	
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Focuse: SE, IT, I	s availa S, ES, I	able for students of the N LR, HCI´, GE.	laster's programme Ir	nformatik (Computer	Science, 120 ECTS credits): AT,	
Worklo	ad					
150 h						
Teachir	ng cycl	e				
	<u> </u>					
Referre	d to in	LPOI (examination regu	lations for teaching-d	legree programmes)		
Module	e appea	ars in				
Master	's degr	ee (1 major) Computer Sc	ience (2016)			
Master	's degr	ee (1 major) Mathematics	6 (2016)			
Master's degree (1 major) Computational Mathematics (2016)						
Master's degree (1 major) Digital Humanities (2016)						
Master	waster's degree (1 major) Computer Science (2017)					
Master	Master's degree (1 major) Computer Science (2018)					
Master	viaster's degree (1 major) Computational Mathematics (2019)					
Master	s uegn 's teacl	ing degree Gymnasium I	MINT Teacher Educati	on PLUS, Flite Netwo	ork Bavaria (FNB) (2020)	
Supple	mentar	y course MINT Teacher E	ducation PLUS, Elite N	letwork Bavaria (ENI	B) (2020)	

Modul	e title	Abbreviation				
Securi	Security of Software Systems 10-I=SSS-172-m01					
Modul	e coordinator		Module offered by			
holder	of the Chair of Computer Scienc	e ll	Institute of Comput	er Science		
ECTS	Method of grading	Only after succ. con	pl. of module(s)			
5	numerical grade					
Durati	on Module level	Other prerequisites				
1 seme	ester graduate					
Conter	nts					
The lecture provides an overview of common software vulnerabilities, state-of-the-art attack techniques on mo- dern computer systems, as well as the measures implemented to protect against these attacks. In the course, the following topics are discussed: • x86-64 instruction set architecture and assembly language • Runtime attacks (code injection, code reuse, defenses) • Web security • Blockchains and smart contracts • Side-channel attacks • Hardware security Intended learning outcomes						
Studer cepts s ses all tive.	nts gain a deep understanding of such as blockchains. The lecture ow students to gain hands-on ex	software security, fr prepares for researc perience with attack	om hardware and lov h in the area of secu s and analysis of sys	w-level attacks to modern con- rity and privacy, while the exerci- tems from an attacker's perspec-		
Course	es (type, number of weekly conta	ct hours, language –	- if other than Germa	n)		
V (2) + Modul	Ü (2) e taught in: English					
Metho ster, ir	d of assessment (type, scope, la Iformation on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-		
writter If anno examin prox. 1 Langua credita	written examination (approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: English craditable for bonus					
Alloca	tion of places					
Additi	onal information					
Focuse IS, LR, Basic I	es available for students of the N HCI, ES. programming knowledge in C is r	laster's programme l equired.	nformatik (Computer	Science, 120 ECTS credits): SE,		
Workle	Workload					
150 h	150 h					
Teaching cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Modul	e appears in					
Maste	r's degree (1 major) Computer Sc	ience (2017)				

Master's with 1 major Mathematics (2019)

Master's degree (1 major) Computer Science (2018) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Information Systems (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Aerospace Computer Science (2020) Master's degree (1 major) eXtended Artificial Intelligence (xtAI) (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 120 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation		
Discrete E	event Simulation			10-I=ST-161-m01	
Module co	oordinator		Module offered by		
holder of t	the Chair of Computer Scie	nce III	Institute of Comput	er Science	
ECTS M	ethod of grading	Only after succ. con	pl. of module(s)		
8 ni	umerical grade				
Duration	Module level	Other prerequisites			
1 semeste	er graduate				
Contents					
Introduction to simulation techniques, statistical groundwork, creation of random numbers and random variables, random sample theory and estimation techniques, statistical analysis of simulation values, inspection of measured data, planning and evaluation of simulation experiments, special random processes, possibilities and limits of model creation and simulation, advanced concepts and techniques, practical execution of simulation projects.					
Intended	learning outcomes				
The students possess the methodic knowledge and the practical skills necessary for the stochastic simulation of (technical) systems, the evaluation of results and the correct assessment of the possibilities and limits of simulation methods.					
Courses (t	type, number of weekly cor	itact hours, language –	- if other than Germa	n)	
V (4) + Ü (2)				
Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus) written examination (approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English					
Allocation	of places				
	i oi places				
Additiona	linformation				
Focuses a IT,IS,ES,G	vailable for students of the E	Master's programme I	nformatik (Computer	Science, 120 ECTS (credits):
Workload					
240 h					
Teaching	cvcle				
Referred t	n in IPO I (evamination re		lagraa programmas)		
Module appears in					
Master's degree (1 major) Computer Science (2016)					
Master's degree (1 major) Authematics (2016)					
Master's degree (1 major) Computational Mathematics (2016)					
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Master's degree (1 major) Computer Science (2017)					
Master's degree (1 major) Computer Science (2018)					
Master's c	degree (1 major) Computati	onal Mathematics (201	9)		
Master's with 1	major Mathematics (2019)	JMU Würzburg data record	g ● generated 19-Apr-2025 ● e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 121 / 403

Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Information Systems (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Aerospace Computer Science (2020) Master's degree (1 major) eXtended Artificial Intelligence (xtAl) (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 122 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
NLP and Text Mining 10-I=STM-162-m01						
Module coordinator			Module offered by			
holder	of the (Chair of Computer Scier	nce VI	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	n l	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its	3.00000				
Founda tection stic pa The stu text mi taught	ations in , token rsing, w Idents I ning an . They h	n the following areas: d isation, collocation, N-g yord sense disambiguat possess theoretical and d language processing ave gained experience	efinition of NLP and te gram models, morphol tion, term extraction m I practical knowledge a mostly for English. The in the application of te	xt mining, properties ogy, hidden Markov ethods, information about typical method ey are able to solve p ext mining algorithms	s of text, sentence bo models for tagging, extraction, sentimer Is and algorithms in problems through the	oundary de- probabili- nt analysis. the area of e methods
Intend	ed lear	ning outcomes		0 0		
The stu text mi	idents p ning an	bossess theoretical and d language processing	l practical knowledge a . They are able to solve	about typical method e practical problems	ls and algorithms in with the methods ac	the area of quired in
Course	r (typo		tast hours language	if other than Corma	n)	
V (2) +	Ü (2)	, number of weekly con	lact nours, language –	- II other than Germa	11)	
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other the can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
written examination (approx. 60 to 120 minutes). If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English						
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Focuse IT, HCI.	s availa	able for students of the	Master's programme I	nformatik (Computer	Science, 120 ECTS (credits): AT,
Worklo	ad					
150 h						
Teachi	ng cvcl	9				
	<u> </u>					
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
§ 22	Nr. 3 b)					
Module appears in						
Master's degree (1 major) Computer Science (2016)						
Master's degree (1 major) Computer Science (2017)						
Master's degree (1 major) Computer Science (2018)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master's degree (1 major) Information Systems (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2020)	
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record I	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 123 / 403

Master's degree (1 major) Computer Science (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Information Systems (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Information Systems (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 124 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module	e title				Abbreviation	
Visualization of Graphs 10-I=VG-161-m01						
Module	e coord	inator		Module offered by		
holder	of the (Chair of Computer Scie	nce l	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites	i		
1 seme	ester	graduate				
Conten	nts					
This co <i>phenth</i> the pla as well	ourse co neorie (/ inar sep l as algo	overs the most importa Algorithmic Graph Theo parator theorem will be prithms to optimise the	nt algorithms to draw g ory) such as divide and used. We will become ese measures.	raphs. Methods from conquer, flow netwo familiar with measu	n the course <i>Algorith</i> orks, integer progran res of quality of a gra	nmische Gra- nming and aph drawing
Intend	ed lear	ning outcomes				
The pa their ki	rticipar nowled	its get an overview of g	raph visualisation and	become familiar with ns with the help of g	h typical tools. They raphs and graph alg	consolidate orithms.
Course	s (type	number of weekly cor	ntact hours, language -	- if other than Germa	in)	
V (2) +	<u> </u> (2)	,			,	
Metho	d of ace	essment (type scope	language — if other th	an German, evamina	tion offered — if not	every como
ster, in	formati	on on whether module	e can be chosen to earn	a bonus)		every serife
examir prox. 1 Langua credita	nation c 5 minut age of a Ible for	of one candidate each (es per candidate). ssessment: German ar bonus	approx. 20 minutes) or	an oral examination	in groups of 2 cand	idates (ap-
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Focuse AT,IT,H	es availa ICI,GE	able for students of the	e Master's programme I	nformatik (Computer	r Science, 120 ECTS	credits):
Worklo	ad					
150 h						
Teachi	ng cycl	۵				
	iis cyce					
Referre	d to in	IPOI (examination re	gulations for teaching.	degree programmes)		
S ap II						
9 22 II	NI. 3 D)	we in				
Module appears in						
Master's degree (1 major) Computer Science (2016) Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Mathematics (2010) Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computer Science (2017)						
Master's degree (1 major) Computer Science (2018)						
Master	's degr	ee (1 major) Computati	onal Mathematics (201	9)		
Master	's degr	ee (1 major) Mathemat	ICS (2019)			
Master's w	ith 1 majo	r Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 125 / 403

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Computer Science (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Computer Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 126 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Applie	Applied Analysis 10-M=AAAN-161-m01					
Modul	e coord	inator		Module offered by		
Dean o	of Studie	es Mathematik (Mathen	natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conter	Contents					
In-dept theory particu theory Recom	th study of Hilbe Ilar FEM of ellipt mendee	of functional analysis ert spaces and Fourier a methods), principles o tic, parabolic and hyper d previous knowledge:	and operator theory, S nalysis, spectral theor f functional analysis, f bolic partial differenti	obolev spaces and p y and quantum mech function spaces, emb al equations with me	partial differential eq hanics, numerical m pedding theorems, c ethods from function	uations, ethods (in ompactness, al analysis.
Intend	od loar	n are contents of the m			Jiiiiieiided.	
The et	dont in	acquainted with the fir	ndamontal nations	othode and requite -	fhigher analysis	Sho is able
to esta physic:	blish a s and of	connection between hi ther natural and engine	s/her acquired skills a ering sciences.	nd other branches o	f mathematics and c	juestions in
Course	s (type,	number of weekly con	tact hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taugh	t in: German and/or Eng	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester creditable for bonus						
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	9				
	<u> </u>					
Peferred to in IPO I (examination regulations for teaching degree programmes)						
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Physics (2016)						
Master's degree (1 major) Economathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master	Master's degree (1 major) Computational Mathematics (2016)					
Master	's teach	ning degree Gymnasium	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	016)
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 127 / 403

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Module title			Abbreviation			
Topics in Algebra			10-M=AALG-161-m01	1		
Modul	<u> </u>	instar		Modulo offered by		
Modul			··			
Dean o	of Studio	es Mathematik (Mathem	atics)	Institute of Mathem	latics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate	<u> </u>			
Conter					• • • •	
algebra	nporary a.	topics in algebra, for ex	ample cooing theory,	elliptic curves, algei	oraic combinatorics o	r computer
Recom	mende	d previous knowledge:				
Basic k "Applie	knowled ed Algel	lge of algebra is assume bra".	d, such as can be acc	quired in the module	s "Introduction to Alg	ebra" and
Intend	ed lear	ning outcomes				
The stu	ident is	acquainted with fundar	mental concents and u	nethods in a contem	norary field of algebr	ra and is ab-
le to ap	oply the	ese skills to complex que	estions.			a, and 15 ab
Course	s (type	, number of weekly conta	act hours, language –	- if other than Germa	n)	
V (4) +	Ü (2)					
Modul	e taugh	t in: German and/or Eng	lish			
Metho	d of ass	essment (type, scope, l	anguage — if other th	an German, examina	tion offered — if not e	every seme-
ster, in	formati	on on whether module o	an be chosen to earn	a bonus)		
a) writt	en exai	mination (approx. 90 to	120 minutes, usually	chosen) or		
b) oral	examin	ation of one candidate e	of 2 15 minutes per c	andidate)		
Langua	age of a	ssessment: German or E	inglish			
Assess	sment o	ffered: In the semester i	n which the course is	offered and in the su	ubsequent semester	
credita	ble for	bonus				
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
			-			
Worklo	ad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computational Mathematics (2019)						
Master	Master's degree (1 major) Mathematics (2019)					
Master Master's	s teach	ning degree Gymnasium		ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	20)
master S W	nan i majo	mathematics (2019)	data record	Master (120 ECTS) Mathemati	k - 2019	page 129 / 403

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 130 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Differential Geometry			10-M=ADGM-161-m	01		
Modulo coordinator Modulo offered by			Module offered by			
		Institute of Mathem				
					Idlics	
ECIS	Metho		Only after succ. con	npl. of module(s)		
10	Inume					
Duratio	on stor	Module level	Other prerequisites			
Conter		graduate				
Centra	l and ac	lvanced results in differ	 ential geometry in pa	rticular about differe	entiable and Rieman	nian mani-
folds.			entiat geometry, in pa			
Recom	mende	d previous knowledge:				
Basic k metric	knowlec Analysi	lge from the modules "I s" is recommended.	ntroduction to Differer	ntial Geometry", "Intr	oduction to Topolog	y" and "Geo-
Intend	ed learr	ning outcomes				
The stu	udent is	acquainted with conce	pts and methods for d	ifferentiable manifol	ds or Riemannian m	anifolds, is
able to try.	apply t	hese methods and kno	ws about the interaction	on of local and globa	al methods in differe	ntial geome-
Course	s (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taugh	t in: German and/or Eng	lish			
Motho	d of acc	essment (type scope)	anguago — if other th	an Gorman, oyamina	tion offered — if not	ovony como-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		every seme-
a) writt	en exar	nination (approx. 90 to	120 minutes, usually	chosen) or		
b) oral	examin	ation of one candidate	each (approx. 20 mini	utes) or		
c) oral	examin	ation in groups (groups	of 2, 15 minutes per c	andidate)		
Langua	age of a	ssessment: German or I	English			
Assess	ment o	ffered: In the semester i	n which the course is	offered and in the su	ibsequent semester	
Allocat	tion of r	laces	_			
Additio	onal info	ormation				
			_			
Worklo	ad		_			
300 h						
Teachi	ng cvcl	9				
	0.7	-				
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Physics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	's degre	ee (1 major) Computatio	nal Mathematics (201	9)		
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 131 / 403

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 132 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Functio	Functional Analysis 10-M=AFAN-161-m01				01	
Module	e coord	inator		Module offered by		
Dean o	of Studi	es Mathematik (Mathe	matics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conten	nts				<u> </u>	
functio	n and H onal ana	ilbert spaces, bounded ilysis and applications	to other fields of math	of functional analysis ematics.	s, further contempor	ary topics in
Recom	mende	d previous knowledge:	odulo "Advancod Anal	vsis" is strongly roco	mmondod	
Intend		n the contents of the h		ysis is stioligly leco	innended.	
The st	Ident is	acquainted with fund:	mental concepts and	methods in a contem	porary field of funct	ional analy-
sis, an	d is abl	e to apply these skills	to complex questions.	nethous in a conten	ipolary neta or funct	ionat anaty
Course	s (type	, number of weekly cor	tact hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taugh	t in: German and/or En	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
a) writt	en exal examir	nination (approx. 90 to) 120 minutes, usually	chosen) or		
c) oral	examin	ation in groups (group	s of 2, 15 minutes per c	andidate)		
Langua	age of a	ssessment: German or	English			
Assess	ment o ble for	ffered: In the semester	in which the course is	offered and in the su	ibsequent semester	
Allocat	tion of r	blaces				
Additio	onal inf	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master	's teacl	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	020)
Master's w	ith 1 majo	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 133 / 403

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 134 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title A					Abbreviation	
Complex Analysis 10-M=AFTH-161-m01					1	
Modul	e coord	inator		Module offered by	<u> </u>	
Dean of Studies Mathematik (Mathematics)			natics)	Institute of Mathem	atics	
ECTS Method of grading Only after succ. compl. of module(s)						
10 numerical grade						
Duration Modula loval Other preservicitor						
1 semester graduate						
Conter	nts					
In-dep geome ons (e. Recom	th study tric met g. ellip	y of mapping properties hods. Structural proper tic functions).	of analytic functions a ties of families of hold	and their generalisat omorphic and merom	ions with modern an orphic functions. Sp	alytic and pecial functi-
Basic I	knowled	lge of the contents of th	e module "Introductio	n to Complex Analys	is" is recommended	
Intend	ed lear	ning outcomes				
The stu ticular betwee	udent is the (ge en his/ł	acquainted with the fu ometric) mapping prope her acquired skills and c	ndamental notions, m erties of holomorphic f other branches of matl	ethods and results o functions. He/She is nematics and applica	f higher complex an able to establish a c ations in other subje	alysis, in par- onnection cts.
Course	es (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (4) + Modul	Ü (2) e taugh	t in: German and/or Eng	lish			
Metho	d of ass	essment (type, scope,	anguage — if other th	an German, examina	tion offered — if not	everv seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		,
a) written examination (approx. 90 to 120 minutes, usually chosen) or						
b) oral	examir	ation of one candidate	each (approx. 20 mini	utes) or		
c) oral	examin	ation in groups (groups	of 2, 15 minutes per c	andidate)		
Langua	age of a	ssessment: German or	English			
Assess	sment o Ible for	ffered: In the semester bonus	in which the course is	offered and in the su	ibsequent semester	
Alloca	tion of r	places				
Additi	onal inf	ormation				
Addition						
Workle			_			
200 h						
Teachi	ng cycl	A				
	iis cyce		_			
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Modul	e appea	irs in				
Master	r's degr	ee (1 major) Mathematio	cs (2016)			
Master	r's degr	ee (1 major) Physics (20	16)			
Master	's degr	ee (1 major) Mathematio	cal Physics (2016)			
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	r's degr	ee (1 major) Computatio	onal Mathematics (201	9)		
Master's w	ith 1 majo	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 135 / 403

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 136 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation						
Geometric Structures 10-M=AGMS-161-m01					01	
Module coordinator			Module offered by			
Dean of Studies Mathematik (Mathematics)			atics)	Institute of Mathem	atics	
ECTS Method of grading Only after succ. compl. of module(s)						
10 numerical grade						
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts	-				
Tits bu ang co	ildings, ndition	generalised polygons o s, classification results.	r related geometric st	ructures, automorph	isms, BN pairs in gro	oups, Mouf-
Recom Basic k comme	mende nowlec ended.	d previous knowledge: Ige from the modules "Ir	troduction to Differer	ntial Geometry" and "	Introduction to Topo	ology" is re-
Intend	ed lear	ning outcomes				
The stu	Ident ic	acquainted with the fur	damental notions m	ethods and results o	oncerning a type of	reometric
structu about t	re. He/	She is able to establish ractions of geometry and	a connection betweer d other fields of math	these results and b ematics.	roader theories, and	learns
Course	s (type	, number of weekly conta	act hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taugh	t in: German and/or Eng	lish			
Metho	d of ass	essment (type, scope, la	anguage — if other th	an German, examina	tion offered — if not	every seme-
a) written examination (approx. 90 to 120 minutes, usually chosen) or						
c) oral	examin	ation in groups (groups	of 2, 15 minutes per c	andidate)		
Langua	ige of a	ssessment: German or E	nglish			
Assess credita	ment o ble for	ffered: In the semester in bonus	n which the course is	offered and in the su	ıbsequent semester	
Additio	Additional information					
			_			
Worklo	ad					
300 h			-			
Teachi	ng cycl	9				
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master	's degr	ee (1 major) Mathematic	al Physics (2016)			
Master	's degr	ee (1 major) Computation	nal Mathematics (201	6)		
Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Supple	mentar	y course MINT Teacher E	ducation PLUS, Elite	Network Bavaria (ENI	B) (2016)	
Master	's degr	ee (1 major) Computation	nal Mathematics (201	9)		
Naster	s degr	ee (1 major) Mathematic	5 (2019)	• concrated to Apr 2025 -	yam reg	nage 127 / (02
master's W	itir i majol	mathematics (2019)	data record	Naster (120 ECTS) Mathemati	k - 2019	page 137 / 403

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 138 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation						
Giovanni Prodi Lecture (Master) 10-M=AGPCin-152-mo1					m01	
Modul	e coordinator		Module offered by	<u> </u>		
Dean	of Studios Mathematik (Mathe	matica	Institute of Mathem			
	Studies Mathematik (Mathe					
ECIS	Method of grading	Only after succ. compt. of module(s)				
5	numerical grade					
Duratio	on Module level	Other prerequisites				
1 seme	ester graduate					
Conter	nts					
Introdu	iction to a specialised topic in	mathematics by an inf	ernational expert.			
Intend	ed learning outcomes					
The stu themat themat	udent is acquainted with the fu tics. He/She is able to establis tics and applications in other	Indamental concepts a h a connection betwee Subjects.	nd methods of a cor en his/her acquired s	temporary research skills and other bran	topic in ma- ches of ma-	
Course	es (type, number of weekly cor	tact hours, language –	- if other than Germa	ın)		
V (3) + Modul	Ü (1) e taught in: English					
Metho ster, in	d of assessment (type, scope, formation on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-	
a) written examination (approx. 60 to 90 minutes, usually chosen) or b) oral examination of one candidate each (approx. 15 minutes) or c) oral examination in groups (groups of 2, approx. 10 minutes per candidate) Language of assessment: English Assessment offered: In the semester in which the course is offered and in the subsequent semester						
Allocat	tion of places					
Additional information						
Workload						
150 h						
Teaching cycle						
Referre	ed to in LPO I (examination re	gulations for teaching-	degree programmes)			
		<u> </u>				
Modul	e appears in					
Master	r's degree (1 major) Mathemat	cs International (2015)				
Master	r's degree (1 major) Mathemati	cs (2016)				
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's degree (1 major) Computational Mathematics (2019)						
Master	r's degree (1 major) Mathemat	cs (2019)				
Master	r's degree (1 major) Mathemati	cal Physics (2020)				
Master	r's degree (1 major) Mathemat	cs International (2021)				
Master	r's degree (1 major) Computati	onal Mathematics (202	22)			
Master	r's degree (1 major) Mathemat	cs (2022)				
Master	r's degree (1 major) Mathemat	cal Physics (2022)				
Master's w	ith 1 major Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e Master (120 FCTS) Mathemati	xam. reg.	page 139 / 403	

Master's degree (1 major) Mathematics International (2022) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Mathematics International (2025) Master's degree (1 major) Mathematical Data Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 140 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation						
Indust	Industrial Statistics 1 10-M=AIST-161-m01					1
Module	e coord	inator		Module offered by	<u> </u>	
Dean of Studies Mathematik (Mathematics)			Institute of Mathem	natics		
ECTS	Metho	od of grading	Only after succ. compl. of module(s)			
10	10 numerical grade					
Duratio	Duration Module level Other prerequisites					
1 semester graduate						
Conten	ıts					
Theory bution	of para analysi	meter and domain est s, comparative analysi	imates, tests for statist s, statistical product te	ical estimates, distri esting, survey sampli	bution models, emp ng, audit sampling.	irical distri-
Intend	ed learı	ning outcomes				
The stu	ident m	asters the fundamenta	l statistical methods fo	or industrial applicat	ions.	
Course		number of weekly cor	tact hours language	if other than Corma	() ()	
Course		, number of weekly cor	– – – – – – – – – – – – – – – – – – –	- II OLIIEI LIIAII GEIIIIA	lii <i>)</i>	
V (4) + Module	U (2) e taugh	t in: German and/or En	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
a) writt	en exai	nination (approx. 90 to	o 120 minutes, usually	chosen) or		
b) oral	examin	ation of one candidate	e each (approx. 20 mini	utes) or andidata)		
L'angua	examin age of a	ssessment. German or	5 of 2, 15 minutes per c Fnølish	alluluale)		
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ibsequent semester	
credita	ble for	bonus				
Allocat	tion of r	olaces				
Additional information						
Worklo	ad					
300 h						
Teaching cycle						
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Module	e appea	nrs in				
Master	's degr	ee (1 major) Mathemati	ics (2016)			
Master	's degr	ee (1 major) Economatl	nematics (2016)			
Master	's degr	ee (1 major) Mathemat	ical Physics (2016)			
Master	's degr	ee (1 major) Computati	onal Mathematics (201	6)		
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	's degr	ee (1 major) Computati	onal Mathematics (201	9)		
Master	's degr	ee (1 major) Mathemat	ics (2019)			
Master	's teach	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	020)
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2020)	
Master	Master's degree (1 major) Mathematical Physics (2020)					
Master	's degr	ee (1 major) Economatł	nematics (2021)			
Master's w	ith 1 majoi	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 141 / 403

Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 142 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation			
Lie Theory 10-M=ALTH-161-m01					1		
Module	e coord	inator		Module offered by	<u> </u>		
Dean o	fStudie	es Mathematik (Mathen	natics)	Institute of Mathem	natics		
ECTS	Metho	od of grading	Only after succ. compl. of module(s)				
10 numerical grade							
Duratio	on	Module level	Other prerequisites				
1 seme	ster	graduate					
Conten	Its						
Linear examp	Lie grou les, app	ıps and their Lie algebr olications, e. g. in physi	as, exponential functions and control theory.	on, structure and cla	ssification of Lie alge	ebras, classic	
Recom Basic k mende useful.	mendeo nowlec d. Furth	d previous knowledge: lge of the contents of th nermore, basic knowled	ne modules "Functiona ge of the contents of t	ll Analysis" and "Intro he module "Introduc	oduction to Topology tion to Differential G	y" is recom- eometry" is	
Intend	ed learr	ning outcomes					
The stu apply t ar alge	ident is hese to bra.	acquainted with the fu common problems, an	ndamental results, the d knows about the int	eorems and methods eractions of group th	in Lie theory. He/Sh eory, analysis, topo	ne is able to logy and line-	
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	ın)		
V (4) + Module	Ü (2) e taugh	t in: German and/or Eng	glish				
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-	
ster, in	formati	on on whether module	can be chosen to earn	a bonus)			
a) writt b) oral c) oral Langua Assess credita	a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester creditable for bonus						
Allocation of places							
Additio	onal info	ormation					
Worklo	ad						
300 h							
Teachi	ng cycl	e					
Referred to in LPO I (examination regulations for teaching-degree programmes)							
Module appears in							
Master	's degre	ee (1 major) Mathemati	cs (2016)				
Master	's degre	ee (1 major) Physics (20	16)				
Master's degree (1 major) Mathematical Physics (2016)							
Master's degree (1 major) Computational Mathematics (2016)							
Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supple	mentar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)		
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 143 / 403	

Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 144 / 403				
	data record Master (120 ECTS) Mathematik - 2019					
Module title				Abbreviation		
--	--	----------------------------	-----------------------------------	-------------------------------	-----------------------	----------------
Numeric of Large Systems of Equations10-M=ANGG-161-m01				01		
Modul	<u>a coord</u>	inator		Module offered by		
Deen	e coord	nator	matical			
Dean C	Math	es Mathematik (Mather		Institute of Mathem	latics	
	metho	nical grade	Unly after succ. cor	npl. of module(s)		
	Inume					
Duratio	on	module level	Other prerequisites	i		
1 Sellie	ester	graduate				
Conter	105	<u> </u>				
Discret	tisation	of elliptic differential e	quations, classical ite	ration methods, prec	onditioners, multigr	id methods.
Recom	mende	d previous knowledge.				
Basic	knowled	lge of numerical mathe	matics, such as that a	cauired in the modul	es "Numerical Math	ematics 1"
and "N	lumeric	al Mathematics 2", is re	equired. Knowledge of	the contents of the n	nodule "Basics in Op	otimization"
is also	recomr	mended.				
Intend	ed lear	ning outcomes				
The stu	udent is	acquainted with the m	ost important method	s for solving large sy	stems of equations,	and knows
the mo	ost effic	ient way to solve a give	n system of equations			
Course	es (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (4) +	Ü (2)					
Modul	e taugh	t in: German and/or En	glish			
Metho	d of ass	sessment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
a) writt	ten exai	mination (approx. 90 to	120 minutes, usually	chosen) or		
b) oral	examir	ation of one candidate	each (approx. 20 min	utes) or		
c) oral	examin	ation in groups (groups	5 of 2, 15 minutes per c	andidate)		
Langua	age of a	ssessment: German or	English in which the course is	offered and in the su	ibsoquent comester	
credita	able for	bonus	in which the course is	onered and in the st	ibsequent semester	
Allocat	tion of r	places				
Additid	onal inf	ormation				
Auun						
Workle						
worku	Jau					
300 1			_			
Teachi	ng cycl	е				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Modul	e appea	ars in				
Master's degree (1 major) Mathematics (2016)						
Master	Master's degree (1 major) Economathematics (2016)					
Master	r's degr	ee (1 major) Mathemati	cal Physics (2016)			
Master	r's degr	ee (1 major) Computatio	onal Mathematics (201			
Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Master	r's door	ee (1 major) Computation	mai mainematics (201	9)		
Master's w	/ith 1 majo	r Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e	xam. reg.	page 145 / 403
			data record	Master (120 ECTS) Mathemati	k - 2019	



Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Module title Abbreviation						
Basics	Basics in Optimization 10-M=AOPT-161-m01				01	
Modul	a coord	inator		Module offered by		
Deen	f Ctudi	Mathamatik (Matha	matica			
Dean o	or Studie	es Mathematik (Mather		Institute of Mathem	latics	
	metho	rical grading	Unly after succ. con	npl. of module(s)		
Durati	nume					
Duratio	on octor	module level	Other prerequisites	i		
Contor		giauuale				
Cunder				:	antinciantian aandi	4:
mality,	restrict	ed optimization, exam	ples and applications	in natural and engine	eering sciences as w	ell as econo-
Intend	ed learı	ning outcomes				
The stu ses an	udent kı d can d	nows the fundamental ecide which method is	methods of continous the most suitable in a	optimization, can jud oplications.	dge their strengths a	nd weaknes-
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
V (4) + Module	Ü (2) e taugh	t in: German and/or En	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		,
a) writt b) oral c) oral Langua Assess credita	en exan examin examin age of a ment o ble for	nination (approx. 90 to ation of one candidate ation in groups (groups ssessment: German or ffered: In the semester bonus	120 minutes, usually each (approx. 20 minus of 2, 15 minutes per c English in which the course is	chosen) or utes) or andidate) offered and in the su	ubsequent semester	
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	A				
	ing cycl	u				
Deferre	d to in	IDOL (avamination ro		dagraa programmac)		
Releffe				legree programmes)		
Modul	o 20002	re in				
Master	's dear	no m 20 (1 maior) Mathemati	cs (2016)			
Master	's degr	ee (1 major) Fconomath	ematics (2016)			
Master's degree (1 major) Leonomatical Physics (2016)						
Master's degree (1 major) Mathematical Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS. Elite Network Bavaria (ENB) (2016)						
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Master	Master's degree (1 major) Computational Mathematics (2019)					
Master	Master's degree (1 major) Mathematics (2019)					
Master	's teacl	ning degree Gymnasiun	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	020)
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2020)	
Master's w	rith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 147 / 403

Master's with 1 major Mathematics (2019)

Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

JMU Würzburg • generated 19-Apr-2025 • exam. reg.

data record Master (120 ECTS) Mathematik - 2019

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Module title Abbreviation						
Contro	Control Theory 10-M=ARTH-161-m01					01
Module	e coord	inator		Module offered by		
Dean o	f Studie	es Mathematik (Mather	natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade		•		
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
Introdu bility, b	iction to basics i	o mathematical system n optimal control.	s theory: stability, con	trollability and obser	vability, state feedb	ack and sta-
Recom Basic k	mende nowlec	d previous knowledge: Ige of the contents of t	he module "Ordinary D	ifferential Equations	" is useful.	
Intende	ed learr	ning outcomes				
The stu blish a and oth	ident is connec ner fielc	acquainted with the fu tion between these results of mathematics.	indamental notions an sults and broader theo	d methods of contro ries, and learns abou	l theory. He/She is a ut the interactions of	ble to esta- geometry
Course	s (type	number of weekly con	tact hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taugh	t in: German and/or En	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		every serie
a) writt b) oral	en exar examin	nination (approx. 90 to ation of one candidate	9 120 minutes, usually e each (approx. 20 minu	chosen) or utes) or		
c) oral	examin	ation in groups (group:	s of 2, 15 minutes per c	andidate)		
Langua	ige of a	ssessment: German or	English			
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ıbsequent semester	
credita	ble for	, ponus				
Allocat	ion of p	olaces				
Additio	nal info	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	9				
Referre	ed to in	LPOT (examination reg	gulations for teaching-	degree programmes)		
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Economathematics (2016)						
Master	Master's degree (1 major) Mathematical Physics (2016)					
Master	Master's degree (1 major) Computational Mathematics (2016)					
Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Supple	mentar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	's degre	ee (1 major) Computati	onal Mathematics (201	9)		
Master	S degre	ee (1 major) Mathemati	CS (2019)	• generated to Apr 2025 • a	vam reg	nage 1/0 / / 02
Master S W	iai i major	mathematics (2019)	data record	Master (120 ECTS) Mathemati	k - 2019	page 149 / 403



Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Bachelor's degree (1 major) Aerospace Computer Science (2020) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023)

Module title Abbreviation							
Stocha	Stochastic Models of Risk Management 10-M=ASMR-161-m01					01	
Module	e coord	inator		Module offered by	l		
Dean o	of Studie	es Mathematik (Mathe	matics)	Institute of Mathematics			
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)			
10	nume	rical grade					
Duratio	on	Module level	Other prerequisites	·			
1 seme	ster	graduate					
Conten	its						
Measu res, va la, moo estima series risk in	Measure theory, risk diagrams, failure mode and effects analysis, risk assessment in auditing, shortfall measu- res, value at risk, conditional value at risk, axiomatic of risk measures, modelling of interdependencies, copu- la, modelling of functional interrelations, regression models, basics in time series modelling, aggregated losses, estimates of shortfall measures, estimates of value at risk and conditional value at risk, basics in empirical time series analysis, methods of exponential smoothing, predictions and prediction domains, estimates of value at risk in time series, elementary empirical regression analysis, simulation methods.						
Tho stu	idont is	acquainted with the fu	indamontal mothods o	f stochastic risk ana	lycic		
Course				if other then Corne	(y515.		
V	is (type)	, number of weekly cor	ilact nours, language –	- ii other than Germa	(11)		
Module	e taugh	t in: German and/or En	glish				
 Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus) a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 							
credita	ble for	bonus	_				
		Jaces					
Additio	onal info	ormation					
Worklo	ad						
300 h							
Teachi	ng cvcl	6					
	0.7	-					
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)			
Module	e appea	urs in					
Master	Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Economathematics (2016)							
Master's degree (1 major) Mathematical Physics (2016)							
Master	Master's degree (1 major) Computational Mathematics (2016)						
Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN ๑)	в) (2016)		
Master	's degr	ee (1 major) Computati	ics (2010)	9)			
1	2 2 2 5 1						
Master's w	ith 1 majoı	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemat	exam. reg. ik - 2019	page 151 / 403	



Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Module title Abbreviation						
Stocha	Stochastical Processes 10-M=ASTP-161-m01					01
Modul	e coord	inator		Module offered by	<u> </u>	
Dean c	of Studio	es Mathematik (Mather	matics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
10	nume	rical grade		-		
Duratio	on	Module level	Other prerequisites	6		
1 seme	ester	graduate				
Conter	nts					
Markov	v chains	s, queues, stochastic p	rocesses in C[0,1], Bro	wnian motion, Donsk	ker's theorem, projec	ctive limits.
Deserve						
Basic k	mende mowled	a previous knowledge: lge of stochastics is red	nuired, such as that ac	auired in the "Stoch:	astics 1" module. Kn	owledge of
the cor	ntents c	of the module "Stochas	tics 2" is also recomm	ended.		onicuze oi
Intend	ed lear	ning outcomes				
The stu	udent is	acquainted with the fu	Indamental notions an	d methods of stocha	stical processes and	d can apply
them t	o practi	cal problems.			```	
Course	es (type	, number of weekly con	tact hours, language -	– if other than Germa	n)	
V (4) + Modul	U (2) e taugh	t in: German and/or Fn	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
a) writt	ten exai	nination (approx. 90 to	120 minutes, usually	chosen) or		
b) oral	examir	ation of one candidate	each (approx. 20 min	utes) or		
c) oral	examin	ation in groups (groups	s of 2, 15 minutes per c English	andidate)		
Assess	sment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	,
credita	ble for	bonus				
Allocat	tion of p	olaces				
	_					
Additio	onal inf	ormation				
	_					
Worklo	oad					
300 h						
Teachi	ng cycl	e				
	-					
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Modul	e appea	irs in				
Master	r's degr	ee (1 major) Mathemati	cs (2016)			
Master's degree (1 major) Economathematics (2016)						
Master	r's degr	ee (1 major) Mathemati	cal Physics (2016)			
Master	s degr	ee (1 major) Computation	onal Mathematics (201	.6)	ork Dovoria (END) (-	016)
Supple	s leach	nng degree Gymnasiun v course MINT Teachar	Education PLUS Flits	Network Bavaria (EN	uik davalla (ENB) (2 B) (2016)	(010)
Master	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2010)					
Master	's degr	ee (1 major) Mathemati	cs (2019)	· <i>)</i> /		
·						
Master's w	ith 1 majo	Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 153 / 403



Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Module title Abbreviation						
Topolo	Topology 10-M=ATOP-161-mo1)1
Module coordinator Module offered by						
Dean o	of Studie	es Mathematik (Mathe	matics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	numei	rical grade		•		
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
Set-the spaces	eoretic t 5, coveri	opology, topological in ng spaces.	nvariants (e. g. fundam	ental group, connect	ion), construction of	ftopological
Intend	ed learr	ning outcomes				
The stu these t	udent is to comm	acquainted with the find the finance of the finance of the finance of the finance of the first sector of t	undamental results, the	eorems and methods	s in topology and is a	able to apply
Course	es (type,	number of weekly cor	ntact hours, language –	- if other than Germa	ın)	
V (4) + Module	Ü (2) e taught	t in: German and/or Er	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	everv seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		every serie
a) writt	en exar	nination (approx. 90 to	o 120 minutes, usually	chosen) or		
b) oral	examin	ation of one candidate	e each (approx. 20 mini	utes) or		
c) oral	examin	ation in groups (group	s of 2, 15 minutes per c	andidate)		
Langua	ment of	ffered. In the semester	r in which the course is	offered and in the su	ihsequent semester	
credita	ble for	bonus	in which the course is	offered and in the st	absequent semester	
Allocat	tion of p	olaces				
Additio	onal info	ormation				
Worklo	oad					
300 h						
Teachi	ng cycl	9				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Modul	e appea	rs in				
Master	's degre	ee (1 major) Mathemat	ics (2016)			
Master	's degre	ee (1 major) Physics (2	016)			
Master	's degre	ee (1 major) Mathemat	ical Physics (2016)			
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	Master's degree (1 major) Computational Mathematics (2019)					
Master	Master's degree (1 major) Mathematics (2019)					
Master	s aegre	ee (1 major) Physics (2	UZUJ m MINIT Taachar Educat	ion DILIC Elita Natur	ork Rovaria (END) (a	020)
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2020)	020)
Master's w	vith 1 major	Mathematics (2019)	JMU Würzburg	• generated 19-Apr-2025 • e	exam. reg.	page 155 / 403
			data record	Master (120 ECTS) Mathemati	k - 2019	

Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 156 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation						
Insurai	nce Mat	hematics 1			10-M=AVSM-161-m	01
Module	e coord	inator		Module offered by		
Dean o	f Studie	es Mathematik (Mathen	natics)	Institute of Mathem	atics	
ECTS	Metho	d of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Duratio	n l	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts	5.44446				
The mo types o policy Recom Depend	odule di of benef values, mendeo ding on	scusses policies on on its, present value, expe expenses, bonus, recu d previous knowledge: the content, basic and	e life: distributions of f oction principle, premi rsive methods, Thiele's advanced knowledge	future lifetime, life ta um calculation, com s differential equatio from different areas	bles, life table appro nutation functions, n n. of statistics or stoch	oximations, reserves and nastics is re-
quired.	In case	e of doubt, it is recomm	ended to consult the l	ecturer.		
Intend	ed learr	ning outcomes				
The stu ply the	ident is m to pr	acquainted with the fu actical problems.	ndamental notions an	d methods of life ins	urance mathematics	and can ap-
Course	s (type,	number of weekly con	act hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taugh	t in: German and/or Eng	lish			
Metho	d of ass	essment (type_scope	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		every serie
a) writt b) oral c) oral Langua Assess credita	en exar examin examin Ige of a ment o ble for	nination (approx. 90 to ation of one candidate ation in groups (groups ssessment: German or ffered: In the semester bonus	120 minutes, usually each (approx. 20 minu of 2, 15 minutes per c English in which the course is	chosen) or utes) or andidate) offered and in the su	ıbsequent semester	
Allocat	ion of p	olaces				
	. <u> </u>					
Additio	nal inf	ormation				
Additio						
			_			
Worklo	ad					
300 h						
Teachi	ng cycl	9				
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Module	e appea	rs in				
Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Economathematics (2016) Master's degree (1 major) Computational Mathematics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	's degre	ee (1 major) Computatio	onal Mathematics (201	9)		
Master	's degre	ee (1 major) Mathemati	cs (2019)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 157 / 403

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Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 158 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation						
Time S	Time Series Analysis 1 10-M=AZRA-161-m01					01
Modul	e coord	inator		Module offered by		
Dean o	of Studie	es Mathematik (Mather	matics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
10	nume	rical grade				
Duratio	on	Module level	Other prerequisites	i		
1 seme	ester	graduate				
Conter	nts					
Additiv	/e mode	el, linear filters, autoco	rrelation, moving avera	ige, autoregressive p	rocesses, Box-Jenki	ns method.
Recom	mende	d previous knowledge:	• • • • •			
Basic k	(nowled	lge of stochastics is rec of the module "Stochas	quired, such as that ac	quired in the "Stocha	astics 1" module. Kn	owledge of
Intend	ad loar	aing outcomes		endeu.		
The et		ing outcomes				
proble	ident is ms.	acquainted with the fu	indamental methods o	r time series analysis	s and can apply ther	n to practical
Course	es (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (4) +	Ü (2)					
Modul	e taugh	t in: German and/or En	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	iformati	on on whether module	can be chosen to earn	a bonus)		
a) writt	ten exar	nination (approx. 90 to	120 minutes, usually	chosen) or		
c) oral	examin	ation in groups (groups	s of 2 15 minutes per c	andidate)		
Langua	age of a	ssessment: German or	English			
Assess	sment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	,
credita	ble for	bonus				
Allocat	tion of p	olaces				
Additio	onal info	ormation				
Worklo	pad					
300 h	_					
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Modul	e appea	irs in				
Master	r's degre	ee (1 major) Mathemati	cs (2016)			
Master's degree (1 major) Economathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master	's degr	ee (1 major) Computatio	onal Mathematics (201	.6)		
Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Master	's degri	ee (1 major) Computationee (1 major) Mathemati	onat mathematics (201 cs (2010)	·9/		
I	Jucgn	ce (i major) matricilati	~~ (2017)			I
Master's w	vith 1 majoı	Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 159 / 403

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 160 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation								
Numbe	Number Theory 10-M=AZTH-161-mo1							
Module	e coord	inator		Module offered by	<u> </u>			
Dean o	f Studie	es Mathematik (Mathen	natics)	Institute of Mathem	natics			
ECTS	Metho	od of grading	Only after succ. compl. of module(s)					
10	nume	rical grade						
Duratio	on	Module level	Other prerequisites					
1 seme	ster	graduate						
Conten	ts							
Number-theoretic functions and their associated Dirichlet series resp. Euler products, their analytic theory with applications to prime number distribution and diophantine equations; discussion of the Riemann hypothesis, overview of the development of modern number theory. Recommended previous knowledge: Basic knowledge of algebra and number theory is assumed, such as can be acquired in the modules "Introducti-								
Intende	ed learr	ing outcomes	<u></u>					
The stu structu into mo	ident is res in n odern d	acquainted with the fu umber theory and know evelopments in numbe	ndamental methods o vs methods for the sol r theory.	f analytics number th ution of diophantine	neory, can deal with equations. He/She	algebraic has insight		
Course	s (type	number of weekly con	tact hours, language –	- if other than Germa	n)			
V (4) + Module	Ü (2) e taugh	t in: German and/or Eng	glish					
Method ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-		
a) writt b) oral c) oral Langua Assess credita	en exar examin examin ige of a ment o ble for	nination (approx. 90 to ation of one candidate ation in groups (groups ssessment: German or ffered: In the semester bonus	120 minutes, usually each (approx. 20 minu of 2, 15 minutes per c English in which the course is	chosen) or utes) or andidate) offered and in the su	ubsequent semester			
Allocat	ion of p	olaces						
Additio	onal info	ormation						
Worklo	ad							
300 h								
Teachi	ng cycl	9						
Referre	ed to in	LPO I (examination reg	ulations for teaching-	degree programmes)				
Module appears in								
Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Physics (2016)								
Master	Master's degree (1 major) Mathematical Physics (2016)							
Master's degree (1 major) Computational Mathematics (2016)								
Master	's teach	ning degree Gymnasium	MINI leacher Educat	ION PLUS, Elite Netwo	ork Bavaria (ENB) (2)	016)		
Master's wi	ith 1 major	Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	ида (2010) xam. reg. k - 2010	page 161 / 403		
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UNIVERSITÄT WÜRZBURG

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 162 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Learning by Teaching 1				10-M=ELT1-192-m01		
Module	e coord	inator		Module offered by		
Dean o	f Studi	es Mathematik (Mathema	atics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
5	(not) s	successfully completed				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	Contents					
Superv	ising a	tutorial or study group in	the Bachelor's progr	amme under guidan	ce of the respective lecturer.	
Intende	ed lear	ning outcomes			•	
The stu method	dent ga Is and	ains his/her first experier can apply them in practic	nce in teaching univer al situations.	rsity mathematics. H	le/She knows basic didactical	
Course	s (type	, number of weekly conta	ct hours, language —	if other than Germa	n)	
Ü (2)						
Method ster, in	l of ass formati	sessment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
Assess Langua	ment o ge of a	f tutoring activities by su ssessment: German	pervising lecturers or	exercise supervisor	s (1 to 2 teaching units)	
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Applica	tion ar	nd selection with the tead	hing coordinator for I	nathematics		
Worklo	ad					
150 h						
Teachi	ng cycl	e				
Referre	d to in	LPOI (examination regu	lations for teaching-d	legree programmes)		
Module	e appea	urs in				
Master	's degr	ee (1 major) Computation	al Mathematics (2019	9)		
Master	's degr	ee (1 major) Mathematics	(2019)			
Master	's degr	ee (1 major) Mathematica	ll Physics (2020)			
Master	's degr	ee (1 major) Economathe	matics (2021)			
Master	's degr	ee (1 major) Computation	al Mathematics (202	2)		
Master	's degr	ee (1 major) Mathematics	s (2022)			
Master	's degr	ee (1 major) Mathematica	ll Physics (2022)			
Master	's degr	ee (1 major) Economathe	matics (2022)			
exchan	exchange program Mathematics (2023)					
Master	Master's degree (1 major) Computational Mathematics (2024)					
Master	's degr	ee (1 major) Mathematics	(2024)			
Master	's degr	ee (1 major) Economathe	matics (2024)			
Master	's degr	ee (1 major) Economathe	matics (2025)			

Module title			Abbreviation		
Learnir	Learning by Teaching 2			10-M=ELT2-192-m01	
Module	e coord	inator		Module offered by	
Dean o	f Studi	es Mathematik (Mathema	atics)	Institute of Mathem	natics
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
5	(not) s	successfully completed			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
Superv	ising a	tutorial or study group in	the Bachelor's progr	amme under guidan	ce of the respective lecturer.
Intende	ed lear	ning outcomes			
The stu method	dent g ds and	ains his/her first experier can apply them in practic	nce in teaching unive al situations.	rsity mathematics. H	le/She knows basic didactical
Course	s (type	, number of weekly conta	ct hours, language —	· if other than Germa	in)
Ü (2)					
Methoo ster, in	l of ass formati	essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
Assess Langua	ment o ge of a	f tutoring activities by su ssessment: German	pervising lecturers or	exercise supervisor	s (1 to 2 teaching units)
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Applica	tion ar	nd selection with the teac	hing coordinator for	mathematics	
Worklo	ad				
150 h					
Teachi	ng cycl	e			
Referre	d to in	LPO I (examination regu	lations for teaching-o	legree programmes)	
Module appears in					
Master's degree (1 major) Mathematics (2019)					
Master's degree (1 major) Mathematics (2022)					
exchan	ge prog	gram Mathematics (2023))		
Master	Master's degree (1 major) Mathematics (2024)				

Module title			Abbreviation		
Interns	Internship Mathematics				10-M=EPRK-161-m01
Module	coord	inator		Module offered by	
Dean of	fStudie	es Mathematik (Mathema	atics)	Institute of Mathem	atics
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
10	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semes	ster	graduate	In advance, please o sor.	onsult with a lecture	er who agrees to be your supervi-
Content	ts				
Work pl	aceme	nt in economy, industry,	research or administ	ration.	
Intende	ed learn	ning outcomes			
The stu cal prot	dent aj olem in	oplies his/her skills obta research, economy or in	ined during his/her s dustry.	tudies in the master	programme to a specific practi-
Courses	s (type,	, number of weekly conta	ct hours, language —	if other than Germa	n)
P (o)					
Method ster, inf	l of ass formati	e ssment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
a) place b) talk (ement i (30 to 6	report (15 to 30 pages) or 60 minutes)			
Allocati	ion of p	olaces			
Additio	nal info	ormation			
Worklo	ad				
300 h					
Teachin	ng cycl	9			
Referre	d to in	LPOI (examination regu	lations for teaching-c	legree programmes)	
		· · · · · ·			
Module	appea	irs in			
Master'	s degre	ee (1 major) Mathematics	(2016)		
Master'	s degre	ee (1 major) Computation	al Mathematics (201	9)	
Master'	s degre	ee (1 major) Mathematics	(2019)	、 、	
Master's degree (1 major) Computational Mathematics (2022)					
Master'	s degre	ee (1 major) Mathematics	al Mathematics (acc	4)	
Master'	s degre	e (1 major) Computation	(202)	47	
Teaching cycle Referred to in LPO I (examination regulations for teaching-degree programmes) Module appears in Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024)					

Module title			Abbreviation			
Resear	Research in Groups - Applied Differential Geometry			10-M=GADG-192-m	01	
Modul	e coordinator		Module offered by			
Dean c	of Studies Mathematik (Mathe	matics)	Institute of Mathematics			
FCTS	Method of grading	Only after succ. con	nnl. of module(s)			
10	numerical grade					
Durati		Other prerequisites				
1 seme	ester graduate					
Conter	its					
Select	ed modern topics in Applied D	ifferential Geometry.				
	i i i i i i i i i i i i i i i i i i i	, , , , , , , , , , , , , , , , , , ,				
Recom	mended previous knowledge:					
Advan	ced knowledge of differential g	geometry is required, s	uch as can be acquir	ed in the module "D	ifferenti-	
"Pseuc	henry . Knowledge of the cont ho-Riemannian and Riemannia	n Geometry" and "Lie 1	Theory" is also recom	imended	channes,	
Intend	ed learning outcomes					
The stu	udent gains insight into conter	nporary research probl	ems in Applied Diffe	rential Geometry. He	/She ma-	
sters a	dvanced techniques in this fie	ld and can apply them	to complex problem	5.		
Course	es (type, number of weekly con	tact hours, language –	- if other than Germa	n)		
V (2) +	S (2) a taught in: Cormon and /or En	alich				
Matha		gusu languaga if athor th	an Carman, avamina	tion offered if not		
ster, in	formation on whether module	can be chosen to earn	a bonus)	tion offered — If not	every seme-	
talk (6	o to 120 minutes)					
Langua	age of assessment: German or	English	offered and in the cu	beaguant competer		
Allocat	tion of places		onered and in the st	ibsequent semester		
Alloca						
	anal information					
Workle						
workii						
Toochi						
Teacin						
	d to in LDO L (avamination to					
Referre			uegree programmes)			
Modul	e annears in					
Master	r's degree (1 major) Mathemati	(2010)				
Master	r's teaching degree Gymnasiur	n MINT Teacher Educat	ion PLUS. Elite Netwo	ork Bavaria (ENB) (2	020)	
Supple	ementary course MINT Teacher	Education PLUS. Elite	Network Bavaria (EN	B) (2020)		
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Computational Mathematics (2022)						
Master's degree (1 major) Mathematics (2022)						
Master's degree (1 major) Mathematical Physics (2022)						
exchange program Mathematics (2023)						
Master	Master's degree (1 major) Computational Mathematics (2024)					
Master	's degree (1 major) Mathemati	cs (2024)				
Master's w	vith 1 major Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e	xam. reg.	page 166 / 403	



Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 167 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module	Module title				Abbreviation	
Resear	rch in Grou	ıps - Algebra			10-M=GALG-161-mc	01
Module	e coordina	tor		Module offered by		
Dean o	of Studies I	Mathematik (Mathen	natics)	Institute of Mathematics		
ECTS	Method o	of grading	Only after succ. con	npl. of module(s)		
10	numerica	al grade		• • • •		
Duratio	on M	odule level	Other prerequisites			
1 seme	ester gr	aduate				
Conten	nts					
Selecte puter a	ed modern algebra, alg	topics in algebra (e. gebras, division rings	g. ring theory, commu s, quadratic forms).	itative algebra, diffe	rential algebra, local	fields, com-
Recom Basic k "Applie	mended p knowledge ed Algebra	revious knowledge: of algebra is assum ".	ed, such as can be acc	quired in the module	s "Introduction to Al	gebra" and
Intend	ed learnin	g outcomes				
The stu	udent gain	s insight into contem	porary research probl	ems in algebra. He/S	She masters advance	ed techni-
ques ir	n this field	and can apply them	to complex problems.			
Course	es (type, nu	umber of weekly con	tact hours, language –	- if other than Germa	n)	
V (2) + Module	S (2) e taught in	: German and/or Eng	zlish			
Metho	d of asses	sment (type scope	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formation	on whether module	can be chosen to earn	a bonus)		every serie
talk (60	o to 120 m	inutes)				
Langua	age of asse	essment: German or	English			
Assess	sment offer	red: In the semester	in which the course is	offered and in the su	ibsequent semester	
Allocat	tion of plac	ces				
Additio	onal inform	nation				
Worklo	bad					
300 h						
Teachi	ng cvcle					
Poforro	d to in I D	OI (ovamination roo	ulations for toaching	dogroo programmos)		
Module	e appears	in				
Master	r's degree	(1 major) Mathematio	cs (2016)			
Master	r's degree	(1 major) Mathematio	cal Physics (2016)			
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Mathematics (2019)						
Supple	Master's teaching degree Gymnasium MINT leacher Education PLUS, Elite Network Bavaria (ENB) (2020)					
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Mathematical Hysics (2020) Master's degree (1 major) Computational Mathematics (2022)						
Master	Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022)					
Master's w	vith 1 major Ma	thematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 168 / 403

Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 169 / 403
	data record Master (120 ECTS) Mathematik - 2019	1

Modul	Module title			Abbreviation	
Resear	Research in Groups - Complex Analysis			10-M=GCOA-161-m	01
Modul	e coordinator		Module offered by		
Dean c	of Studies Mathematik (Mather	matics)	Institute of Mathematics		
ECTS	Method of grading	Only after succ. cor	npl. of module(s)		
10	numerical grade				
Duratio	on Module level	Other prerequisites			
1 semester graduate					
Conter	nts				
Selecte geome	ed modern topics in complex a tric complex analysis, value di	nalysis (e.g. in approx stribution theory).	imation theory, pote	ntial theory, comple	ex dynamics,
Recom Depen on with	mended previous knowledge: ding on the current focus of th	e course, knowledge fr of the course is recom	om different areas o mended	f analysis is required	l. Consultati-
Intend	ed learning outcomes				
Tho ctu	ident gains insight into contor	norany recearch probl	ome in complex anal	vcic Ho/Sho macto	rs advanced
technie	ques in this field and can appl	y them to complex pro	blems.	lysis. ne/ sne maste	is auvaliceu
Course	es (type, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (2) +	S (2)				
Modul	e taught in: German and/or En	glish	- ·		
Metho ster, in	d of assessment (type, scope, formation on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
talk (6	o to 120 minutes)				
Langua	age of assessment: German or	English	offered and in the c	heer want competer	
Assess			onered and in the st	ibsequent semester	
Alloca	lion of places				
 Additid	nal information				
Auun					
WORKIG					
300 h					
Teachi	ng cycle				
Referre	ed to in LPO I (examination reg	gulations for teaching-	degree programmes)		
Modul	e appears in				
Master	's degree (1 major) Mathemati	cs (2016)			
Master	's degree (1 major) Mathemati	cal Physics (2016)			
Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)				
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Master's degree (1 major) Mathematics (2019) Master's teaching degree Cympasium MINT Teacher Education DLUS, Elite Network Payeria (ENP) (2000)					
Sunnle	Supplementary course MINT Teacher Education PLUS, Elite Network Bayaria (ENR) (2020)				
Master's degree (1 major) Mathematical Physics (2020)					
Master's degree (1 major) Computational Mathematics (2022)					
Master	's degree (1 major) Mathemati	cs (2022)			
	*** · · · · · · · · · · · · · · · · · ·				· · · · · · · · · · · · · · · · · · ·
waster's w	nun 1 major Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 170 / 403

Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 171 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module	e title				Abbreviation	
Research in Groups - Control Theory of Quantum Mechanical Systems			10-M=GCQS-161-m01			
Module	e coord	inator		Module offered by		
Dean o	f Studi	es Mathematik (Mathema	atics)	Institute of Mathem	patics	
ECTS	Metho	od of grading	Only after succ. com	nl. of module(s)		
10	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	Contents					
Solocto	d mod	orn tonics in control theo	nu of quantum mocha	nical systems		
Selecte			Ty of quantum mecha	filled systems.		
Intende	ed lear	ning outcomes				
The stu stems.	dent ga He/Sh	ains insight into contemp e masters advanced tech	oorary research proble niques in this field an	ems in control theory Id can apply them to	y of quantum mechanical sy- o complex problems.	
Course	s (type	, number of weekly conta	ct hours, language —	if other than Germa	n)	
V (2) + 1 Module	S (2)	t in Cormon and for Engli	ich			
Mothod			nguaga if athor tha	n Cormon overning	tion offered if not even come	
ster, in	formati	ion on whether module ca	an be chosen to earn a	a bonus)	tion onered — It not every senie-	
talk (60	o to 120	o minutes)				
Langua	ge of a	ssessment: German or Er	nglish			
Assess	ment o	ffered: In the semester in	which the course is o	offered and in the su	ibsequent semester	
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
300 h						
Teachir	ng cycl	e				
Referre	d to in	LPO I (examination regu	lations for teaching-d	egree programmes)		
			0			
Module	e appea	ars in				
Master	's degr	ee (1 major) Mathematics	(2016)			
Master	's degr	ee (1 major) Mathematica	ll Physics (2016)			
Master	's teacl	hing degree Gymnasium I	WINT Teacher Education	on PLUS, Elite Netwo	ork Bavaria (ENB) (2016)	
Supple	mentai	ry course MINT Teacher Eo	ducation PLUS, Elite N	letwork Bavaria (EN	B) (2016)	
Master	's degr	ee (1 major) Mathematics	(2019)			
Master	's teacl	hing degree Gymnasium I	WINT Teacher Education	on PLUS, Elite Netwo	ork Bavaria (ENB) (2020)	
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)					
Master	Master's degree (1 major) Mathematical Physics (2020)					
Master	Master's degree (1 major) Computational Mathematics (2022)					
Master	's degr	ee (1 major) Mathematics	(2022)			
Master	's degr	ee (1 major) Mathematica	ll Physics (2022)			
exchan	ge prog	gram Mathematics (2023))			

Modul	Module title			Abbreviation	
Resear	rch in Groups - Deformation Q	uantization		10-M=GDFQ-161-m	01
Modul	e coordinator		Module offered by		
Dean c	of Studies Mathematik (Mathe	matics)	Institute of Mathem	natics	
ECTS	Method of grading	Only after succ. con	npl. of module(s)		
10	numerical grade		•		
Duratio	on Module level	Other prerequisites	;		
1 seme	ester graduate				
Conter	its				
Selecte	ed modern topics in deformat	ion quantization.			
Recom	mended previous knowledge	dulas "Differential Coa	moter" and "Coomot	ria Maabaniaa" ia ra	a m m a n d a d
KIIOWIE			interry and Geomer		.ommended.
Intend	ed learning outcomes				
The stu advance	ident gains insight into conte ced techniques in this field ar	mporary research probl d can apply them to co	ems in Deformation mplex problems.	Quantization. He/Sh	e masters
Course	s (type, number of weekly co	ntact hours, language –	- if other than Germa	n)	
V (2) + Modul	S (2) e taught in: German and/or Er	nglish			
Metho	d of assessment (type, scope	, language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formation on whether module	e can be chosen to earn	a bonus)		
talk (6	o to 120 minutes)				
Langua	age of assessment: German o	r English			
Assess	ment offered: In the semeste	r in which the course is	offered and in the su	ubsequent semester	
Allocat	tion of places				
Additio	onal information				
Worklo	bad				
300 h					
Teachi	ng cycle				
	<u> </u>				
Referre	d to in IPO I (examination re	gulations for teaching.	degree programmes)		
		galations for teaching			
Modul	o appoars in				
Mactor	e appears in de degree (1 maior) Mathemat	ics (2016)			
Master	's degree (1 major) Mathemat	ical Physics (2016)			
Master	's teaching degree Gymnasiu	m MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (FNB) (2	016)
Supple	ementary course MINT Teache	r Education PLUS, Elite	Network Bavaria (EN	B) (2016)	010)
Master	's degree (1 major) Mathemat	ics (2019)			
Master	's teaching degree Gymnasiu	m MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	020)
Supple	ementary course MINT Teache	r Education PLUS, Elite	Network Bavaria (EN	B) (2020)	
Master	Master's degree (1 major) Mathematical Physics (2020)				
Master's degree (1 major) Computational Mathematics (2022)					
Master's degree (1 major) Mathematics (2022)					
waster	s uegree (1 major) Mathemat	ical Physics (2022)			
	ise program mathematics (20	<i>43)</i>			
Master's w	ith 1 major Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 173 / 403

Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 174 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Research in Groups - Differential Geometry			10-M=GDGE-161-m	01		
Module coordinator		Module offered by				
Dean o	Dean of Studies Mathematik (Mathematics)		Institute of Mathematics			
ECTS	Method	of grading	Only after succ. con	Only after succ. compl. of module(s)		
10	numeric	al grade		• • • •		
Duratio	on N	Nodule level	Other prerequisites	i		
1 seme	ester g	raduate				
Conter	nts					
Selecte	ed moder	n topics in differentia	l geometry.			
Decom	mondod	n rovious knowlodge.				
Advan	rnenaea j ced know	ledge of differential g	enmetry is required s	uch as can be acquir	ed in the module "D	ifferential
Geome	etry". Know	wledge of the content	s of the modules "App	lied Differential Geo	metry", "Geometric I	Mechanics".
"Pseuc	do-Riemar	nnian and Riemannia	n Geometry" and "Lie T	Theory" is also recom	imended.	· · · · · · ·
Intend	ed learnii	ng outcomes				
The stu	udent gair	ns insight into conten	nporary research probl	ems in Differential G	eometry. He/She ma	asters advan-
ced teo	chniques	in this field and can a	apply them to complex	problems.	, ,	
Course	es (type, n	umber of weekly con	tact hours, language –	- if other than Germa	n)	
V (2) +	S (2)					
Modul	e taught i	n: German and/or Eng	glish			
Metho ster, in	d of asses	ssment (type, scope, 1 on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-
talk (6	o to 120 n	ninutes)				
Langua	age of ass	sessment: German or	English			
Assess	sment offe	ered: In the semester	in which the course is	offered and in the su	ubsequent semester	
Allocation of places						
Additio	onal infor	mation				
Worklo	oad					
300 h						
Releffe				degree programmes)		
 Modulo appears in						
Moulie appeals III Mastar's dograe (1 major) Mathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Flite Network Bavaria (FNB) (2016)						
Supplementary course MINT Teacher Education PLUS. Elite Network Bavaria (FNB) (2016)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Computational Mathematics (2022)						
Master's degree (1 major) Mathematics (2022)						
Mastoria	with 1 major M	athematics (2010)		T Concrated to Apr 2005 -		Dage 175 / 102
master S W	nai i major M	atticitatics (2019)	data record	Master (120 ECTS) Mathemati	ik - 2019	page 1/5 / 403

Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 176 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Research in Groups - Discrete Mathematics			10-M=GDIM-161-mc)1		
Module coordinator		Module offered by				
Dean o	Dean of Studies Mathematik (Mathematics) Institu		Institute of Mathem	nstitute of Mathematics		
ECTS	Metho	d of grading	Only after succ. compl. of module(s)			
10	numei	rical grade				
Duratio	on l	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its					
Selecte	ed mode	ern topics in discrete m	athematics.			
Intende	ed learr	ning outcomes				
The stu ced tec	ident ga hnique:	ains insight into conten s in this field and can a	porary research probl pply them to complex	ems in discrete math problems.	nematics. He/She ma	asters advan-
Course	s (type,	number of weekly con	tact hours, language –	- if other than Germa	n)	
V (2) +	S (2)					
Module	e taugh	t in: German and/or Enន្	glish			
Method ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
talk (60	o to 120	minutes)				
Langua	ige of a	ssessment: German or	English			
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ibsequent semester	
Allocat	ion of p	laces				
Additio	onal info	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	9				
Referre	d to in	IPOI (examination reg	ulations for teaching.	legree programmes)		
Referre						
Module	e appea					
Master	's degre	e (1 major) Mathemati	CS (2016)			
Master	Master's degree (1 major) Mathematical Physics (2016)					
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Computational Mathematics (2022)						
master's degree (1 major) Mathematical Dhysics (2022)						
master's degree (1 major) mathematical Physics (2022)						
exchange program Mathematics (2023) Mastaria dagrae (a major) Computational Mathematics (2023)						
master's degree (1 major) Computational Mathematics (2024)						
master's degree (1 major) mathematics (2024) Masteria tagaking dagree Compaging MINT Tagakan Education DUUC, Elita Natural, Dagree (END) (
master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)						
Master's wi	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g ● generated 19-Apr-2025 ● e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 177 / 403



Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 178 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Research in Groups - Dynamical Systems and Control Theory		10-M=GDSC-161-m	01			
Module coordinator M		Module offered by	Module offered by			
Dean o	of Studie	es Mathematik (Mather	natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. compl. of module(s)			
10	nume	rical grade				
Durati	on	Module level	Other prerequisites	i		
1 seme	ester	graduate				
Conter	nts	-				
Select Recom	ed mode	ern topics in dynamica d previous knowledge: the contents of the mo	systems and control t	heory. heory or "Co	ntrol Theory" is requi	ired
Intend	ed lear	ning outcomes		intro meory or con	ni ot meory is requ	i cui
The stu	udont g	ning outcomes		ame in dynamical sy	stome and control th	ann Hal
She m	asters a	dvanced techniques in	this field and can app	ly them to complex p	problems.	leory. ne/
Course	es (type,	, number of weekly con	tact hours, language –	– if other than Germa	ın)	
V (2) + Modul	S (2) e taugh	t in: German and/or En	glish			
Metho	d of ass	essment (type, scope	language — if other th	an German examina	tion offered — if not	every seme-
ster, ir	nformati	on on whether module	can be chosen to earn	a bonus)		every serie
talk (6	o to 120	o minutes)				
Langua	age of a	ssessment: German or	English			
Assess	sment o		In which the course is	offered and in the st	ubsequent semester	
Allocation of places						
Additi	Additional information					
Workle	oad					
300 h						
Teachi	ing cycl	9				
Referr	ed to in	IPOL (examination reg	ulations for teaching.	degree programmes)		
Kelen						
		•				
Modul	e appea	irs in				
Master	r's degre	ee (1 major) Mathemati	cs (2016)			
Master's degree (1 major) Economathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016) Master's teaching degree Cympacium MINT Teacher Education DUUS, Elite Network Payeria (END) (2016)						
Supplementary course MINT Teacher Education PLUS Flite Network Rayaria (FNR) (2016)						
Master's degree (1 major) Mathematics (2010)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS. Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Economathematics (2021)						
Master's degree (1 major) Computational Mathematics (2022)						
Master's degree (1 major) Mathematics (2022)						
Master's w	vith 1 major	Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemat	exam. reg. ik - 2019	page 179 / 403



Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 180 / 403				
	data record Master (120 ECTS) Mathematik - 2019					
Module title				Abbreviation		
--	--	---	---	--	-----------------------	----------------
Resear	Research in Groups - Geometry and Topology 10-M=GGMT-161-m01					
Modul	e coord	inator		Module offered by		
Deen	f Ctudi	nator	atiac)	Institute of Methom		
Dean c	Studi	es Mathematik (Mathem		Institute of Mathem	latics	
ECIS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	Inume					
Duratio	on	Module level	Other prerequisites			
1 Seme	ster	graduate	<u> </u>			
Collect						
Selecte						
Intend	ed leari	ning outcomes				
The stu vanced	udent ga I techni	ains insight into contem ques in this field and ca	porary research probl n apply them to comp	ems in geometry and plex problems.	l topology. He/She n	nasters ad-
Course	s (type	. number of weekly cont	act hours, language –	- if other than Germa	n)	
V(2) +	S(2)	,			,	
Modul	e taugh	t in: German and/or Eng	lish			
Metho	d of ass	essment (type, scope, l	anguage — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module of	an be chosen to earn	a bonus)		
talk (6	o to 120	o minutes)				
Langua	age of a	ssessment: German or E	English	- 66		
Assess	sment o		n which the course is	offered and in the st	ibsequent semester	
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
			_			
Worklo	bad					
300 h						
Teachi	ng cycl	e				
Referre	d to in	IPOI (examination reg	ulations for teaching-	degree programmes)		
Keren						
Modul	0 20002	vrc in				
Mactor	e appea	ns m aa (a majar) Mathamatic	s (2016)			
Master	's degr	ee (1 major) Mathematic	3 (2010) al Physics (2016)			
Master	's teacl	ning degree Gymnasium	MINT Teacher Educat	ion PLUS Elite Netwo	ork Bayaria (FNB) (20	016)
Supple	mentai	v course MINT Teacher F	ducation PLUS Flite	Network Bayaria (FN	B) (2016)	010)
Master	's degr	ee (1 major) Mathematic	s (2010)	network Bavaria (En	D) (2010)	
Master	's teacl	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Flite Netwo	ork Bavaria (FNB) (20	020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bayaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Computational Mathematics (2022)						
Master's degree (1 major) Mathematics (2022)						
Master's degree (1 major) Mathematical Physics (2022)						
exchange program Mathematics (2023)						
Master's degree (1 major) Computational Mathematics (2024)						
Master's degree (1 major) Mathematics (2024)						
Master	's teacl	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (20	025)
Master's w	ith 1 majo	Mathematics (2019)	JMU Würzburg data record	g•generated 19-Apr-2025•e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 181 / 403



Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 182 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Resear	Research in Groups - Lie Theory10-M=GLIE-192-m01					
Module	e coord	inator		Module offered by		
Dean of Studies Mathematik (Mathematics)			natics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its					
Selecte	ed mod	ern topics in Lie Theory				
Recom	mende	d previous knowledge:	dule "Lie theory" is rea	uired		
Intend	ad loar	ning outcomes		uncu.		
The stu	dont g	ning outcomes	norany rocoarch probl	ame in Lie Theory H	Chamactars adva	ncod tochni
ques ir	this fie	eld and can apply them	to complex problems.	enis in Lie meory. He	e/ She masters auvai	iceu techini-
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (2) + Module	S (2) e taugh	t in: German and/or Eng	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
talk (60	o to 120	minutes)				
Langua	age of a	ssessment: German or	English			
Assess	ment o	ffered: in the semester	in which the course is	offered and in the su	ibsequent semester	
Allocat	ion of p	olaces				
	-					
Additio	onal info	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPO I (examination reg	ulations for teaching-	legree programmes)		
Module	a annoa	rs in				
Mactor	's dogr	ns m na (1 maior) Mathamatik	ss (2010)			
Master	's teach	ving degree Gymnasium	n MINT Teacher Educat	ion PLUS Elite Netwo	ork Bayaria (FNB) (20	າວດ)
Supple	mentar	v course MINT Teacher	Education PLUS, Elite	Network Bavaria (FN	B) (2020)	520)
Master	's degre	ee (1 major) Mathemati	cal Physics (2020)		_) (_0_0)	
Master	Master's degree (1 major) Computational Mathematics (2022)					
Master's degree (1 major) Mathematics (2022)						
Master's degree (1 major) Mathematical Physics (2022)						
exchange program Mathematics (2023)						
Master's degree (1 major) Computational Mathematics (2024)						
Master's degree (1 major) Mathematics (2024)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)						
Supple	mental			EN DAVAIIA (EN	DJ (2025)	
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g ● generated 19-Apr-2025 ● e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 183 / 403

Module title				Abbreviation		
Resear	Research in Groups - Measure and Integral 10-M=GMAI-161-m01					
Modul	e coord	inator		Module offered by		
Dean o	of Studio	es Mathematik (Mathe	matics)	Institute of Mathem	atics	
FCTS	Metho	od of grading	Only after succ. con	nnl. of module(s)		
10	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conter	nts					
Aspect functio transfo	Aspects of measure and integration theory: sigma algebras and Borel sets, volume and measure, measurable functions and Lebesgue integrals, selected applications, e.g. product measures (with Fubini's theorem and the transformation rule), Lp spaces and absolute continuity, measures on topological spaces.					
Intend	ed lear	ning outcomes				
The stu sters a	udent ga dvance	ains insight into conter d techniques in this fie	nporary research probl ld and can apply them	ems in measure and to complex problem	integration theory. I s.	le/She ma-
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (2) + Module	S (2) e taugh	t in: German and/or En	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		,
talk (6	o to 120	o minutes)				
Langua	age of a	ssessment: German or	English			
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	е				
Referre	ed to in	LPO I (examination res	gulations for teaching-	degree programmes)		
			<u> </u>			
Modul	e annea	ors in				
Master	's dear	no III no (1 maior) Mathemati	(2016)			
Master	's degr	ee (1 major) Fconomath	(2010)			
Master	's degr	ee (1 major) Mathemati	cal Physics (2016)			
Master	's teacl	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Economathematics (2021)						
Master's degree (1 major) Computational Mathematics (2022)						
Master's degree (1 major) Mathematics (2022)						
Master	's degr	ee (1 major) Mathemati	cai Physics (2022)			
Master's w	ith 1 majo	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 184 / 403

Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 185 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Resea	Research in Groups - Mathematical Physics 10-M=GMAP-192-mo1					
Module coordinator				Module offered by		
Dean o	of Studio	es Mathematik (Mathei	natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	Only after succ. compl. of module(s)		
10	nume	rical grade		• • • •		
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
Select	ed mod	ern topics in Mathemat	ical Physics.			
Recom	mende	d previous knowledge:		(- f h i	:
Depen	ding on	the content, basic and	l advanced knowledge	from different areas	of analysis and/or d	ifferential
Intend			, it is recommended t		1.	
Intend	ed lear	ing outcomes				
The stu vanced	udent ga d techni	ains insight into conter ques in this field and c	nporary research probl an apply them to comp	ems in Mathematica blex problems.	l Physics. He/She m	asters ad-
Course	es (type	, number of weekly con	tact hours, language –	- if other than Germa	in)	
V (2) +	S (2)	tin. Cormon and/or En	alich			
Modul					tion offered if wet	
ster, ir	d of ass Iformati	on on whether module	can be chosen to earn	an German, examina a bonus)	ition offered — If not	every seme-
talk (6	o to 120	o minutes)				
Langua	age of a	ssessment: German or	English	cc		
Assess	sment o	ffered: in the semester	in which the course is	offered and in the su	ibsequent semester	
Alloca	tion of p	olaces				
Additi	onal inf	ormation				
Worklo	bad					
300 h						
Teachi	ng cycl	e				
Referr	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Modul	o 20002	ors in				
Mactor	r's dogr	no (1 maior) Mathomati	(2010)			
Master	r's teacl	ning degree Gymnasiur	us (2019) n MINT Teacher Educat	ion PLUS Elite Netw	ork Bayaria (FNB) (2)	020)
Supple	mentai	v course MINT Teacher	Education PLUS Flite	Network Bayaria (FN	B) (2020)	020)
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Mathematical Mysics (2020)						
Master's degree (1 major) Mathematics (2022)						
Master's degree (1 major) Mathematical Physics (2022)						
exchange program Mathematics (2023)						
Master's degree (1 major) Computational Mathematics (2024)						
Master's degree (1 major) Mathematics (2024)						
Maste	r's teacl	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	025)
Master's w	vith 1 majo	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 186 / 403



Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 187 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Resear	Research in Groups - Mathematics in Context 10-M=GMCX-161-m01					
Modul	e coord	inator		Module offered by		
Dean c	of Studie	es Mathematik (Mathe	natics)	Institute of Mathem	natics	
ECTS	Metho	d of grading	Only after succ. cor	npl. of module(s)		
10	nume	rical grade		• • • •		
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
Reflect ven by the cor	Reflection on mathematics in a cultural context, for example by discussing part of the history of mathematics, given by a historical period, a geographic region or a particular field of mathematics. Other possibilities arise from the connection of mathematics with literature, language, music, art or the media.					
Intend	ed learr	ning outcomes				
The stu	udent re	alises the cultural dim	ension of mathematics	and its relation to o	ther cultural fields.	
Course	es (type,	number of weekly cor	tact hours, language –	- if other than Germa	ın)	
V (2) + Modul	S (2) e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass Iformati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-
talk (6	o to 120	minutes)				
Langua	age of a	ssessment: German or	English			
Assess	sment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	
Allocat	tion of p	olaces				
 Additid	nal inf	rmation				
Auunn						
Worklo	oad					
300 h						
Teachi	ng cycl	9				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Modul	e appea	rs in				
Master	's degre	ee (1 maior) Mathemat	cs (2016)			
Master	's degre	ee (1 major) Mathemat	cal Physics (2016)			
Master	's teach	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	016)
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	r's degre	ee (1 major) Mathemat	cs (2019)			
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Computational Mathematics (2022)						
Master's degree (1 major) Mathematics (2022)						
Master's degree (1 major) Mathematical Physics (2022)						
exchange program Mathematics (2023)						
Master's degree (1 major) Computational Mathematics (2024)						
Master	r's degre	ee (1 major) Mathemat	cs (2024)			
Master's w	vith 1 major	Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 188 / 403



Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	IMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 189 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Resea	Research in Groups - Mathematics in the Sciences10-M=GMSC-161-m01					
Modul	e coordi	nator		Module offered by		
Dean o	of Studie	es Mathematik (Mather	natics)	Institute of Mathem	natics	
ECTS	Metho	d of grading	Only after succ. con	npl. of module(s)		
10	numer	ical grade		•		
Durati	on [Module level	Other prerequisites	i		
1 seme	ester	graduate				
Conter	nts					
A mod	ern topi	c in mathematics in the	e sciences.			
Recom	mended	d previous knowledge:	Ordinany Differential E	sustions" and "Intro	duction to Dartial Dif	forontial
Fauati	ons" is r	ecommended as well	as basic knowledge of	functional analysis	Juction to Partial Di	lerentiat
Intend	ed learn	ing outcomes		Tunctional analysis.		
The stu	udent ga	ains insight into conter	nporary research probl	ems in mathematics	in the sciences. He/	She masters
advan	ced tech	iniques in this field and	d can apply them to co	mplex problems.		
Course	es (type,	number of weekly con	tact hours, language –	- if other than Germa	in)	
V (2) + Modul	S (2) e taught	in• German and/or En	ølish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, ir	formati	on on whether module	can be chosen to earn	a bonus)		every serie
talk (6	o to 120	minutes)				
Langua	age of a	ssessment: German or	English	cc 1 1 1 1 1		
Assess	sment of	tered: In the semester	In which the course is	offered and in the st	lbsequent semester	
Alloca	tion of p	laces				
 Additi	onal info	rmation				
Auuiti						
Workle	nad					
200 h	Jau					
Teachi	ing cycle	2				
Referr	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
				<u> </u>		
Modul	e appea	rs in				
Maste	r's degre	ee (1 major) Mathemati	cs (2016)			
Maste	r's degre	ee (1 major) Mathemati	cal Physics (2016)			
Maste	r's degre	ee (1 major) Computati	onal Mathematics (201	6)		
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Maste	r's degre	ee (1 major) Computati	onal Mathematics (202	22)		
Master's w	vith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 190 / 403

Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 191 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Resea	Research in Groups - Non-linear Analysis 10-M=GNLA-161-m01					
Modul	e coord	inator		Module offered by		
Dean o	of Studie	es Mathematik (Mathe	matics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade		• • • •		
Durati	on	Module level	Other prerequisites	6		
1 seme	ester	graduate				
Conte	nts					
Select	ed mod	ern topics in non-linea	r analysis.			
5						
Recom	imende ding on	d previous knowledge:	ladvancod knowlodgo	from different areas	of analysis is roquir	od In caso of
doubt.	it is rec	commended to consult	the lecturer.	fioli unerent areas	of allatysis is require	eu. In case of
Intend	ed lear	ning outcomes				
The st	udent ga	ains insight into conter	mporary research probl	ems in Non-linear Ar	alysis. He/She mas	ters advan-
ced te	chnique	s in this field and can	apply them to complex	problems.		
Course	es (type	, number of weekly cor	itact hours, language –	- if other than Germa	ın)	
V (2) + Modul	S (2) e taugh	t in: German and/or En	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, ir	nformati	on on whether module	can be chosen to earn	a bonus)		,
talk (6	o to 120	minutes)				
Langu	age of a	ssessment: German or	English	- C		
Assess		rerea: in the semester	In which the course is	offered and in the st	ubsequent semester	
Alloca	tion of p	Diaces				
		, , , , , , , , , , , , , , , , , , ,				
Additio	onatimo	ormation				
worki	bau					
300 n		-				
Teach	ng cycl	9				
Referr	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Modul	e appea	irs in				
Maste	r's degr	ee (1 major) Mathemat	ics (2016)			
Maste	r's degr	ee (1 major) Mathemati	ical Physics (2016)			
Maste	r's teach	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2)	016)
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master's degree (1 major) Mathematics (2019) Master's teaching degree Cumpacium MINT Teacher Education DUUS, Elite Natural, Deverie (END) (as a c)						
Master's teaching degree Gymnasium Min Lleacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Computational Mathematics (2022)						
Master's degree (1 major) Mathematics (2022)						
Maste	r's degr	ee (1 major) Mathemat	ical Physics (2022)			
Master's v	vith 1 major	Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e	exam. reg.	page 192 / 403
			data record	Master (120 ECTS) Mathemati	ik - 2019	

exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025)

 Master's with 1 major Mathematics (2019)
 JMU Würzburg • generated 19-Apr-2025 • exam. reg. data record Master (120 ECTS) Mathematik - 2019
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Modul	e title				Abbreviation	
Resea	rch in G	roups - Numerical Mat	hematics and Applied	Analysis	10-M=GNMA-161-m	101
Modul	e coord	inator		Module offered by		
Dean o	of Studie	es Mathematik (Mathe	natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
10	nume	rical grade		•		
Durati	on	Module level	Other prerequisites	;		
1 seme	ester	graduate				
Conter	nts					
Select	ed topic	s in numerical mathen	natics, applied analysis	s or scientific compu	ting.	
Recom Depen thema	imende ding on tics is re	d previous knowledge: the content, basic and equired. In case of dou	l advanced knowledge bt. it is recommended	from different areas to consult the lecture	of analysis and/or n er.	umerical ma-
Intend	ed lear	ning outcomes				
The stu He/Sh	udent ga e maste	ains insight into a cont	emporary research pro es in this field and can	blems in numerical r apply them to comp	nathematics or appl lex problems.	ied analysis.
Course	es (type	number of weekly cor	tact hours, language -	- if other than Germa	n)	
V (2) +	S (2)	tin. Corman and/or En	alich			
Matha			languaga if athor th	an Carman, avamina	tion offered if not	
ster, ir	d of ass formati	on on whether module	can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-
talk (6 Langua Assess	o to 120 age of a sment o	minutes) ssessment: German or ffered: In the semester	English in which the course is	offered and in the su	ubsequent semester	
Alloca	tion of p	olaces			•	
Additio	onal info	ormation				
worki	bad					
300 II	ing cycl	a				
	ing cycu	-				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)	1	
Modul	e appea	rs in				
Maste	r's degre	ee (1 major) Mathemat	cs (2016)			
Maste	r's degre	ee (1 major) Economatl	nematics (2016)			
Maste	r's degre	ee (1 major) Mathemati	cal Physics (2016)			
Maste	r's degre	ee (1 major) Computati	onal Mathematics (201	.6)		
Master Supple Master	r's teach ementar r's degre	ning degree Gymnasiur y course MINT Teacher ee (1 major) Computati	n MINT Teacher Educat Education PLUS, Elite onal Mathematics (201	ion PLUS, Elite Netw Network Bavaria (EN 9)	ork Bavaria (ENB) (2 B) (2016)	016)
Maste	Master's degree (1 major) Mathematics (2019)					
Master Supple Master	r's teach ementar r's degra	ning degree Gymnasiur y course MINT Teacher See (1 major) Mathemati	n MINT Teacher Educat Education PLUS, Elite cal Physics (2020)	ion PLUS, Elite Netw Network Bavaria (EN	ork Bavaria (ENB) (2 B) (2020)	020)
Master's w	vith 1 major	Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemat	exam. reg. ik - 2019	page 194 / 403

UNIVERSITÄT WÜRZBURG

Master's degree (1 major) Economathematics (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

Master's degree (1 major) Economathematics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's degree (1 major) Economathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 195 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title				Abbreviation	
Resea	Research in Groups - Number Theory 10-M=GNTH-161-m01				51	
Modul	e coord	inator		Module offered by		
Dean o	of Studio	es Mathematik (Mather	natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
10	nume	rical grade				
Duration Module level			Other prerequisites	5		
1 seme	ester	graduate				
Conter	nts					
Select	ed mod	ern topics in number th	ieory (e. g. algebraic ni	umber theory, modul	ar forms, diophantir	ie analysis).
Recom	mende	d previous knowledge:	harthaan is assumed	such as can be as	uirad in the medule	c "Introducti
on to A	(lowled	lige of algebra and hum	ber Theory" and "Appli	, such as can be acq ied Algebra".	uned in the modules	s millouucii-
Intend	ed lear	ing outcomes				
The stu	udent g	ains insight into conter	nporary research probl	ems in numer theory	. He/She masters ad	dvanced tech-
niques	in this	field and can apply the	em to complex problem	IS.		
Course	es (type	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
V (2) +	S (2)					
Modul	e taugh	t in: German and/or En	glish			
Metho ster, ir	d of ass Iformati	s essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-
talk (6	o to 120	o minutes)				
Langua	age of a	ssessment: German or	English	- 66		
Allege		nered: In the semester	In which the course is	offered and in the st	ubsequent semester	
Alloca		Jiaces				
Additi	onal inf	ormation				
Auuiti						
Workle						
worki	Jau					
300 n		_				
Teachi	ng cycl	8				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Modul	e appea	irs in				
Maste	r's degr	ee (1 major) Mathemati	cs (2016)			
Maste	r's degr	ee (1 major) Mathemati	cal Physics (2016)			
Maste	r's teacl	ning degree Gymnasiun	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	016)
Supple	ementai	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	r's degr	ee (1 major) Mathemati	cs (2019)			,
Master	r's teacl	ning degree Gymnasiun	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2)	020)
Supple	ementai	y course MINI Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2020)	
Master	Master's degree (1 major) Mathematical Physics (2020)					
Master	r's degri	ee (1 major) Computation	onal mathematics (202	22)		
Master	r's degr	ee (1 major) Mathemati ee (1 major) Mathemati	cal Physics (2022)			
	Jucgh	ee (i major) mathemati	(2022)			
Master's w	ith 1 majo	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 196 / 403

exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 197 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title				Abbreviation	
Resear	Research in Groups - Operator Algebras 10-M=GOPA-161-mo1				01	
Modul	e coordinator			Module offered by		
Dean c	Dean of Studies Mathematik (Mathematics)		atics)	Institute of Mathem	natics	
ECTS	Method of grading		Only after succ. con	npl. of module(s)		
10	numerical grade			•		
Duratio	on Module level		Other prerequisites			
1 seme	ester graduate					
Conter	its					
Selecte	Selected modern topics in operator algebras.					
Recom Knowle stems'	Recommended previous knowledge: Knowledge of the contents of the modules "Functional Analysis" and "Algebra and Dynamics of Quantum Sy- stems" is recommended.					
Intend	ed learning outcomes					
The stu technio	udent gains insight into c ques in this field and can	ontemp apply t	oorary research probl them to complex prob	ems in Operator alge olems.	ebras. He/She maste	ers advanced
Course	es (type, number of week	ly conta	act hours, language –	- if other than Germa	n)	
V (2) + Module	S (2)	or Engl	lish		,	
Metho ster, in	d of assessment (type, so formation on whether mo	cope, la odule c	anguage — if other than an be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
talk (6 Langua Assess Allocat	talk (60 to 120 minutes) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester Allocation of places					
Additio	onal information					
Worklo	bad					
300 h	· · · · ·		-			
Teachi	ng cycle					
Referre	ed to in LPO I (examinati	on regu	ulations for teaching-o	degree programmes)		
Modul	e appears in					
Master	's degree (1 major) Math	ematics	s (2016)			
Master	's degree (1 major) Math	ematica	al Physics (2016)			
Master	s teaching degree Gymn	iasium achor F	MINT Teacher Educat	Ion PLUS, Elite Netwo Notwork Bayaria (EN	DIK BAVAHA (ENB) (20 B) (2016)	516)
Master	's degree (1 major) Math	ematics	(2010)	Network Davaria (EIN	D) (2010)	
Master	's teaching degree Gvmn	asium	MINT Teacher Educat	ion PLUS. Elite Netwo	ork Bavaria (FNB) (20	020)
Supple	ementary course MINT Tea	acher E	ducation PLUS, Elite	Network Bavaria (EN	B) (2020)	020)
Master	's degree (1 major) Math	ematica	al Physics (2020)			
Master	Master's degree (1 major) Computational Mathematics (2022)					
Master	's degree (1 major) Math	ematics	5 (2022)			
Master	's degree (1 major) Math	ematica	al Physics (2022)			
Master's w	ith 1 major Mathematics (2019)		JMU Würzburg data record I	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 198 / 403

exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 199 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title			Abbreviation	
Resear	rch in Groups - Robotics, Op	timization and Control T	heory	10-M=GROC-161-m	01
Modul	e coordinator		Module offered by		
Dean c	of Studies Mathematik (Math	ematics)	Institute of Mathem	natics	
ECTS	Method of grading	Only after succ. co	mpl. of module(s)		
10	numerical grade				
Duratio	on Module level	Other prerequisites	5		
1 seme	ester graduate				
Conter	its				
Selecte Recom Knowle	ed modern topics in robotics mended previous knowledg edge of the contents of the r	e: nodule "Mathematical Co	ol theory. ontrol Theory" or "Col	ntrol Theory" is requi	ired.
Intend	ed learning outcomes				
The stu She ma	udent gains insight into contact advanced techniques	emporary research prob in this field and can app	lems in robotics, opti bly them to complex p	mization and contro problems.	l theory. He/
Courses (type, number of weekly contact hours, language — if other than German)					
V (2) + Modul	S (2) e taught in: German and/or	English			
Metho ster, in	Method of assessment (type, scope, language — if other than German, examination offered — if not every seme-				
talk (6 Langua	o to 120 minutes) age of assessment: German	or English	offored and in the su	ubsoquent comester	
Allocat	tion of places		oncica and in the st	absequent semester	
Allocal	tion of places				
Additio	onal information				
Worklo	ad				
300 h					
Teachi	ng cycle				
Referre	ed to in LPO I (examination	regulations for teaching-	degree programmes)		
Modul	o appoars in				
Mostor	e appears III	atics (aa.()			
Master	's degree (1 major) Mathem	alles (2016)			
Master	's degree (1 major) Leonom	atical Physics (2010)			
Master	's degree (1 major) Matricin	ational Mathematics (201	16)		
Master	's teaching degree Gymnasi	um MINT Teacher Educa	tion PLUS. Elite Netw	ork Bavaria (ENB) (20	016)
Supple	ementary course MINT Teach	er Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	's degree (1 major) Computa	ational Mathematics (20	19)		
Master	's degree (1 major) Mathem	atics (2019)			
Master	's teaching degree Gymnasi	um MINT Teacher Educa	tion PLUS, Elite Netw	ork Bavaria (ENB) (2	020)
Supple	ementary course MINT Teach	er Education PLUS, Elite	Network Bavaria (EN	B) (2020)	
Master	's degree (1 major) Mathem	atical Physics (2020)			
Master	's degree (1 major) Econom	athematics (2021)			
Master's w	ith 1 major Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 200 / 403

Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 201 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title				Abbreviation		
Resear	rch in G	roups - Statistics			10-M=GSTA-161-mc	01	
Modul	e coord	inator		Module offered by	<u> </u>		
Doan	f Studi	s Mathomatik (Mathon	natice)				
	Mothe	ad of grading	Only offer succ. con	nl of modulo(c)	Idlics		
10	nume	rical grade					
Durati	Inume		044				
Juration 1 some	on	graduate	Other prerequisites				
Conter	nts	Sidudic					
Select	ed mod	ern tonics in statistics	_				
Sciecti							
Recom	mende	d previous knowledge:					
Basic I	knowled	lge of stochastics is req	uired, such as that ac	quired in the "Stocha	astics 1" module. Kn	owledge of	
the co	ntents o	f the module "Stochast	ics 2" is also recomme	ended. Depending or	n the content of the o	course, other	
prior k	nowled	ge may also be helpful;	consultation with the	lecturer is recommen	nded.		
Intend	ed leari	ning outcomes					
The stu	udent ga	ains insight into contem	porary research probl	ems in statistics. He	/She masters advan	ced techni-	
ques li		eid and can apply them	to complex problems.	if a the suith sur Courses			
Course	s (type	, number of weekly con	act nours, language –	- If other than Germa	in)		
V (2) + Modul	S(2) e taugh	t in• German and/or Eng	olish				
Motho	d of acc	essment (type scope	languago — if othor th	an Gorman, oyamina	tion offered — if not	ovory como-	
ster, in	iformati	on on whether module	can be chosen to earn	a bonus)		every seme-	
talk (6	o to 120	minutes)					
Langua	age of a	ssessment: German or	English				
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester		
Alloca	tion of p	olaces					
Additio	onal inf	ormation					
Worklo	oad						
300 h							
Teachi		•					
Teacin	ing cycu	5					
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)			
Modul	e appea	irs in					
Master	r's degre	ee (1 major) Mathematio	cs (2016)				
Master	Master's degree (1 major) Economathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)							
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)							
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	r's degro	ee (1 major) Mathematio	cs (2019)				
Master	r's teach	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	020)	
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2020)		
Master	r's degre	ee (1 major) Mathematio	cal Physics (2020)				
Master	r's degro	ee (1 major) Economath	ematics (2021)				
Master's w	ith 1 maio	Mathematics (2019)	IMU Würzburg	e generated 19-Apr-2025 • e	exam. reg.	page 202 / 403	
	,0		data record	Master (120 ECTS) Mathemati	ik - 2019	, , , , , , , , , , , , , , , , , , , ,	

Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 203 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title				Abbreviation		
Resea	Research in Groups - Time Series Analysis 10-M=GTSA-161-m01				01		
Modul	e coord	inator		Module offered by	<u> </u>		
Dean o	Dean of Studies Mathematik (Mathematics)		natics)	Institute of Mathem	natics		
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)			
10	nume	rical grade					
Durati	on	Module level	Other prerequisites	Other prerequisites			
1 seme	ester	graduate					
Conte	nts		•				
Select	Selected modern topics in time series analysis.						
5							
Recom	mende	d previous knowledge:	nuired such as that as	auirad in the "Stach	actice 1" modulo. Kn	owlodge of	
the co	ntents o	if the module "Stochas	tics 2" is also recomm	ended.	astics I module. Kin	owieuge of	
Intend	ed lear	ning outcomes					
The st	udent g	ains insight into conter	nporary research probl	ems in time series a	nalvsis. He/She mas	ters advan-	
ced te	chnique	s in this field and can	apply them to complex	problems.			
Course	Courses (type, number of weekly contact hours, language — if other than German)						
V (2) +	V(2) + S(2)						
Modul	e taugh	t in: German and/or En	glish				
Metho ster, ir	o d of ass nformati	s essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-	
talk (6	o to 120	minutes)					
Langu	age of a	ssessment: German or	English				
Assess	sment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester		
Alloca	tion of p	olaces					
Additi	onal info	ormation					
Workle	oad						
300 h							
Teachi	ing cycl	9					
Referr	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)			
Modul	e appea	irs in					
Maste	r's degr	ee (1 major) Mathemati	cs (2016)				
Maste	r's degre	ee (1 major) Economatł	nematics (2016)				
Maste	r's degr	ee (1 major) Mathemati	cal Physics (2016)				
Maste	r's teach	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	016)	
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)							
Maste	r's degro	ee (1 major) Mathemati	cs (2019)			,	
Maste	r's teach	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (20	020)	
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2020)		
Maste	r's degro	ee (1 major) Mathemati	cal Physics (2020)				
Maste	r's degri	ee (1 major) Economati	iematics (2021)				
maste	r s aegro	ee (1 major) Computati	unal mathematics (202	22)			
Master's v	vith 1 majoı	Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 204 / 403	

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Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 205 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation					Abbreviation	
Master	Thesis	Mathematics			10-M=MAAR-161-m01	
Module	e coord	inator		Module offered by		
Dean of	fStudi	es Mathematik (Mathema	atics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
30	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate	The supervisor may make the successful completion of certain modu- les that are relevant for the respective topic a prerequisite for the assign- ment of the topic.			
Conten	ts					
Indepe	ndently	/ researching and writing	on a topic in mathem	natics selected in co	nsultation with the supervisor.	
Intende	ed lear	ning outcomes				
The stu tained o suitable	dent is during e form.	able to work independen his/her studies in the ma	ntly on a given mathe aster programme. He/	matical topic and ap 'She can write down	oply the skills and methods ob- the result of his/her work in a	
Course	s (type	, number of weekly conta	ct hours, language —	if other than Germa	n)	
No cou	rses as	signed to module				
Methoo ster, inf	l of ass formati	essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
Master' Registra Langua	's thesi ation a ge of a	is (750 to 900 hours total nd assignment of topic ir ssessment: German or Ei) n consultation with sunglish	ipervisor.		
Allocati	ion of p	olaces				
Additio	nal inf	ormation				
Time to	compl	ete: 6 months				
Worklo	ad					
900 h						
Teachir	ng cycl	e				
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Master'	Master's degree (1 major) Mathematics (2016)					
Master'	Master's degree (1 major) Mathematics (2019)					
Master'	s degr	ee (1 major) Mathematics	(2022)			
Master'	Master's degree (1 major) Mathematics (2024)					

Module title				Abbreviation		
Analysis and	Analysis and Geometry of Classical Systems					
Module coord	inator		Module offered by			
Dean of Studio	es Mathematik (Mathen	natics)	Institute of Mathem	atics		
ECTS Metho	od of grading	Only after succ. con	npl. of module(s)			
10 nume	rical grade					
Duration	Module level	Other prerequisites				
1 semester	graduate					
Contents						
Modern analytic methods (such as partial differential equations) and geometric methods (such as differential geometry) for the description of classical physics. Examples include movements of deformable bodies as reaction to outer load (deformation of elastic bodies, flow of a fluid, stream of a gas). Additional examples include geometric mechanics and symplectic geometry, classical field theory and classical gauge theory, general relativity theory.						
Recommende Basic knowlec is recommend	d previous knowledge: lge from the modules "I led. Furthermore, basic	Differential Geometry", knowledge of classica	"Introduction to Top l field theory is usefu	ology" and "Geome Il.	tric Analysis"	
Intended lear	ning outcomes					
The student ga masters adva	ains insight into moden nced techniques in this	n methods in mathema field and is able to ap	atics, which are appli ply them to complex	ed in classical phys problems.	ics. He/She	
Courses (type	, number of weekly cont	act hours, language –	- if other than Germa	n)		
V (4) + Ü (2) Module taugh	t in: German and/or Eng	glish				
Method of ass ster, informati	sessment (type, scope, on on whether module	language — if other the can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-	
 a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) Language of assessment: German or English creditable for bonus 						
Allocation of p	olaces					
Additional inf	ormation					
Workload						
300 h						
Teaching cvcl	e					
Referred to in	IPOI (examination reg	ulations for teaching-	legree programmes)			
Module appea	ars in					
Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Mathematical Physics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Mathematics (2019)						
Master's teach	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	020)	
Master's with 1 majo	r Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e. Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 207 / 403	

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 208 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title					Abbreviation	
Algebr	Algebra and Dynamics of Quantum Systems 10-M=MP2-161-m01					1
Modul	e coord	inator		Module offered by	<u> </u>	
Dean o	of Studi	es Mathematik (Mathe	matics)	Institute of Mathematics		
ECTS	Metho	od of grading	Only after succ. compl. of module(s)			
10	nume	rical grade		2		
Durati	on	Module level	Other prerequisites	6		
1 seme	ester	graduate				
Conter	nts					
Modern algebraic methods for dynamics of quantum systems, e.g. operator algebras with applications in alge- braic quantum field theory, spectral theory, symmetries and representation theory.						
Recom	mende	d previous knowledge:				
Basic I	knowled	lge from the modules "	Functional Analysis", "	Introduction to Topo	logy" and "Introduct	ion to Com-
piex A			ic knowledge of quanti		Juselui.	
	ed tear	ning outcomes				ing the /Cha
master	rs advai	nced techniques in this	field and is able to ap	ply them to complex	problems.	SICS. He/She
Course	es (type	, number of weekly con	itact hours, language -	- if other than Germa	In)	
V (4) +	Ü (2)	· · · ·			- ·	
Modul	e taugh	t in: German and/or En	glish			
Metho	d of ass	sessment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, ir	formati	on on whether module	can be chosen to earn	a bonus)		
a) writ	ten exar examir	mination (approx. 90 to) 120 minutes, usually	chosen) or		
c) oral	examin	ation in groups (group)	s of 2, 15 minutes per c	andidate)		
Langua	age of a	ssessment: German or	English			
credita	able for	bonus				
Alloca	tion of _l	olaces				
Additio	onal inf	ormation				
Worklo	bad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's teaching degree Gymnasium MINT leacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	Master's degree (1 major) Mathematics (2019)					
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master	r's degr	ee (1 major) Mathemati	ical Physics (2020)			
Master's w	/ith 1 majo	r Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 209 / 403

Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 210 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title					Abbreviation	
Semina	ar in Ap	plied Differential Geon	netry		10-M=SADG-161-m	01
Modul	e coord	inator		Module offered by		
Dean o	Dean of Studies Mathematik (Mathematics)			Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. compl. of module(s)			
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
A mod	ern topi	c in applied differentia	l geometry.			
Recom Advano Geome	mende ced kno etry". Kn	d previous knowledge: wledge of differential و owledge of the conten	geometry is required, s ts of the modules "App	uch as can be acquir lied Differential Geo	ed in the module "D metry", "Geometric I	ifferential Mechanics",
"Pseuc	lo-Riem	annian and Riemannia	n Geometry" and "Lie 1	"heory" is also recom	mended.	
Intend	ed learı	ning outcomes				
The stu the top	udent is bic and	able to elaborate a co the available literature	ntemporary research to , preparing a talk and t	opic. This includes co he ability to participa	omprehending and s ate in a scientific dis	tructuring of cussion.
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
S (2)		· · · ·				
Modul	e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
talk (6	o to 120	minutes)				
Langua Assess	age of a sment o	ssessment: German or ffered: In the semester	English in which the course is	offered and in the su	ıbsequent semester	
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
150 h						
Toachi		•				
Teacin	ing cycu	e				
	1					
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Modul	e appea	ars in				
Master	's degro	ee (1 major) Mathemati	cs (2016)			
Master's degree (1 major) Mathematical Physics (2016)						
Master's teaching degree Gymnasium MINT leacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course minist reacher education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Mathematics (2010)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS Elite Network Ravaria (ENR) (2020)						
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)					
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Computational Mathematics (2022)						
Master's degree (1 major) Mathematics (2022)						
Mactaria	(ith a main	(Mathematics (acce)	18411 \8/2;	• concreted as Arrange	vom kog	
widster's W	nur i majoi	mathematics (2019)	data record	s • generateu 19-Apr-2025 ● e Master (120 ECTS) Mathemati	k - 2019	page 211 / 403

Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 212 / 403
	data record Master (120 ECTS) Mathematik - 2019	1

Module title					Abbreviation	
Semina	Seminar in Algebra 10-M=SALG-161-m01					
Module	e coord	inator		Module offered by		
Dean of Studies Mathematik (Mathematics)			natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	numei	rical grade				
Duratio	on	Module level	Other prerequisites	i i i i i i i i i i i i i i i i i i i		
1 seme	ster	graduate				
Conten	ts					
A mode	ern topi	c in algebra.				
Deserve						
Recom Basic k	menaed	a previous knowledge:	ed such as can be acc	nuired in the module	s "Introduction to Al	ophra" and
"Applie	ed Algel	ora".	cu, such as can be acc			
Intende	ed learr	ing outcomes				
The stu	ident is	able to elaborate a cor	ntemporary research to	ppic. This includes co	mprehending and st	tructuring of
the top	ic and t	he available literature,	preparing a talk and t	he ability to participa	ate in a scientific dis	cussion.
Course	s (type,	number of weekly con	tact hours, language –	- if other than Germa	n)	
S (2)						
Module	e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other the can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
talk (60	o to 120	minutes)				
Langua	ige of a	ssessment: German or	English			
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	
Allocat	ion of p	laces				
Additio	nal info	ormation				
Worklo	ad					
150 h						
Teachi	ng cycle	9				
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
			<u> </u>			
Module	e appea	rs in				
Master	's degre	ee (1 major) Mathemati	cs (2016)			
Master	's degre	ee (1 major) Mathemati	cal Physics (2016)			
Master	's teach	ning degree Gymnasiun	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Computational Mathematics (2022)						
Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022)						
master	s uegre	e (1 major) mathemati	Lat MIYSICS (2022)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 213 / 403

exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 214 / 403
	data record Master (120 ECTS) Mathematik - 2019	1

Module title					Abbreviation	
Semina	Seminar Applied Mathematics 10-M=SAMA-192-mo1					01
Modul	e coord	inator		Module offered by	<u>.</u>	
Dean c	of Studie	es Mathematik (Mathe	natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
5	nume	rical grade		- · · ·		
Duratio	on	Module level	Other prerequisites	;		
1 seme	ster	graduate				
Conter	nts					
A modern topic in applied mathematics.						
D		d				
Recom	menae ding on	a previous knowledge:	ladvanced knowledge	from different areas	of applied mathema	tice is requi-
red. In	case of	doubt, it is recommen	ded to consult the lect	urer.	or applied mathema	lites is requi-
Intend	ed learr	ning outcomes				
The stu	udent is	able to elaborate a co	ntemporary research to	opic. This includes co	omprehending and s	tructuring of
the top	oic and	the available literature	, preparing a talk and t	he ability to participa	ate in a scientific dis	cussion.
Course	s (type,	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
S (2) Moduli	o taugh	t in: German and/or En	alich			
Metho	d of acc	essment (type scope	language — if other th	an German examina	tion offered — if not	avary como-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		every serife
talk (6	o to 120	minutes)				
Langua	age of a	ssessment: German or	English			
Assess	ment o	ffered: in the semester	in which the course is	offered and in the su	ubsequent semester	
Alloca		naces				
Additio	onal info	ormation				
Worklo	ad					
150 h						
Teachi	ng cvcl	9				
	0.7	-				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
	-		<u> </u>	<u> </u>		
Modul	e appea	irs in				
Master	's degre	ee (1 major) Computati	onal Mathematics (201	.9)		
Master	's degre	ee (1 major) Mathemati	cs (2019)			
Master	's teach	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (20	020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Economathematics (2021)						
Master's degree (1 major) Computational Mathematics (2022)						
Master's degree (1 major) Mathematics (2022)						
Master's degree (1 major) Mathematical Physics (2022)						
Master's degree (1 major) Economathematics (2022)						
exchar	nge prog	gram Mathematics (202	23)			
Master's w	vith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 215 / 403

Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)
Module title Abbreviation						
Seminar in Complex Analysis 10-M=SCOA-161-m01					01	
Modul	e coord	inator		Module offered by	······	
Dean o	of Studie	es Mathematik (Mather	natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites	;		
1 seme	ster	graduate				
Conter	Its					
A mod	ern topi	c in complex analysis.				
Recom	mende	d previous knowledge:	ha madulas "Introducti	on to Complex Analy	sis" and " Complex	Analycic" ic
recomi	nended	lge of the contents of the		on to complex Analy	sis and complex?	HIAIYSIS IS
Intend	ed learr	ning outcomes				
The stu	udent is	able to elaborate a co	ntemporary research to	pic. This includes co	omprehending and s	tructuring of
the top	ic and	the available literature,	, preparing a talk and t	he ability to participa	ate in a scientific dis	cussion.
Course	s (type)	number of weekly con	tact hours, language –	- if other than Germa	n)	
S (2)						
Modul	e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
talk (6	o to 120	minutes)				
Langua	age of a	ssessment: German or	English			
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	9				
	<u> </u>					
Referre	ed to in	LPO I (examination res	gulations for teaching-	degree programmes)		
				<u> </u>		
Modul	e annea	rs in				
Master	's degre	e (1 major) Mathemati	<u>(2016)</u>			
Master	's degre	ee (1 major) Mathemati	cal Physics (2016)			
Master	's teach	ning degree Gymnasiun	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	,
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Computational Mathematics (2022)						
Master	's degre	ee (1 major) Mathemati	CS(2022)			
master	s uegre	ee (1 major) Mathemati	cai Filysics (2022)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 217 / 403

exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 218 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Seminar in Dynamical Systems and Control 10-M=SDSC-161-m01				01		
Module	e coordi	nator		Module offered by		
Dean o	of Studie	es Mathematik (Mather	natics)	Institute of Mathem	atics	
ECTS	Metho	d of grading	Only after succ. con	pl. of module(s)		
5	numer	ical grade		•		
Duratio	on [Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	nts					
A modern topic in dynamical systems and control.						
Recom Knowle	Recommended previous knowledge: Knowledge of the contents of the module "Mathematical Control Theory" or "Control Theory" is required					
Intend	ed learn	ing outcomes		,	, ,	
The stu	udent is	able to elaborate a con	ntemporary research to	pic. This includes co	omprehending and s	tructuring of
Course		number of weekly con	tact hours language -	if other than Germa	n)	cussion.
Course S (a)	3 (type,	number of weekly con	tact nours, tanguage –		11)	
S (2) Module	e taught	in: German and/or En	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
talk (60	0 to 120	minutes)	Fueliek			
Langua	age of as	Ssessment: German or	English in which the course is	offered and in the su	ibsoquent comester	
Allocat	tion of n	lacas		oncrea and in the st	ibsequent semester	
Allocal						
Additio	onal info	ormation				
Worklo	ad					
150 h						
Teachi	ng cycle	9				
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
			<u></u>			
Module	o annoa	rs in				
Mastor	e appea	no (1 major) Mathomati	(2016)			
Master	's degre	e (1 major) Feonomath	ematics (2016)			
Master	's degre	e (1 major) Leonomati	cal Physics (2010)			
Master	's teach	ing degree Gymnasiun	n MINT Teacher Educat	ion PLUS. Elite Netwo	ork Bavaria (ENB) (20	016)
Supplementary course MINT Teacher Education PLUS. Flite Network Bavaria (FNB) (2016)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Economathematics (2021)						
Master	's degre	e (1 major) Computatio	onal Mathematics (202	2)		
Master	's degre	ee (1 major) Mathemati	cs (2022)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 219 / 403



Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 220 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title			Abbreviation	
Semina	ar in Financial and Insurance	Mathematics		10-M=SFIM-161-mo	1
Modul	e coordinator		Module offered by	<u> </u>	
Dean o	of Studies Mathematik (Mathe	ematics)	Institute of Mathem	natics	
ECTS	Method of grading	Only after succ. cor	npl. of module(s)		
5	numerical grade		2		
Duratio	on Module level	Other prerequisites	;		
1 seme	ester graduate				
Conter	its				
A mod	ern topic in financial and insu	rance mathematics.			
Recom Familia	mended previous knowledge arity with the contents of the i	: nodules "Introduction t	o Stochastic Financia	al Mathematics" and	"Stochastics
1" is st	rongly recommended.				
Intend	ed learning outcomes				
The stu the top	Ident is able to elaborate a co bic and the available literature	ontemporary research to e. preparing a talk and t	ppic. This includes control of the ability to participation of the ability of the abilit	omprehending and s ate in a scientific dis	tructuring of cussion.
Course	s (type, number of weekly co	ntact hours, language -	- if other than Germa	n)	
S(2)				,	
Module	e taught in: German and/or E	nglish			
Metho ster, in	d of assessment (type, scope formation on whether modul	, language — if other th e can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
talk (6	o to 120 minutes)				
Langua Assess	age of assessment: German o sment offered: In the semeste	r English r in which the course is	offered and in the su	ubsequent semester	
Allocat	tion of places			·	
	· ·				
Additio	onal information				
Worklo	ad				
150 h					
Teachi	ng cycle				
Referre	ed to in LPO I (examination re	gulations for teaching-	degree programmes)		
Modul	e appears in				
Master	's degree (1 major) Mathema	tics (2016)			
Master	's degree (1 major) Economat	hematics (2016)			
Master	's teaching degree Gymnasiu	m MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	016)
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)				
Master's degree (1 major) Mathematics (2019)					
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)					
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Economathematics (2021)					
Master's degree (1 major) Computational Mathematics (2021)					
Master	's degree (1 major) Mathema	ran mathematics (202)			
Master	's degree (1 major) Economat	hematics (2022)			
Master's w	ith 1 major Mathematics (2019)	JMU Würzbur	g • generated 19-Apr-2025 • e	exam. reg.	page 221 / 403
	<i></i>	data record	Master (120 ECTS) Mathemati	ik - 2019	

exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 222 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Giovan	Giovanni Prodi Seminar (Master) 10-M=SGPCin-152-m01					
Module	e coordir	nator		Module offered by		
Dean o	of Studies	s Mathematik (Mathem	atics)	Institute of Mathem	atics	
ECTS	Method	l of grading	Only after succ. con	pl. of module(s)		
5	numeri	cal grade		1		
Duratio	n []	Vodule level	Other prerequisites			
1 seme	ster g	graduate				
Conten	its					
A mode	ern topic	in the research expert		er of the Giovanni Pr	odi Chair.	
Intende	ed learni	ng outcomes				
The stu	dont is a		tomporon, recently to	nia This includes as	march and in a and a	tructuring of
the top	ic and th	ne available literature.	preparing a talk and t	he ability to participa	ate in a scientific dis	cussion.
Course		number of weekly cont	<u> </u>	if other than Germa	n)	
Course	3 (type, 1	number of weekly cont			11)	
S (2) Module	e taught	in: English				
Metho	d of asse	ssment (type, scope, l	anguage — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formatio	n on whether module (can be chosen to earn	a bonus)		
laik (ou	o to 120 l	secoment: Fnglich				
Assess	ment off	ered: In the semester i	n which the course is	offered and in the su	ihsequent semester	
Allocat	tion of nl	2025				
Allocal		aces				
Additio	onal info	rmation				
Worklo	ad		-			
150 h						
Teachi	ng cycle					
Referre	ed to in L	POI (examination reg	ulations for teaching-	degree programmes)		
Module	e appear	s in				
Master	's degree	e (1 major) Mathematic	s International (2015)			
Master	's degree	e (1 major) Mathematic	s (2016)			
Master	's degree	e (1 major) Economath	ematics (2016)			
Master	's degree	e (1 major) Mathematic	al Physics (2016)			
Master	's degree	e (1 major) Computatio	nal Mathematics (201	6)		
Master	's degree	e (1 major) Computatio	nal Mathematics (201	9)		
Master's degree (1 major) Mathematics (2019)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Mathematics International (2021)						
Master's degree (1 major) Economathematics (2021)						
Master's degree (1 major) Computational Mathematics (2022)						
Master's degree (1 major) Mathematics (2022)						
Master	s degree	e (1 major) Mathematic	al Physics (2022)			
Master	s degree	e (1 major) Mathematic	s international (2022)			
master	s degree	e (1 major) Economath	ematics (2022)			
Master's wi	ith 1 major N	Nathematics (2019)	JMU Würzburg data record I	; • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 223 / 403

Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's degree (1 major) Mathematics International (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 224 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title				Abbreviation	
Semin	ar in Ge	ometry and Topology			10-M=SGTO-161-m	01
Modul	e coord	inator		Module offered by		
Dean c	of Studie	es Mathematik (Mather	matics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
5 numerical grade						
Duratio	on	Module level	Other prerequisites	6		
1 seme	ester	graduate				
Conter	nts					
A modern topic in geometry and topology.						
D		d				
Recom Basic k	mende	a previous knowleage: lae of the contents of t	ne modules "Introducti	on to Differential Ge	ometry" and "Introdu	uction to To-
pology	" is reco	ommended.	ie modules introducti	on to Differentiat Ge	ometry and introdu	
Intend	ed learı	ning outcomes				
The stu	udent is	able to elaborate a co	ntemporary research to	pic. This includes co	omprehending and s	tructuring of
the top	oic and	the available literature,	preparing a talk and t	he ability to participa	ate in a scientific dis	cussion.
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
S (2)	o tough	tin. Cormon and lor En	alich			
Modul	e taugn		gusn 		tion offered if we t	
ster, in	formati	on on whether module	can be chosen to earn	a bonus)	tion offered — If not	every seme-
talk (6	o to 120	minutes)				
Langua	age of a	ssessment: German or	English	offered and in the cu	beaquant competer	
Allocat	tion of r				ibsequent semester	
		haces				
Additio	onal inf	ormation				
Worklo						
150 h						
Teachi	ng cycl	e				
		-				
Referre	ed to in	LPOI (examination res		degree programmes)		
Modul	e annea	in in				
Master	's degr	e (1 major) Mathemati	rs (2016)			
Master	's degr	ee (1 major) Mathemati	cal Physics (2016)			
Master	's teach	ning degree Gymnasiun	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Computational Mathematics (2022)						
Master	's degr	ee (1 major) Mathemati	cs (2022)			
Master	's degr	ee (1 major) Mathemati	cal Physics (2022)			
Master's w	rith 1 majoi	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 225 / 403

exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 226 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation						
Interdisciplinary Seminar 10-M=SIDC-161-m01						
Module	e coord	inator		Module offered by		
Dean o	f Studie	es Mathematik (Mathen	natics)	Institute of Mathem	natics	
ECTS	Metho	d of grading	Only after succ. con	pl. of module(s)		
5	nume	rical grade				
Duratio	n l	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its	5.000000				
A mode	ern topi	c in mathematics with i	nterdisciplinary aspec	ts.		
Intend	ad loar	ning outcomes	,,,,,,			
			. 1.		1 12 1	
the stu	ident is	able to elaborate a cor the available literature,	preparing a talk and t	he ability to participa	omprehending and s ate in a scientific dis	tructuring of cussion.
Course	s (type,	number of weekly con	tact hours, language –	- if other than Germa	n)	
S (2)						
Module	e taugh	t in: German and/or Eng	glish			
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other the can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
talk (60	o to 120	minutes)				
Langua	age of a	ssessment: German or	English			
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	2				
	3 .,	-				
Deferre		IDOL (avamination to	ulations for tooshing			
				legiee programmes)		
Module	e appea	rs in				
Master	's degre	ee (1 major) Mathemati	cs (2016)			
Master	's degre	ee (1 major) Economath	ematics (2016)			
Master	's degre	ee (1 major) Mathemati	cal Physics (2016)			
Master	's degre	ee (1 major) Computatio	onal Mathematics (201	6)		
Master	's teach	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supple	mentar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	's degre	ee (1 major) Computatio	onal Mathematics (201	9)		
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Economathematics (2021)						
Master's degree (1 major) Computational Mathematics (2022)						
Master	Master's degree (1 major) Mathematics (2022)					
Master	's degre	ee (1 major) Mathemati	cal Physics (2022)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record I	g•generated 19-Apr-2025•e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 227 / 403

Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 228 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Semin	ar Math	ematics in the Science	95		10-M=SMSC-161-m	01
Modul	e coord	inator		Module offered by	<u> </u>	
Dean c	of Studie	es Mathematik (Mathe	natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
5	nume	rical grade		•		
Duratio	on	Module level	Other prerequisites	;		
1 seme	ester	graduate				
Conter	nts					
A mod	ern topi	c in mathematics in th	e sciences.			
Recom	mende	d previous knowledge:	Ordinary Differential F	nuntions" and "Intro	duction to Dortial Dif	Forontial
Equation Formation	cnowled ons" is	ige from the modules	as basic knowledge of	functional analysis	duction to Partial Dir	rerential
Intend	ed lear	ning outcomes		Tunctional analysis.		
The st	ident is	able to elaborate a co		nic This includes co	mprehending and s	tructuring of
the top	oic and	the available literature	, preparing a talk and t	he ability to participa	ate in a scientific dis	cussion.
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
S (2)						
Modul	e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
talk (6	o to 120	minutes)				
Langua	age of a	ssessment: German or	English			
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	
Allocat	tion of p	olaces				
			_			
Additio	onal info	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Modul	e appea	irs in				
Master	's degr	ee (1 major) Mathemati	cs (2016)			
Master's degree (1 major) Economathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019) Master's teaching degree Cumpacium MINT Teacher Education DUUC, Elite Natural, Deverie (END) (5)						
Master's teaching degree Gymnasium Mini Lleacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supple Mactor	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)					
	5 ucgli		(2020)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 229 / 403

Master's degree (1 major) Economathematics (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

Master's degree (1 major) Economathematics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's degree (1 major) Economathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 230 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Semin	ar in No	n-linear Analysis			10-M=SNLA-161-mc	01
Modul	e coord	inator		Module offered by	<u> </u>	
Dean o	of Studio	es Mathematik (Mathe	matics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
5	nume	rical grade		• • • •		
Durati	on	Module level	Other prerequisites	i		
1 seme	ester	graduate				
Conter	nts					
A mod	A modern topic in non-linear analysis.					
D		d				
Recom	imende ding on	d previous knowledge:	ladvancod knowlodgo	from different areas	of analysis is roquir	od In caso of
doubt.	it is rec	commended to consult	the lecturer.	nom unerent areas	of allatysis is require	eu. III case of
Intend	ed lear	ning outcomes				
The stu	udent is	able to elaborate a co	ntemporary research to	opic. This includes co	omprehending and s	tructuring of
the top	pic and	the available literature	, preparing a talk and t	he ability to participa	ate in a scientific dis	cussion.
Course	es (type	, number of weekly con	itact hours, language –	- if other than Germa	in)	
S (2)						
Modul	e taugh	t in: German and/or En	glish			
Metho ster, ir	d of ass Iformati	on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
talk (6	o to 120	o minutes)				
Langua	age of a	ssessment: German or	English	offered and in the c	head want competer	
Allocat	tion of			onereu anu in the st	insequent semester	
Alluca		Jaces				
Additi	onal inf	ormation				
Auditio						
Workle	had					
150 h						
Teachi	ng cycl	٩				
	ing cycl	5				
Referr	ed to in	IPOI (examination reg	gulations for teaching.	degree programmes)		
Modul	o annos	ors in				
Master	r's degr	ne (1 maior) Mathemati	ics (2016)			
Master	r's degr	ee (1 major) Kathemati	nematics (2016)			
Master	r's degr	ee (1 major) Dechemati	ical Physics (2016)			
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bayaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS Elite Network Bayaria (ENB) (2016)						
Master	Master's degree (1 major) Mathematics (2010)					
Master's teaching degree Gymnasium MINT Teacher Education PLUS. Elite Network Bavaria (ENB) (2020)						
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)					
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Economathematics (2021)						
Maste	r's degr	ee (1 major) Computati	onal Mathematics (202	22)		
Master's w	ith 1 majo	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. ik - 2019	page 231 / 403

Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 232 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Semina	ar in Nu	merical Mathematics a	nd Applied Analysis		10-M=SNMA-161-m	01
Modul	e coord	inator		Module offered by		
Dean o	of Studie	es Mathematik (Mathe	natics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites	i		
1 seme	ester	graduate				
Conter	its					
A mode	ern topi mender	c in numerical mathem	atics or applied analys	sis.		
Depen themat	ding on tics is re	the content, basic and equired. In case of dou	advanced knowledge bt, it is recommended t	from different areas to consult the lecture	of analysis and/or n er.	umerical ma-
Intend	ed learr	ning outcomes				
The stu the top	udent is bic and f	able to elaborate a co he available literature	ntemporary research to preparing a talk and t	ppic. This includes co he ability to participa	omprehending and s ate in a scientific dis	tructuring of cussion.
Course	s (type,	number of weekly con	tact hours, language –	- if other than Germa	n)	
S (2) Module	e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other the can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
talk (60 Langua	o to 120 age of a	minutes) ssessment: German or	English			
Assess	sment o	ffered: In the semester	in which the course is	offered and in the su	ibsequent semester	
Allocat	tion of p	laces				
Additio	onal info	ormation				
			_			
Worklo	oad					
150 h						
Teachi	ng cycl	9				
Referre	ed to in	LPOI (examination reg	gulations for teaching-o	degree programmes)		
	_					
Modul	e appea	rs in				
Master	's degre	ee (1 major) Mathemati	cs (2016)			
Master	's degre	ee (1 major) Economatl	ematics (2016)			
Master	Master's degree (1 major) Mathematical Physics (2016)					
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computational Mathematics (2019)						
Master	's teach	ning degree Gymnasiur v course MINT Teacher	n MINT Teacher Educat	ion PLUS, Elite Netwo Network Bayaria (FN	ork Bavaria (ENB) (20 B) (2020)	020)
Master	's degre	ee (1 major) Mathemati	cal Physics (2020)		_, (,	
Master's w	vith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 233 / 403

UNIVERSITÄT WÜRZBURG

Master's degree (1 major) Economathematics (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

Master's degree (1 major) Economathematics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's degree (1 major) Economathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 234 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation	
Semina	Seminar in Optimization 10-M=SOPT-161-m01)1
Modul	e coordinator		Module offered by		
Dean o	f Studies Mathematik (Math	ematics)	Institute of Mathem	natics	
ECTS	Method of grading	Only after succ. cor	npl. of module(s)		
5	numerical grade				
Duratio	m Module level	Other prerequisites	•		
1 seme	ster graduate	Other prerequisites			
Conten	its]			
A mode	ern topic in optimisation.				
Intend	ed learning outcomes				
The stu the top	Ident is able to elaborate a vic and the available literatu	contemporary research to re, preparing a talk and t	opic. This includes co he ability to participa	omprehending and s ate in a scientific dis	tructuring of cussion.
Course	s (type_number of weekly c	ontact hours language -	- if other than Germa	n)	
S (a)			in other than defind		
Module	e taught in: German and/or	English			
Metho ster, in	d of assessment (type, scop formation on whether modu	e, language — if other th Ile can be chosen to earr	an German, examina a bonus)	tion offered — if not	every seme-
talk (60 Langua	o to 120 minutes) age of assessment: German	or English			
Assess	ment offered: In the semes	er in which the course is	offered and in the su	ubsequent semester	,
Allocat	tion of places				
Additio	nalinformation				
Auditic					
 Worklo	ad				
150 h					
Toochi	ng gyalo				
Teacili					
Referre	ed to in LPO I (examination	regulations for teaching-	degree programmes)		
Module	e appears in				
Master	's degree (1 major) Mathem	atics (2016)			
Master	's degree (1 major) Econom	athematics (2016)			
Master	's degree (1 major) Mathem	atical Physics (2016)			
Master	's degree (1 major) Comput	ational Mathematics (201	.6)		
Master	's teaching degree Gymnas	um MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)				
Master	Master's degree (1 major) Computational Mathematics (2019)				
Master's degree (1 major) Mathematics (2019)					
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)					
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)					
Master's degree (1 major) Mathematical Physics (2020)					
Master	Master's degree (1 major) Economathematics (2021)				
Master's degree (1 major) Computational Mathematics (2022)					
Master	Master's degree (1 major) Mathematics (2022)				
Master	's degree (1 major) Mathem	atical Physics (2022)			
Master's w	ith 1 major Mathematics (2019)	JMU Würzbur	g • generated 19-Apr-2025 • e	xam. reg.	page 235 / 403

Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Module	Module title				Abbreviation	
Semina	ar in Sta	atistics			10-M=SSTA-161-mc	91
Module	e coord	inator		Module offered by		
Dean o	fStudie	es Mathematik (Mather	natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade		• • • •		
Duratio	on	Module level	Other prerequisites	6		
1 seme	ster	graduate				
Conten	its					
A mode	ern topi	c in statistics.				
Recom	mende	d previous knowledge:				
Basic k	nowled	lge of stochastics is rec	juired, such as that ac	quired in the "Stocha	astics 1" module. Kn	owledge of
the cor	ntents o nowleds	f the module "Stochast ge may also be helpful:	ics 2" is also recomme consultation with the	ended. Depending or lecturer is recommen	n the content of the o nded.	course, other
Intend	ed lear	ning outcomes				
Tho stu	idont is	able to elaborate a cor	tomporany rosparch to	nic This includes co	mprohanding and c	tructuring of
the top	ic and	the available literature,	preparing a talk and t	he ability to participa	ate in a scientific dis	cussion.
Course	s (type,	, number of weekly con	tact hours, language –	- if other than Germa	n)	
S (2)						
Module	e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
talk (60	o to 120	minutes)				
Langua	age of a	ssessment: German or	English			
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Worklo	ad					
150 h						
Teachi		0				
reaction	ing cycl	5				
				d		
Referre		LPOT (examination reg	gulations for teaching-	degree programmes)		
Module	e appea	irs in				
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Economathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
master	s degre	ee (1 major) Economath	ematics (2021)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 237 / 403

Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 238 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Applied	l Differ	ential Geometry			10-M=VADG-161-mo	01
Module	e coordi	inator		Module offered by		
Dean of	f Studie	es Mathematik (Mathei	natics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	numei	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	Contents					
The mo tial geo timisati Recomm Advanc Geome	The module builds on the topics covered in module 10-M=ADGM and discusses selected applications of differen- tial geometry, e. g. at the interface of control theory and mechanics (subriemannian geometry), in the smooth op- timisation on manifolds or applications in physics. Recommended previous knowledge: Advanced knowledge of differential geometry is required, such as can be acquired in the module "Differential					
"Pseud	o-Riem	annian and Riemannia	n Geometry" and "Lie T	Theory" is also recom	mended.	, incentantes ,
Intende	ed learr	ing outcomes				
The stu blish a sics.	dent is connec	acquainted with selec tion between his/her a	ted advanced applicati acquired skills and oth	ions of differential ge er branches of mathe	eometry. He/She is a ematics and question	ble to esta- ns in phy-
Course	s (type,	number of weekly con	tact hours, language –	- if other than Germa	n)	
V (4) + I Module	Ü (2) e taughi	t in: German and/or En	glish			
Method	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	everv seme-
ster, inf	formati	on on whether module	can be chosen to earn	a bonus)		···· , ····
a) writte b) oral e c) oral e Langua Assesse credital	en exar examin examin ge of a ment o ble for	nination (approx. 90 to ation of one candidate ation in groups (group ssessment: German or ffered: In the semester	9 120 minutes, usually each (approx. 20 minu s of 2, 15 minutes per c English in which the course is	chosen) or utes) or andidate) offered and in the su	ıbsequent semester	
Allocati	ion of r	laces				
Allocal		iaces				
Additio	nal info	ormation				
Worklo	ad					
300 h						
Teachir		•				
reaciiii	ig cycu	2				
Referred to in LPO I (examination regulations for teaching-degree programmes)						
		•				
module	e appea					
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Mathematical Hysics (2010) Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS. Elite Network Bavaria (FNB) (2016)						
Supple	mentar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (ENI	B) (2016)	,
Master's wi	th 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e. Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 239 / 403

Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 240 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Algebra	aic Geo	metry			10-M=VAGE-192-mo	01
Module	e coord	inator		Module offered by		
Dean o	f Studie	es Mathematik (Mathen	natics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
Affine a sors an Bezout Recom Basic k "Applie	and pro Id Riem 's theor mendeo mowlec ed Algel	jective space, affine an ann-Roch theorem for c rem; Grassmann and fla d previous knowledge: lge of algebra is assum ora".	d projective varieties, urves; genus, singula ag varieties; 27 lines ir ed, such as can be acc	morphisms and ratic rities and Plücker for a cubic surface. quired in the module	onal maps; function mula; dual curve, du s "Introduction to Alg	fields, divi- Ial surface; gebra" and
Intende	ed learr	ning outcomes				
The stu classify other fi	Ident is / these elds of	acquainted with funda results within more ger mathematics.	mental concepts, met neral theories and kno	hods and results in a ws about the connec	lgebraic geometry, i tions of algebraic ge	s able to cometry with
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taugh	t in: German and/or Eng	glish			
Methor ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt b) oral c) oral Langua Assess credita	en exar examin examin ige of a ment o ble for	nination (approx. 90 to ation of one candidate ation in groups (groups ssessment: German or ffered: In the semester bonus	120 minutes, usually each (approx. 20 minu of 2, 15 minutes per c English in which the course is	chosen) or utes) or andidate) offered and in the su	ıbsequent semester	
Allocat	ion of p	olaces				
Additio	nal info	ormation				
Worklo	ad					
300 h						
Teachi	ng cvcl	9				
	0 . 7	-				
Peferred to in LPO L (examination regulations for teaching degree programmes)						
Module	e appea	irs in				
Master's degree (1 major) Computational Mathematics (2010)						
Master	's degre	ee (1 major) Mathemati	cs (2019)	~ ·		
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master	's degre	ee (1 major) Computatio	onal Mathematics (202	22)		
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 241 / 403

Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 242 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	Module title Abbreviation					
Select	Selected Topics in Analysis 10-M=VANA-161-m01					
Modul	Module coordinator Module offered by					
			Module offered By			
Dean of Studies Mathematik (Mathematics)			Institute of Mathem	atics		
ECTS Method of grading Only after succ. compl. of module(s)						
10	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conter		· · · · · ·		• • • • •		
with ot	th discl her ma	thematical concepts.	opic in analysis taking	g into account recent	developments and ini	terrelations
Recom	mende	d previous knowledge:				
Depen doubt,	ding on it is rea	the content, basic and a commended to consult the construction of the constructio	advanced knowledge he lecturer.	from different areas	of analysis is required	. In case of
Intend	ed lear	ning outcomes				
The stu	Ident is	acquainted with advan		ed tonic in analysis	and is able to apply th	nese to
comple	ex prob	lems.				
Course	s (type	, number of weekly conta	act hours, language –	- if other than Germa	n)	
V (4) +	Ü (2)					
Modul	e taugh	t in: German and/or Eng	lish			
Metho	d of ass	essment (type, scope, la	anguage — if other th	an German, examina	tion offered — if not ev	very seme-
ster, in	format	on on whether module o	can be chosen to earn	a bonus)		
a) writt	ten exa	mination (approx. 90 to	120 minutes, usually	chosen) or		
c) oral	examin	ation in groups (groups	of 2 15 minutes per c	andidate)		
Langua	age of a	ssessment: German or E	English			
Assess	sment o	ffered: In the semester i	n which the course is	offered and in the su	ıbsequent semester	
credita	ble for	bonus	_			
Allocat	tion of p	olaces				
Additional information						
Worklo	ad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Modul	e appea	ars in				
Master	's degr	ee (1 major) Mathematic	s (2016)			
Master	's degr	ee (1 major) Mathematic	al Physics (2016)			
Master	's degr	ee (1 major) Computation	nal Mathematics (201	6)		
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master	's teacl	ning degree Gymnasium	MINI leacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (202	20)
waster's w	ntri 1 majo	mathematics (2019)	data record	; • generateu 19-Apr-2025 ● e Master (120 ECTS) Mathemati	k - 2019	Jage 243 / 403

UNIVERSITÄT WÜRZBURG

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 244 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation					
Algebr	Algebraic Topology 10-M=VATP-161-m01)1
Modul	e coordinator		Module offered by	<u> </u>	
Dean c	Dean of Studies Mathematik (Mathematics)		Institute of Mathem	natics	
ECTS	Method of grading	Only after succ. compl. of module(s)			
10	numerical grade	numerical grade			
Duratio	on Module level	Other prerequisites	5		
1 seme	ster graduate				
Conter	its				
Homol spaces	ogy, homotopy invariance, ex 5.	act sequences, cohomo	ology, application to	the topology of Eucl	idean
Recom Basic k	mended previous knowledge mowledge of topology is assi	: Imed. such as can be a	cauired in the modul	e "Introduction to To	ppology".
Intend	ed learning outcomes				,poto3) 1
The stu	ident is acquainted with adva	Inced results in algebra	ic topology.		
Course	s (type, number of weekly co	ntact hours. language –	- if other than Germa	n)	
V (4) + Modul	Ü (2) e taught in: German and/or E	nglish		,	
Metho	d of assessment (type, scope	, language — if other th	an German, examina	tion offered — if not	every seme-
 a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 					
Allocat	tion of places				
Additio	onal information				
Workload					
300 h					
Teachi	ng cycle				
Referre	ed to in LPO I (examination re	gulations for teaching-	degree programmes)		
Modul	e appears in				
Master	's degree (1 major) Mathema	ics (2016)			
Master's degree (1 major) Mathematical Physics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Mathematics (2019)					
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020)					
master	s acgree (1 major) computat		;		I
Master's w	ith 1 major Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 245 / 403

Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 246 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	Module title Abbreviation					
Algorithmic Number Theory 10-M=VAZT-192-mo1				01		
Modul	e coord	inator		Module offered by	<u> </u>	
Dean of Studies Mathematik (Mathematics)			Institute of Mathem	natics		
FCTS	Metho	d of grading	Only after succ. con	nol of module(s)	latics	
10 numerical grade						
Durati		Madula laval	Other prerequisites			
1 seme	ster	graduate				
Conter	its	0				
Binary roots. I tic curv Recom Basic k	numbe Primalit ve meth mendec nowlec	rs, computation of the y tests for Fermat and <i>I</i> od, quadratic sieve me d previous knowledge: lge of algebra and num	greatest common divis Aersenne numbers, fac thod), discrete logarith ber theory is assumed ber Theory" and "Appli	or, pseudoprime tes ctorisation methods nm. , such as can be acq ed Algebra"	ts, computation of p (Pollard-Rho, (p-1)-m uired in the modules	rimitive nethod, ellip- s "Introducti-
Intend	ed learr	ing outcomes				
The stu	ıdent kı	nows about the theoret	ical foundations and th	ne possible applicati	ions of several meth	ods in algo-
rithmic	numbe	er theory.				
Course	s (type	number of weekly con	tact hours, language –	- if other than Germa	in)	
V (4) +	Ü (2)					
Modul	e taugh	t in: German and/or En	glish			
Metho	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
 a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 						
Allocation of places						
Additional information						
Worklo	ad					
300 h						
Teachi	ng cycl	9				
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Modul	e appea	rs in				
Master	's degre	ee (1 major) Computatio	onal Mathematics (201	9)		
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master's degree (1 major) Computational Mathematics (2022)						
Master	's degre	ee (1 major) Mathemati	cs (2022)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 247 / 403

Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 248 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Computer Algebra 10-M=VCAL-192-m01)1		
Module coordinator Module offered by			Module offered by			
Dean of Studies Mathematik (Mathematics)		Institute of Mathem	atics			
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10 numerical grade						
Duratio	n	Module level	Other prerequisites	i		
1 seme	ster	graduate				
Conten	ts					
Fast mu lynomia als, syn als, Grö Recomn Basic k	ultiplica als over nbolic i bbner b mendeo nowled	ation of numbers, polyr r finite fields; lattices, l ntegration of rational f asis, Buchberger's algo d previous knowledge: lge of algebra is assum	nomials and matrices, attice basis reduction unctions; exact arithm orithm, algorithms for p red. such as can be acc	fast chinese remaind and LLL-algorithm; fa etic with algebraic no permutation groups.	er theorem; factoris actorisation of ration umbers; multivariate s "Introduction to Al	ation of po- al polynomi- polynomi- gebra" and
"Applie	d Algel	ora".		•	· · · · · · · · · · · · · · · · · · ·	
Intende	ed learr	ning outcomes				
The stu puter a	dent kr Igebra.	nows about the theoret	ical foundations and t	he possible applicati	ons of several meth	ods in com-
Course	s (type,	number of weekly con	tact hours, language –	– if other than Germa	n)	
V (4) + Module	Ü (2) e taught	t in: German and/or En	glish			
Methoo ster, inf	l of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
 a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester creditable for bonus 						
Allocation of places						
Additio	nal info	ormation				
Worklo	ad					
300 h						
Teachir	ng cycle	e				
Referre	d to in	LPOI (examination res	gulations for teaching-	degree programmes)		
			<u></u>			
Module appears in						
Master	's degre	ee (1 major) Computati	onal Mathematics (201	.9)		
Master	's degre	ee (1 major) Mathemati	cs (2019)			
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master	's degre	ee (1 major) Mathemati	cal Physics (2020)			
Master	's degre	ee (1 major) Computati	onal Mathematics (202	22)		
Master's wi	th 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 249 / 403

Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 250 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title			Abbreviation		
Discre	Discrete Mathematics 10-M=VDIM-161-m01					
Modul	e coordinator		Module offered by	<u> </u>		
Dean of Studies Mathematik (Mathematics)		Institute of Mathem	atics			
FCTS Method of grading Only after succ. compl. of module(s)						
5 numerical grade						
Durati		Other prerequisites				
1 seme	ester graduate					
Conte	nts					
Advan graph Recom	ced methods and results in a se theory or combinatorics) mended previous knowledge:	lected field of discret	e mathematics (e. g.	coding theory, cryptography,		
Basic	knowledge of the contents of the	e module "Introductio	n to Discrete Mather	natics" is required.		
	ident is acquainted with advance	ad results in a coloct	ed tonic in discrete r	nathematics		
The su			if a the with a w Common			
V (3) + Modul	Ü (1) e taught in: German and/or Engl	ish	- If other than Germa	n)		
Metho ster, ir	d of assessment (type, scope, la Iformation on whether module c	anguage — if other the an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme		
 b) oral examination of one candidate each (approx. 15 minutes) or c) oral examination in groups (groups of 2, approx. 10 minutes per candidate) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 						
Allocation of places						
Additional information						
Workload						
150 h						
Teachi	ng cycle					
		_				
Referr	ed to in LPO I (examination regu	lations for teaching-	degree programmes)			
Modul	e appears in					
Maste	r's degree (1 major) Mathematics	5 (2016)				
Master's degree (1 major) Physics (2016)						
Master's degree (1 major) Nanostructure Technology (2016)						
Master's degree (1 major) Economathematics (2016)						
Maste	Master's degree (1 major) Mathematical Physics (2016)					
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Maste Maste	r's degree (1 major) Mathematics r's degree (1 major) Nanostructu	s (2019) re Technology (2020)				
Master's v	vith 1 maior Mathematics (2019)	JMU Würzburg	• generated 19-Apr-2025 • e	xam. reg. page 251 / 40		

Asstar's with a major Mathematics (2010)	IMILWÜrzhurg e generated to Apr 2025 e over rog	paga as4 / 100
haster S with 1 major Mathematics (2019)	JMO WUZDUIG • generated 19-Apr-2025 • exam. reg.	page 251 / 403
	data record Master (120 ECTS) Mathematik - 2019	

UNIVERSITÄT WÜRZBURG

Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)
Modul	e title				Abbreviation
Dynam	nical Sys	stems			10-M=VDSY-161-m01
Modul	e coord	inator		Module offered by	
Dean o	of Studie	es Mathematik (Mathema	atics)	Institute of Mathem	atics
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
5	nume	rical grade			
Durati	on	Module level	Other prerequisites		
1 seme	ester	graduate			
Conter	nts				
Funda Recom Basic I	mentals mende <nowlec< td=""><td>of dynamical systems, e d previous knowledge: lge of the contents of the</td><td>. g. stability theory, e module "Ordinary Di</td><td>rgodic theory, Hamil</td><td>tonian systems. " is useful.</td></nowlec<>	of dynamical systems, e d previous knowledge: lge of the contents of the	. g. stability theory, e module "Ordinary Di	rgodic theory, Hamil	tonian systems. " is useful.
Intend	ed learı	ning outcomes			
The stu quality	udent m 1.	asters the mathematical	methods in the theo	ry of dynamic systen	ns, and is able to analyse their
Course	es (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)
V (3) + Modul	Ü (1) e taugh	t in: German and/or Engli	ish		
Metho	d of ass	sessment (type, scope, la	nguage — if other tha	an German, examina	tion offered — if not every seme-
ster, ir	ıformati	on on whether module ca	an be chosen to earn	a bonus)	
a) writ	ten exai	mination (approx. 60 to 9	o minutes, usually c	hosen) or	
b) oral	examin	ation of one candidate e	ach (approx. 15 minu	tes) or	
Langua	age of a	ssessment: German or Er	nglish	les per canuluale)	
Assess credita	sment o able for	ffered: In the semester in bonus	which the course is	offered and in the su	ibsequent semester
Alloca	tion of p	olaces			
Additi	onal inf	ormation			
Workle	bad				
150 h					
Teachi	ng cycl	e			
Referr	ed to in	LPOI (examination regu	lations for teaching-o	degree programmes)	
Modul	e appea	ars in			
Maste	r's degr	ee (1 major) Mathematics	(2016)		
Maste	r's degre	ee (1 major) Economathe	matics (2016)		
Master	r's degre	ee (1 major) Mathematica	Il Physics (2016)		
Master	Master's degree (1 major) Computational Mathematics (2016)				
Sunnla	mentar	ning degree dynniasium i V course MINT Teacher Fr	ducation PILIS Flite	Network Bavaria (FNI	B) (2016)
Master	r's degr	ee (1 major) Computation	al Mathematics (201	9)	2, (2010)
Maste	r's degre	ee (1 major) Mathematics	(2019)	~	
Maste	r's teacl	ning degree Gymnasium I	WINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 253 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022)

Master's degree (1 major) Economathematics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's degree (1 major) Economathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 254 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Select	ed Topi	cs in Financial Mathem	atics		10-M=VFNM-161-m	01
Modul	e coord	inator		Module offered by		
Dean of Studies Mathematik (Mathematics)			natics)	Institute of Mathem	atics	
FCTS	Metho	nd of grading	Only after succ. con	nnl of module(s)		
10	nume	rical grade				
Durati		Madula laval	Other prerequisites			
1 seme	ester	graduate		•		
Conter	its		-			
Selecte of asse stocha Recom Familia 1" is st	ed topic et pricin stic inte mende arity wit rongly r	is in financial mathema g in discrete time for fir egration, stochastic diff d previous knowledge: h the contents of the m recommended.	tics, e.g. conditional entry of the spaces, American erential equations and oddles "Introduction to	expectation and mari put, Snell envelope, d Ito calculus, Black- o Stochastic Financia	tingales, fundament stopping time, optir Merton-Scholes moc al Mathematics" and	al theorem nal stopping, lel. "Stochastics
Intend	ed learı	ning outcomes				
The stu conten	udent is nporary	acquainted with advar research questions in f	nced results in financia inancial mathematics	al mathematics. He/S and can apply his/h	She gains the ability er skills to complex	to work on problems.
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (4) +	Ü (2)					
Modul	e taugh	t in: German and/or Eng	glish			
Metho ster. in	d of ass formati	essment (type, scope, on on whether module)	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writh b) oral c) oral Langua Assess credita	en exar examin examin age of a sment o ble for	mination (approx. 90 to aation of one candidate ation in groups (groups ssessment: German or ffered: In the semester bonus	120 minutes, usually each (approx. 20 minus of 2, 15 minutes per c English in which the course is	chosen) or utes) or andidate) offered and in the su	ıbsequent semester	
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	oad					
300 h						
Teachi	ng cycl	е				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Economatnematics (2016)						
Master's degree (1 major) Computational Mathematics (2016) Master's toaching degree Cympasium MINT Teacher Education DLUS, Elite Network Paveria (ENP) (cost)						
Master's teaching degree dyninasium Mint Teacher Education PLUS, Elite Network Pavaria (END) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	's degr	ee (1 major) Computatio	onal Mathematics (201	9)		
Waster	s degr	ee (1 major) Mathemati	CS (2019)	a concrete d to Accesso		nogo /
waster's w	ntri 1 majoi	mathematics (2019)	data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	k - 2019	page 255 / 403

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 256 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Groups	and th	eir Representations			10-M=VGDS-161-m	01
Modul	e coord	inator		Module offered by		
Dean o	f Studie	es Mathematik (Mathen	natics)	Institute of Mathematics		
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)		
10	nume	rical grade		1		
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
Finite p the S-r	ermuta	ition groups and charac Schur.	ter theory of finite gro	ups, interrelations ar	nd special technique	es such as
Recom Basic k "Applie	mende nowlec ed Algel	d previous knowledge: Ige of algebra is assum ora".	ed, such as can be acc	quired in the module	s "Introduction to Al	gebra" and
Intend	ed learı	ning outcomes				
The stu rary res blems.	ident m search o	asters advanced algeb questions in group thec	raic concepts and met ry and representation	hods. He/She gains t theory and can apply	the ability to work or / his/her skills to co	n contempo- mplex pro-
Course	s (type	, number of weekly con	act hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taugh	t in: German and/or Eng	glish			
Metho ster. in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt b) oral c) oral Langua Assess credita	en exar examin examin ge of a ment o ble for	nination (approx. 90 to ation of one candidate ation in groups (groups ssessment: German or ffered: In the semester bonus	120 minutes, usually each (approx. 20 minu of 2, 15 minutes per c English in which the course is	chosen) or utes) or andidate) offered and in the su	ıbsequent semester	
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
200 h						
Toochi		•				
	ing cycl	5	_			
Referre	ed to in	LPO I (examination reg	ulations for teaching-	degree programmes)		
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Physics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supple	mentar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (ENI	B) (2016)	
Master	's degr	ee (1 major) Computatio	nal Mathematics (201	9)		
Master's w	ith 1 majoi	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e. Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 257 / 403

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 258 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviati			Abbreviation			
Geome	trical N	lechanics			10-M=VGEM-161-m	01
Module	e coordi	nator		Module offered by		
Dean o	f Studie	es Mathematik (Mather	natics)	Institute of Mathem	atics	
ECTS	Metho	d of grading	Only after succ. con	npl. of module(s)		
10	numer	ical grade				
Duratio	on	Module level	Other prerequisites	i		
1 seme	ster	graduate				
Conten	ts					
The module builds on the topics covered in module 10-M=ADGM and discusses these in more detail: symplec- tic geometry, cotangent bundles and other examples of symplectic manifolds, symmetries and Noether theorem, phase space reduction, normal forms, introduction to Poisson geometry.						
Advanc Geome ge of th	ed kno try". Kn neoretic	wledge of differential g owledge of the content al mechanics can also	eometry is required, s s of the module "Intro be useful.	uch as can be acquir duction to Topology"	ed in the module "Di is also recommende	fferential ed. Knowled-
Intende	ed learr	ing outcomes				
The stu He/She and qu	ident is e is able estions	acquainted with select to establish a connec in physics.	ed advanced applicat tion between his/her a	ions of differential ge acquired skills and ot	cometry to geometric her branches of mat	mechanics. hematics
Course	s (type,	number of weekly con	tact hours, language –	– if other than Germa	n)	
V (4) + Module	Ü (2) e taught	in: German and/or En	glish			
Methoo ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt b) oral c) oral Langua Assess	en exar examin examin ge of a: ment of	nination (approx. 90 to ation of one candidate ation in groups (groups ssessment: German or ffered: In the semester	120 minutes, usually each (approx. 20 minus of 2, 15 minutes per c English in which the course is	chosen) or utes) or andidate) offered and in the su	ıbsequent semester	
Allocat	ion of n	lares				
Additio	nal info	rmation				
Auditio		mation				
Worklo						
	au					
300 H						
Teachi	ng cycle	9				
Referre	d to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Module	e appea	rs in				
Master	Master's degree (1 major) Mathematics (2016)					
Master's degree (1 major) Physics (2016) Master's degree (1 major) Mathematical Physics (2016)						
Master	's teach	ing degree Gymnasiun	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supple	mentar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master's wi	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 259 / 403

Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 260 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Aspect	s of Ge	ometry			10-M=VGEO-161-m	01
Modul	e coord	inator		Module offered by	<u> </u>	
Dean c	of Studie	es Mathematik (Mathe	matics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites	i		
1 seme	ester	graduate				
Conter	nts					
In-dep ⁻ with ot	with other mathematical structures, e. g. topological geometries, diagram geometries.					
Recom	mende	d previous knowledge:			- · ··	
Basick	cnowled	ige from the modules "	Differential Geometry"	and "Introduction to	lopology" is recomi	mended.
Intend	ed leari	ning outcomes				1.00
The stu comple	ident is ex probl	acquainted with advar	nced results in a select	ed field of geometry	and can apply his/h	er skills to
Course	es (type	number of weekly con	tact hours, language –	- if other than Germa	n)	
V (3) + Moduli	Ü (1) e taugh	t in• German and/or En	ølish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		,
a) writt	en exai	nination (approx. 60 to	90 minutes, usually c	hosen) or		
b) oral	examin	ation of one candidate	each (approx. 15 minu	ites) or tes per candidate)		
Langua	age of a	ssessment: German or	English			
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ıbsequent semester	
credita	ble for	bonus				
Alloca	tion of p	olaces				
Auunu		Jillation				
Workle						
150 h						
Teachi	ng cycl	a				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
			<u> </u>	<u> </u>		
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Mathematics (2010)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master	's degr	ee (1 major) Mathemati	cal Physics (2020)			
Mactoria	ith a main	Mathematics (appa)	IA11 \ \ \ / / ?	a generated to Art coort	vam rog	
waster's w	ntri 1 majoi	mathematics (2019)	JMU Wurzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	лані. reg. k - 2019	page 261 / 403

Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 262 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Geome	etric Co	nplex Analysis			10-M=VGFT-192-m0	1
Madul	<u></u>	instar		Madula offered by		
Modul						
Dean o	of Studio	es Mathematik (Mathem	atics)	Institute of Mathem	latics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	its					
Advano trics, q	ced met uasicor	hods and results in geo nformal maps, harmonic	metric complex analy functions, biholomor	sis (e.g. conformal m phic maps).	iaps, conformal Rien	1annian me-
Recom	mende	d previous knowledge:				
Basic k	nowled	lge of the contents of th	e module "Introductio	n to Complex Analys	is" is recommended	•
Intend	ed lear	ning outcomes				
The stu	udent is	acquainted with fundar	mental concepts, met	hods and results in g	eometric complex a	nalysis, is
able cl	assify t	hese results within more	e general theories and	knows about the co	nnections of geome	tric complex
analys	is with	other fields of mathema	tics.			
Course	s (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (4) +	Ü (2)					
Modul	e taugh	t in: German and/or Eng	lish			
Metho ster, in	d of ass formati	essment (type, scope, l on on whether module o	anguage — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt	en exai	mination (approx. 90 to	120 minutes, usually	chosen) or		
b) oral	examir	ation of one candidate	each (approx. 20 minu	utes) or		
c) oral	examin	ation in groups (groups	of 2, 15 minutes per c	andidate)		
Langua	age of a	ssessment: German or E ffored, In the compostor i	nglish nwhich the course is	offered and in the cu	ibcoquent comector	
credita	ihle for	honus	II WIIICH LITE COUISE IS	onered and in the st	insequent semester	
Allocat	tion of r					
Allocal		Jaces				
			_			
Additio	onal inf	ormation				
WORKIC	bad					
300 h						
Teachi	ng cycl	8				
	_					
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Modul	e appea	irs in				
Master	's degr	ee (1 major) Computatio	nal Mathematics (201	9)		
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master	Master's degree (1 major) Computational Mathematics (2022)					
Master	's degr	ee (1 major) Mathematic	S (2022)			
INIASter Master's w	s degr	ee (1 major) Mathematic	al Physics (2022)	• generated 10-Apr 2025 • 2	yam reg	nage 262 / 102
master S W	nan i majo	mathematics (2019)	data record	Master (120 ECTS) Mathemati	k - 2019	pase 203 / 403

exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 264 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title			Abbreviation	
Giovanni Prodi Lecture Advanced Topics (Master) 10-M=VGPAi			10-M=VGPAin-152-r	n01	
Module coordinator Module offered by					
Deen	of Studios Mathematik (Mathe	matica	Institute of Methom		
Dean	or studies Mathematik (Mathe		Institute of Mathem	latics	
ECIS	Method of grading	Only after succ. cor	npl. of module(s)		
10	I numerical grade				
Durati	on Module level	Other prerequisites	5		
1 seme	ester graduate				
Conte	nts				
Introd	uction to a specialised topic in	mathematics by an in	ternational expert.		
Intend	led learning outcomes				
The st thema thema	udent is acquainted with the fu tics. He/She is able to establis tics and applications in other	undamental concepts a sh a connection betwee subjects.	and methods of a cor en his/her acquired s	ntemporary research skills and other bran	topic in ma- ches of ma-
Course	es (type, number of weekly cor	ntact hours, language -	– if other than Germa	in)	
V (4) + Modul	Ü (2) e taught in: English				
Metho ster, ir	d of assessment (type, scope, nformation on whether module	language — if other th can be chosen to earr	an German, examina 1 a bonus)	ition offered — if not	every seme-
b) oral c) oral Langu Assess credita	examination of one candidate examination in groups (group age of assessment: English sment offered: In the semester able for bonus	e each (approx. 20 min s of 2, 15 minutes per o in which the course is	utes) or candidate) offered and in the su	ubsequent semester	
Alloca	tion of places				
Additi	onal information				
Workl	oad				
300 h					
Teach	ing cycle				
Referr	ed to in LPO I (examination re	gulations for teaching-	degree programmes)		
Modul	e appears in				
Maste	r's degree (1 major) Mathemat	ics International (2015))		
Maste	r's degree (1 major) Mathemat	ics (2016)			
Maste	r's degree (1 major) Mathemat	ical Physics (2016)			
Master's degree (1 major) Computational Mathematics (2016)					
Master's degree (1 major) Computational Mathematics (2019)					
Maste	Master's degree (1 major) Mathematics (2019)				
Maste	Master's degree (1 major) Mathematical Physics (2020)				
Master's degree (1 major) Mathematics International (2021)					
Maste	Master's degree (1 major) Computational Mathematics (2022)				
Maste	r's degree (1 major) Mathemat	ics (2022)			
Maste	r's degree (1 major) Mathemat	ical Physics (2022)			
Master's v	vith 1 major Mathematics (2019)	JMU Würzbur	g • generated 19-Apr-2025 • 6	exam. reg.	page 265 / 403

Master's degree (1 major) Mathematics International (2022) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Mathematics International (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 266 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title			Abbreviation	
Giovanni Prodi Lecture Modern Topics (Master)				10-M=VGPMin-152-	m01
Modul	a coordinator		Module offered by		
Modul			Would offered by		
Dean d	of Studies Mathematik (Mathe		Institute of Mathem	latics	
ECIS	Method of grading	Only after succ. cor	npl. of module(s)		
10					
Durati	on Module level	Other prerequisites	5		
1 seme	ester graduate				
Contents					
Introd	uction to a specialised topic ir	n mathematics by an in	ternational expert.		
Intend	ed learning outcomes				
The sto thema thema	udent is acquainted with the f tics. He/She is able to establi tics and applications in other	undamental concepts a sh a connection betwee subjects.	and methods of a cor en his/her acquired s	ntemporary research skills and other bran	topic in ma- ches of ma-
Course	es (type, number of weekly con	ntact hours, language -	– if other than Germa	an)	
V (4) + Modul	Ü (2) e taught in: English				
Metho ster, ir	d of assessment (type, scope, nformation on whether module	, language — if other th e can be chosen to earr	an German, examina 1 a bonus)	ition offered — if not	every seme-
b) oral c) oral Langua Assess credita	examination of one candidate examination in groups (group age of assessment: English sment offered: In the semeste able for bonus	e each (approx. 20 min s of 2, 15 minutes per o r in which the course is	utes) or candidate) offered and in the su	ubsequent semester	
Alloca	tion of places				
Additi	onal information				
Workle	pad				
300 h					
Teachi	ing cycle				
Poforr	ed to in IPOI (examination re	gulations for teaching	degree programmes)		
Keren					
	•				
Modul	e appears in				
Maste	r's degree (1 major) Mathemat	ics International (2015)			
Maste	r's degree (1 major) Mathemat r's degree (1 major) Mathemat	ICS (2016)			
master's degree (1 major) mathematical Physics (2016) Master's degree (1 major) Computational Mathematics (2016)					
Master's degree (1 major) Computational Mathematics (2010) Master's degree (1 major) Computational Mathematics (2010)					
Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2010)					
Maste	Master's degree (1 major) Mathematical Physics (2020)				
Master's degree (1 major) Mathematics International (2021)					
Maste	Master's degree (1 major) Computational Mathematics (2022)				
Maste	r's degree (1 major) Mathemat	ics (2022)			
Maste	r's degree (1 major) Mathemat	ical Physics (2022)			
Master's v	vith 1 major Mathematics (2019)	JMU Würzbur	g • generated 19-Apr-2025 • 6	exam. reg.	page 267 / 403

Master's degree (1 major) Mathematics International (2022) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Mathematics International (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 268 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title			Abbreviation	
Giovanni Prodi Lecture Selected Topics (Master)			10-M=VGPSin-152-r	m01	
Module coordinator Module offered by			Module offered by	<u> </u>	
Deen	f Studios Mathematik (Mathe	matica	Institute of Methom		
Dean	or Studies Mathematik (Mathe		Institute of Mathem	Tatics	
ECIS	Method of grading	Only after succ. cor	npl. of module(s)		
10					
Durati	on Module level	Other prerequisites	5		
1 seme	ester graduate				
Contents					
Introd	uction to a specialised topic ir	n mathematics by an in	ternational expert.		
Intend	led learning outcomes				
The st thema thema	udent is acquainted with the f tics. He/She is able to establi tics and applications in other	undamental concepts a sh a connection betwee subjects.	and methods of a cor en his/her acquired s	ntemporary research skills and other bran	topic in ma- ches of ma-
Course	es (type, number of weekly co	ntact hours, language -	– if other than Germa	an)	
V (4) + Modul	Ü (2) e taught in: English				
Metho ster, ir	d of assessment (type, scope nformation on whether module	, language — if other th e can be chosen to earr	an German, examina 1 a bonus)	ition offered — if not	every seme-
b) oral c) oral Langu Assess credita	examination of one candidate examination in groups (group age of assessment: English sment offered: In the semeste able for bonus	e each (approx. 20 min s of 2, 15 minutes per c r in which the course is	utes) or candidate) offered and in the si	ubsequent semester	
Alloca	tion of places				
Additi	onal information				
Workl	oad				
300 h					
Teach	ing cycle				
Referr	ed to in LPO I (examination re	gulations for teaching-	degree programmes)		
Modul	e appears in				
Maste	r's degree (1 major) Mathemat	ics International (2015))		
Maste	r's degree (1 major) Mathemat	ics (2016)			
Maste	r's degree (1 major) Mathemat	ical Physics (2016)			
Master's degree (1 major) Computational Mathematics (2016)					
Master's degree (1 major) Computational Mathematics (2019)					
Maste	Master's degree (1 major) Mathematics (2019)				
Maste	Master's degree (1 major) Mathematical Physics (2020)				
Maste	Master's degree (1 major) Mathematics International (2021)				
Maste	r's degree (1 major) Computat	ional Mathematics (202	22)		
Maste	r's degree (1 major) Mathemat	ics (2022)			
Maste	r's degree (1 major) Mathemat	ical Physics (2022)			
Master's v	vith 1 major Mathematics (2019)	JMU Würzbur	g • generated 19-Apr-2025 • e	exam. reg.	page 269 / 403

Master's degree (1 major) Mathematics International (2022) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Mathematics International (2025) Master's degree (1 major) Mathematical Data Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 270 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title				Abbreviation	
Inverse	e Proble	ems			10-M=VIPR-161-mo:	1
Modul	e coord	inator		Module offered by		
Doon	e coord	nator	(atics)	Institute of Mathem		
	Moth	ad of grading	Only offer cuce con		Idlics	
	nume	rical grade				
) Durati						
	on	module level	Other prerequisites			
Conter	nte	graduate				
Lincor				n theory Tilchenour	aquiarization itorati	vo rogulari
sation	method	ls, examples of ill-posed	d problems.	in theory, fixitonov i	egularisation, iterati	ve legulali-
Recom	mende	d previous knowledge:				
Basic I ded.	knowled	lge of functional analysi	s, such as that taught	in the module "Fund	tional Analysis", is r	ecommen-
Intend	ed lear	ning outcomes				
The stu	udent ca	an judge whether a give	n problem is well pose	ed or ill posed. He/SI	he can apply regular	isation me-
thods	and exa	mine them regarding st	ability and convergen	ce, and is familiar wi	th selected inverse p	problems.
Course	es (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (3) +	Ü (1)					
Modul	e taugh	t in: German and/or Eng	lish			
Metho ster, in	d of ass Iformati	sessment (type, scope, l on on whether module of	anguage — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt	ten exai	mination (approx. 60 to	90 minutes, usually c	hosen) or		
b) oral	examir	nation of one candidate	each (approx. 15 minu	tes) or		
c) oral	examin	ation in groups (groups	of 2, approx. 10 minu	tes per candidate)		
Assess	age of a sment o	ffered: In the semester i	n which the course is	offered and in the su	ıbsequent semester	
credita	ble for	bonus				
Alloca	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	bad					
150 h	_					
Teachi	ng cvcl	e				
		-				
Referre	ed to in	LPOI (examination reg	ulations for teaching-	legree programmes)		
Modul	e appea	urs in				
Master	r's degr	ee (1 major) Mathematic	5 (2016)			
Master	r's degr	ee (1 major) Economathe	ematics (2016)			
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	r's degr	ee (1 major) Computatio	nal Mathematics (201	9)		
Master	r's degr	ee (1 major) Mathematic	s (2019)	A.		
waster's w	nun 1 majoi	mathematics (2019)	JMU Wurzburg data record	, • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xani. reg. k - 2019	page 271 / 403

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Economathematics (2021)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 272 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Indust	rial Sta	tistics 2			10-M=VIST-161-mo	1
Modul	e coord	inator		Module offered by	<u>.</u>	
Dean c	of Studie	es Mathematik (Mather	natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
10	nume	rical grade				
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts	5				
Linear ling, ba mains,	Linear models, regression analysis, nonlinear regression, experimental design, basics in time series model- ling, basics in empirical time series analysis, methods of exponential smoothing, predictions and prediction do- mains, statistical process monitoring.					
Intend	ed learı	ning outcomes				
The stu	ident m	asters advanced statis	tical methods for indu	strial applications.		
Course		number of weekly con	tact hours language -	if other than Corma	un)	
V (4) +	Ü (2)	, number of weekly con				
Modul	e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt b) oral c) oral	ten exar examin examin	mination (approx. 90 to ation of one candidate ation in groups (groups	120 minutes, usually each (approx. 20 min 5 of 2, 15 minutes per c	chosen) or utes) or andidate)		
Langua Assess	age of a sment o ble for	ssessment: German or ffered: In the semester bonus	English in which the course is	offered and in the su	ubsequent semester	
Allocat	tion of r		_			
		haces				
Additio	onal inf	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Modul	e appea	ars in				
Master	's degr	ee (1 major) Mathemati	cs (2016)			
Master	's degr	ee (1 major) Economatł	iematics (2016)			
Master	's degr	ee (1 major) Mathemati	cal Physics (2016)			
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2010)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2020)	
master	5 uegli	ce (I major) mathemati	cari iiyoito (2020)			
Master's w	ith 1 majoi	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 273 / 403

Master's degree (1 major) Economathematics (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

Master's degree (1 major) Economathematics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's degree (1 major) Economathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 274 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Modul	e title				Abbreviation	
Field A	rithmet	ics			10-M=VKAR-161-mc	01
Modul		inator		Module offered by		
Doon	f Ctudi	na Mathomatik (Matham	atics)	Institute of Methem	matics	
	Mothe	d of grading	Only offer succ. con		Idlics	
	metho	rical grade	Only after succ. con	ipi. of module(s)		
10	Inume					
Duratio	on octor	module level	Other prerequisites			
Conter	nts	graduate]			
Combin ber the ture) an Recom Basic k "Applie	nation of eory, e. ; nd the i mendeo knowled ed Algel	of Galois theory, group th g. topics around Hilbert' nverse problem in Galoi d previous knowledge: lge of algebra is assume ora".	heory and the theory of s irreducibility theore s theory. ed, such as can be acc	of function fields with m, permutation poly quired in the module	n the aim of applicat nomials (e.g. Calitz- s "Introduction to Alg	ion in num- Wan-conjec- gebra" and
Intend	ed learı	ning outcomes				
The stu rary res	udent m search d	asters advanced algebr questions in algebra and	aic concepts and met I can apply his/her sk	hods. He/She gains ills to complex probl	the ability to work or ems.	n contempo-
Course	s (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taugh	t in: German and/or Eng	lish			
Metho	d of ass	essment (type, scope, l	anguage — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module o	an be chosen to earn	a bonus)		
a) writt b) oral c) oral Langua Assess credita	en exan examin examin age of a sment o ble for	nination (approx. 90 to ation of one candidate ation in groups (groups ssessment: German or E ffered: In the semester i bonus	120 minutes, usually each (approx. 20 minu of 2, 15 minutes per c inglish n which the course is	chosen) or utes) or andidate) offered and in the su	ıbsequent semester	
Allocat	tion of p	olaces				
Additio	onal inf	ormation	_			
Worklo						
300 h						
Teachi	ng cycl	2				
	ing cycl	-	_			
Referre	d to in	IPOI (examination reg	lations for teaching.	degree programmes)		
Referred to in LFOT (examination regulations for teaching-degree programmes)						
Modul	e appea	in in				
Master	's degr	e (1 maior) Mathematic	s (2016)			
Master	's degr	ee (1 major) Mathematic	al Physics (2016)			
Master	's teach	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supple	ementar	y course MINT Teacher E	Education PLUS, Elite	Network Bavaria (EN	B) (2020)	
Master's w	vith 1 major	Mathematics (2019)	JMU Würzburg data record	s • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 275 / 403

Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 276 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Comple	Complex Geometry 10-M=VKGE-161-m01					
Module coordinator			Module offered by			
Dean o	f Studie	es Mathematik (Mathem	atics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Duratio	n l	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	Contents					
The mc calculu Kähler) Recom Basic k	odule bi is, com , differe mendee nowlec etric Co	uilds on the topics cover plex structures and com ential operators on comp d previous knowledge: lge of the contents of the mplex Analysis" is reco	ed in module 10-M=A plex manifolds, metri plex manifolds, classi e modules "Introducti nmended	DGM and discusses cs on complex manif fication of complex r on to Complex Analy	these in more detail olds (e.g. conforma nanifolds. sis" and " Complex /	: Wirtinger I, hermitian, Analysis" or
Intend	ed learr	ning outcomes				
The st	ident kr	ows and masters advar	iced methods and no	tions in complex diff	erential geometry H	e is familiar
with th	e centra	al concepts in this fied a	nd is able to apply th	e fundamental proof	methods independe	ently.
Course	s (type	, number of weekly conta	act hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taugh	t in: German and/or Eng	lish			
Metho	d of acc	essment (type scope l	anguage — if other th	an German, examina	tion offered — if not	every seme-
ster. in	formati	on on whether module of	an be chosen to earn	a bonus)		every serie
a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester creditable for bonus						
Allocat	ion of p	olaces				
Additic	nal info	ormation				
/ durine						
WORKIO	au					
300 h						
Teachi	ng cycl	9				
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	's degre	ee (1 major) Computation	nal Mathematics (201	9)		
Master	's degre	ee (1 major) Mathematic	s (2019)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 277 / 403

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 278 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Mathe	Mathematical Continuum Mechanics 10-M=VKOM-161-m01					
Module coordinator			Module offered by			
Dean c	of Studie	es Mathematik (Mathe	matics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
Partial	differer	ntial equations and/or	variational methods in	the context of contin	nuum mechanics.	
Recom	mende	d previous knowledge.				
Basic k	nowled	lge from the modules "	Ordinary Differential E	quations" and "Introd	duction to Partial Dif	ferential
Equati	ons" is	recommended, as well	as basic knowledge of	functional analysis.		
Intend	ed learı	ning outcomes				
The stu	udent m	asters the mathematic	al methods in mathem	atical continuum me	chanics and knows	about their
Course	s (type	number of weekly cor	tact hours language -	- if other than Germa	n)	
V(3) +	Ü (1)	, number of weekly cor		in other than bernia		
Modul	e taugh	t in: German and/or En	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
a) writt	en exar	nination (approx. 60 to	o 90 minutes, usually c	hosen) or		
c) oral	examin	ation in groups (group	s of 2. approx. 15 minu	tes per candidate)		
Langua	age of a	ssessment: German or	English	p,		
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	
credita	ible for	bonus				
Alloca		naces				
Additio	nal inf	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Module appears in						
Master	's degr	ee (1 major) Mathemat	ics (2016)			
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT leacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computational Mathematics (2010)						
Master's degree (1 major) Mathematics (2019)						
Master	's teacl	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	020)
Master's w	vith 1 maio	Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e	xam. reg.	page 279 / 403
	.,		data record	Master (120 ECTS) Mathemati	k - 2019	

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 280 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Crypto	Cryptography/Coding Theory 10-M=VKRY-192-mo1					
Module coordinator			Module offered by	<u> </u>		
Dean c	Dean of Studies Mathematik (Mathematics)		Institute of Mathem	atics		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Durati	n		Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
Error d rary co	etectior des, bo	n and error correction, l unds, network codes, c	inear codes, channel c onnections to cryptog	oding theorems of S raphy.	hannon, classical ar	าd contempo-
Recom Basic k "Applie	mende knowled ed Algel	d previous knowledge: lge of algebra is assum bra".	ed, such as can be acc	quired in the module	s "Introduction to Al	gebra" and
Intend	ed learı	ning outcomes				
The stu is able and cry	udent is to clas /ptogra	acquainted with funda sify these results withir phy with other fields of	mental concepts, met n more general theories mathematics.	hods and results in c s and knows about th	oding theory and cr ne connections of co	yptography, oding theory
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
$V(4) + \ddot{U}(2)$ Module taught in: Cormon and /or English						
Motho		accment (type, scope	languago if other th	an Corman, ovamina	tion offered if not	ovoni como
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		every seme-
 a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 						
credita	ible for	bonus				
Alloca		Diaces				
Additio	onal info	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	е				
Referre	ed to in	LPO I (examination reg	gulations for teaching-	degree programmes)		
Module appears in						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's degree (1 major) Mathematical Physics (2020)						
Master	Master's degree (1 major) Computational Mathematics (2022)					
Master	's degr	ee (1 major) Mathemati	cs (2022)			
Master's w	rith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 281 / 403

Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025)

Module title			Abbreviation			
Mathe	matical	Imaging			10-M=VMBV-161-m	01
Module coordinator Mo			Module offered by			
Doop of Studios Mathematik (Mathematics)		atics)	Institute of Mathem	atics		
ECTS	Mothe	ad of grading		and of module(s)	latics	
	nume	rical grade				
Durati	nume	Madula laval	Other preveruisites			
1 seme	on ester	graduate				
Conter	nts	3.00000	1			
Mathe camera ra picti Recom Basic I ded.	matical a model ures; al mende knowlec	fundamentals of image s and camera calibratio gorithms; module might d previous knowledge: lge of functional analysi	processing and comp n, rigid and non-rigid also include an intro s, such as that taught	uter vision such as e registration, reconst duction to geometric in the module "Func	lementary projective ruction of 3D objects methods and tomos tional Analysis", is i	e geometry, 5 from came- graphy. recommen-
Intend	ed learı	ning outcomes				
The stu fields o	udent m of appli	asters the mathematica cation.	l methods in the theo	ry of image processi	ng and knows about	their main
Course	es (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (3) + Modul	Ü (1) e taugh	t in: German and/or Eng	lish			
Metho	d of ass	essment (type, scope, b	anguage — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module o	an be chosen to earn	a bonus)		,
a) written examination (approx. 60 to 90 minutes, usually chosen) or b) oral examination of one candidate each (approx. 15 minutes) or c) oral examination in groups (groups of 2, approx. 10 minutes per candidate) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester creditable for bonus						
Alloca	tion of p	olaces				
Additio	onal inf	ormation				
Workle						
150 h						
Teachi	ng cycl	٩				
	ing cycu	5	_			
Poforr	ed to in	IPOL (examination reg	lations for teaching	degree programmes)		
Referred to in LFOT (examination regulations for teaching-degree programmes)						
 Module appears in						
Mastor	r's dogr	no (1 maior) Mathematic	c (2016)			
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) (namenatical Hysics (2010) Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computational Mathematics (2010)						
Master	r's degr	ee (1 major) Mathematic	s (2019)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg	• generated 19-Apr-2025 • e	xam. reg.	page 283 / 403
1			data record	Master (120 ECTS) Mathemati	k - 2019	

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 284 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Select	Selected Topics in Mathematical Physics 10-M=VMPH-161-m01				01	
Madula soordinator			Module offered by	<u> </u>		
Doon	f Studi	nator	matics)	Institute of Mathom		
	Moth	es Mathematik (Mathe			Iducs	
10	numo	rical grade	Only after succ. con	npt. of module(s)		
Durati						
	on octor	module level	Other prerequisites			
Conter	nts	Siduate				
Selecte terial s	Selected topics in mathematical physics, for example continuum mechanics, fluid dynamics, mathematical ma- terial sciences, geometric field theory, advanced topics in quantum theory.					
Recom Depen doubt,	mende ding on it is rec	d previous knowledge: the content, basic and commended to consult	l advanced knowledge the lecturer.	from different areas	of analysis is require	ed. In case of
Intend	ed lear	ning outcomes				
The stu connec	udent is ction be	acquainted with an ac tween his/her acquire	lvanced topic in mathe d skills and other brane	matical physics. He/ ches of mathematics	She is able to estab and questions in pl	lish a ıysics.
Course	s (type	, number of weekly cor	ntact hours, language –	- if other than Germa	ın)	
V (4) +	Ü (2)					
Modul	e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt	en exa	mination (approx. 90 to	o 120 minutes, usually	chosen) or		
b) oral	examir	ation of one candidate	e each (approx. 20 mini	utes) or		
c) oral	examin	ation in groups (group	s of 2, 15 minutes per c	andidate)		
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	
credita	ble for	bonus				
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Physics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supple	Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Master	s degr	ee (1 major) Computati	onal Mathematics (201	9)		
Master's w	ith 1 maio	Mathematics (2019)	ICS (2019) IMU Würzburs	g • generated 19-Apr-2025 • P	exam. reg.	page 285 / 403
			data record	Master (120 ECTS) Mathemati	k - 2019	,

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 286 / 403
	data record Master (120 ECTS) Mathematik - 2019	1

Module title			Abbreviation			
Module Theory 10-M=VMTH-161-m01				01		
Module coordinator		Module offered by				
Dean o	of Studie	s Mathematik (Mathem	natics)	Institute of Mathem	atics	
ECTS	Metho	d of grading	Only after succ. con	pl. of module(s)		
5	numer	ical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	Contents					
Basics semi-si rems.	in modı imple aı	ule theory: modules and nd complex modules, n	d module spaces, can nodule trees and their	onical decomposition defibrations, distors	n and representatior ion theorems, reduc	is, simple, tion theo-
Recom Basic k "Applie	mendeo mowled ed Algeb	l previous knowledge: ge of algebra is assum pra".	ed, such as can be acc	juired in the module	s "Introduction to Alક્	gebra" and
Intende	ed learn	ing outcomes				
The stu	ıdent m	asters mathematical m	ethods in module theo	ory and is able to ana	lyse their quality.	
Course	s (type,	number of weekly cont	act hours, language –	- if other than Germa	n)	
V (3) +	Ü (1)	,			,	
Module	e taught	in: German and/or Eng	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formatio	on on whether module	can be chosen to earn			
a) writt	en exan examin	nination (approx. 60 to	90 minutes, usually c	nosen) or tes) or		
c) oral	examina	ation in groups (groups	of 2, approx. 10 minu	tes per candidate)		
Langua	age of as	ssessment: German or l	English	,		
Assess	ment of	fered: In the semester	in which the course is	offered and in the su	ibsequent semester	
credita	ble for t	oonus				
Allocat	tion of p	laces				
Additio	onal info	ormation				
Worklo	oad					
150 h						
Teachi	ng cycle	2				
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)					
Module appears in Mastar's dagree (a major) Mathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS Flite Network Ravaria (FNR) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master	's degre	e (1 major) Mathematio	cal Physics (2020)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	; • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 287 / 403

Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 288 / 403			
	data record Master (120 ECTS) Mathematik - 2019				
Module title		Abbreviation			
----------------------------	--	---	--	-----------------------	----------------
Select	ed Topics in Numerical and A	pplied Mathematics		10-M=VNAM-192-m	101
Modul	e coordinator		Module offered by		
Dean o	of Studies Mathematik (Mathe	matics)	Institute of Mathem	atics	
	Mothod of grading	Only after succ. con	nl of modulo(c)	latics	
10	numerical grade				
Densti					
	on module level	Other prerequisites			
Conter	its				
In-dept lopmer	th discussion of a specialised nts and interrelations with oth	l topic in numerical or a ner mathematical conce	pplied mathematics pts.	taking into account	recent deve-
Recom Depen- red. In	Recommended previous knowledge: Depending on the content, basic and advanced knowledge from different areas of applied mathematics is requi- red. In case of doubt, it is recommended to consult the lecturer.				
Intend	ed learning outcomes				
The stu able to	udent is acquainted with adva apply these to complex prob	nced results in a select lems.	ed topic in numerica	l or applied mathem	natics, and is
Course	es (type, number of weekly co	ntact hours, language –	- if other than Germa	n)	
V (4) +	Ü (2)				
Modul	e taught in: German and/or E	nglish			
Metho ster, in	d of assessment (type, scope formation on whether modul	, language — if other th e can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt	en examination (approx. 90 t	o 120 minutes, usually	chosen) or		
b) oral	examination of one candidat	e each (approx. 20 min	utes) or		
c) oral	examination in groups (group	os of 2, 15 minutes per c	andidate)		
Langua	age of assessment: German o	r English r in which the course is	offered and in the cu	head want competer	
credita	ible for bonus	r in which the course is	onered and in the st	ibsequent semester	
Allocat	tion of places				
Additio	nal information				
Auunt					
Worklo	oad				
300 h					
Teachi	ng cvcle				
	0.0				
Referre	ed to in LPO I (examination re	gulations for teaching-	degree programmes)		
Modul	e appears in				
Master	's degree (1 major) Computat	ional Mathematics (201	9)		
Master	's degree (1 major) Mathema	tics (2019)			
Master	's teaching degree Gymnasiu	m MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	020)
Supple	ementary course MINT Teache	r Education PLUS, Elite	Network Bavaria (EN	B) (2020)	
Master	Master's degree (1 major) Mathematical Physics (2020)				
Master	's degree (1 major) Economat	hematics (2021)			
Master	's degree (1 major) Computat	ional Mathematics (202	2)		
Master	's degree (1 major) Mathema	tics (2022)			
Master's w	uth 1 major Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 289 / 403

Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 290 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Non-liı	near An	alysis			10-M=VNAN-161-m	01
Modul	e coord	inator		Module offered by	<u> </u>	
Dean c	of Studie	es Mathematik (Mathe	matics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites	6		
1 seme	ester	graduate				
Conter	nts		•			
Metho	ds in no	onlinear analysis (e. g.	topological methods, n	nonotony and variati	onal methods) with	applications.
Recom	mende	d previous knowledge:				
We rec	ommen	d basic knowledge of i	functional analysis and	l partial differential e d "Applied Applysis"	quations, such as ca	an be acqui-
Intend	ed lear	ning outcomes			•	
The stu	Ident is	acquainted with the c	oncents of non-linear a	nalvsis can compar	e them and assess t	heir annlica.
bility o	n practi	ical problems.		inatysis, can compar		
Course	es (type,	, number of weekly cor	itact hours, language –	– if other than Germa	n)	
V (3) +	Ü (1)					
Modul	e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass Iformati	s essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt	ten exar	nination (approx. 60 to	o 90 minutes, usually c	hosen) or		
b) oral	examin	ation of one candidate	each (approx. 15 minu	ıtes) or		
c) oral	examin	ation in groups (group	s of 2, approx. 10 minu	tes per candidate)		
Langua	age of a	ssessment: German or ffered: In the semester	English in which the course is	offered and in the su	ihsequent semester	
credita	able for	bonus	in which the course is	oncrea and in the st	issequent semester	
Allocat	tion of p	olaces				
Additio	onal info	ormation				
Worklo	oad					
150 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Modul	e appea	rs in				
Master	r's degre	ee (1 major) Mathemat	ics (2016)			
Master	r's degre	ee (1 major) Economatł	nematics (2016)			
Master	r's degre	ee (1 major) Mathemat	cal Physics (2016)			
Master	r's degre	ee (1 major) Computati	onal Mathematics (201	.6)		
Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Supple	r's door	y course MINT Teacher	Euucation PLUS, Elite	Network Bavaria (EN	Б) (2016)	
Master	r's degra	e (1 major) Computati (1 major) Mathemati	irs (2010)	·9/		
musici	Jucan	ce (i major) matricillati	(2019)			I
Master's w	/ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 291 / 403



Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Module title			Abbreviation			
Numer	ic of Pa	rtial Differential Equation	ons		10-M=VNPE-161-mc	01
Module	<u> </u>	inator		Module offered by		
Deer		Math are still (Masth	ation)	Institute of Mathematics		
Dean o	Studio	es mathematik (Mathem		nistitute of Mathem	Iduics	
10	nume	rical grado	Unity after succ. con	npi. of module(s)		
10						
	on	module level	Uther prerequisites			
Conten	its	Siauuale				
Types of (nume) discon Recom We rec	Types of partial differential equations, qualitative properties, finite differences, finite elements, error estimates (numerical methods for elliptic, parabolic and hyperbolic partial differential equations; finite elements method, discontinuous Gelerkin finite elements method, finite differences and finite volume methods). Recommended previous knowledge: We recommend basic knowledge of functional analysis and partial differential equations, such as can be acqui-					
Intend	ad loar	aing outcomes		u Applieu Allalysis	•	
			and mother de ferral!	oticing restict diff.	ntial acusticus	
ine stu	aent is	acquainted with advan	cea methods for discr	eusing partial differe	vinitial equations.	
Course	s (type	, number of weekly cont	act hours, language –	- If other than Germa	n)	
V (4) + Module	U (2) e taugh	t in: German and/or Eng	lish			
Metho	d of ass	essment (type, scope)	 anguage — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		every serie
a) writt b) oral c) oral Langua Assess credita	 a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 					
Allocat	ion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Module appears in						
Master	's degr	ee (1 major) Mathematic	cs (2016)			
Master	's degr	ee (1 major) Physics (20	16)			
Master	's degr	ee (1 major) Economath	ematics (2016)			
Master	's degr	ee (1 major) Mathematio	al Physics (2016)			
Master's degree (1 major) Computational Mathematics (2016)						
Master	's teacl	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	016)
Supple	ementai	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	's degr	ee (1 major) Computatio	nal Mathematics (201	.9)		
Master's w	ith 1 majo	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 293 / 403

Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Module title		Abbreviation				
Select	ed Topi	cs in Optimization			10-M=VOPT-161-mc)1
Modul	e coord	inator		Module offered by	<u> </u>	
Dean	of Studie	es Mathematik (Mathe	matics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conter	its					
Selecte me the	ed topic ory, op	s in optimization, e.g. timization with differer	inner point methods, s itial equations.	semidefinite program	ıs, non-smooth optiı	mization, ga-
Intend	ed learı	ning outcomes				
The stu	udent is	acquainted with adva	nced methods in contir	nuous optimization.	He gains the ability t	o work on
conten	nporary	research questions in	continuous optimizatio	on.		
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
V (4) +	Ü (2)					
Modul	e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt	en exai	nination (approx. 90 to	o 120 minutes, usually	chosen) or		
b) oral	examin	ation of one candidate	each (approx. 20 mini	utes) or		
c) oral	examin	ation in groups (group)	s of 2, 15 minutes per c	andidate)		
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ibsequent semester	
credita	ble for	bonus		oncrea and in the se		
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Modul	e appea	irs in				
Master	's degr	ee (1 major) Mathemati	cs (2016)			
Master	's degr	ee (1 major) Economatł	nematics (2016)			
Master	's degr	ee (1 major) Mathemati	cal Physics (2016)			
Master	's degr	ee (1 major) Computati	onal Mathematics (201	6)		
Master	's teach	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2)	016)
Supple	ementar	y course MINT Teacher	Equivation PLUS, Elite	וvetwork Bavaria (EN م)	в) (2016)	
Master	s uegri 's doar	ee (1 major) Computati (1 major) Mathemati	onat mathematics (201	<i>9)</i>		
Master	's tearl	ning degree Gymnaciur	n MINT Teacher Educat	ion PLUS Flite Netwo	ork Bayaria (FNR) (a	020)
Supple	ementar	v course MINT Teacher	Education PLUS. Flite	Network Bavaria (FN	B) (2020)	
Master	's degr	ee (1 major) Mathemati	cal Physics (2020)			
Master's	ith 1 maio	Mathematics (2010)	۱۸۸۱۱ ۱۸۸۱) ۱۸۸۱ ۱۸۸۱	e generated 10-Apr 2025 • 2	wam reg	nage 205 / 102
muster 5 W	iti i maju	mainematics (2019)	data record	Master (120 ECTS) Mathemati	k - 2019	puse 295 / 403

Master's degree (1 major) Economathematics (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

Master's degree (1 major) Economathematics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's degree (1 major) Economathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 296 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Optima	al Contr	ol			10-M=VOST-161-mc	01
Modul	e coord	inator		Module offered by		
Doon	f Studie	nator	(atics)	Institute of Mathem		
	Mothe	ad of grading	Only after succ. con	nl of modulo(c)	Idlics	
	nume	rical grade				
Durati	munic	Madula laval				
1 seme	oster	graduate				
Conter	nts	Sidduite				
Basics	in onti	mal control of ordinary a	 Ind nartial differential	equations theory of	ontimal control cor	nditions for
optima	optimality, methods for numerical solution.					
Recom	mende	d previous knowledge:				
We rec	ommen	d basic knowledge of fu	Inctional analysis and	ordinary differential	equations, such as	can be ac-
quired	in the r	nodules "Introduction to	o Functional Analysis"	and "Ordinary Differ	ential Equations". K	nowledge of
Interd				so be userui.		
Intena	ed leari	ning outcomes	<u> </u>			
The stu rary res	ident is search o	acquainted with advan questions in continuous	ced methods in optim optimization.	al control. He gains f	the ability to work or	i contempo-
Course	s (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (3) +	Ü (1)					
Modul	e taugh	t in: German and/or Eng	lish			
Metho ster, in	d of ass formati	sessment (type, scope, l on on whether module	anguage — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt	ten exai	nination (approx. 60 to	90 minutes, usually c	hosen) or		
b) oral	examin	ation of one candidate	each (approx. 15 minu	ites) or		
c) oral	examin	ation in groups (groups	of 2, approx. 10 minu	tes per candidate)		
Langua	age of a	ssessment: German or I	English nyuhish tha saursa is	offered and in the cu	head want competer	
credita	ible for	honus	II WIIICH LITE COUISE IS	onered and in the st	insequent semester	
Allocat	tion of r	olaces				
Additic	nal inf	ormation				
Auunt						
			_			
WORKIC						
150 h			_			
Teachi	ng cycl	e	_			
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Modul	e appea	irs in				
Master	Master's degree (1 major) Mathematics (2016)					
Master	Master's degree (1 major) Economathematics (2016)					
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master	's teach	ning degree Gymnasium	MINI Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supple	ementar	y course MINT Teacher	aucation PLUS, Elite	Network Bavaria (EN	в) (2016)	
Master's w	s aegro	(1 major) Computatio		9)	yam reg	nage 207 / 402
master S W	nan i majoi	mathematics (2019)	data record	Master (120 ECTS) Mathemati	k - 2019	page 297 / 403

Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Economathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 298 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Partial	Differe	ntial Equations of Matl	nematical Physics	_	10-M=VPDP-161-mc	01
Module	e coord	inator		Module offered by	<u> </u>	
Dean o	of Studie	es Mathematik (Mather	natics)	Institute of Mathem	atics	
FCTS	Metho	od of grading	Only after succ. con	nnl. of module(s)		
10	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate		•		
Conten	its					
Elliptic examp ons an Recom Basic k	Elliptic, parabolic, and hyperbolic equations; Laplace equation, heat equation and wave equation as standard examples; initial and boundary value problems; well-posed and ill-posed problems; solution methods; extensi- ons and generalisations; Hilbert space methods; Sobolev spaces and Fourier transforms. Recommended previous knowledge:					
Equation	ons" is	recommended, as well	as basic knowledge of	functional analysis.		
Intende	ed learı	ning outcomes				
The stu equation betwee	ident is ons, as en his/h	acquainted with funda well as standard exam her acquired skills and	mental concepts and ples from mathematica other branches of mat	solution methods in al physics. He/She is hematics and questio	the theory of partial able to establish a ons in physics.	differential connection
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taugh	t in: German and/or En	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
a) written examination (approx. 90 to 120 minutes, usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, 15 minutes per candidate) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester creditable for bonus						
Allocat	ion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
300 h						
Teachi	ng cvcl	9				
Referre	ed to in	LPO I (examination res	gulations for teaching-	degree programmes)		
			<u></u>			
Module appears in						
Master	's degr	ee (1 major) Mathemati	cs (2016)			
Master	Master's degree (1 major) Physics (2016)					
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master	's teach	ning degree Gymnasiun	n MINT Teacher Educat	ion PLUS. Elite Netwo	ork Bavaria (ENB) (2	016)
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master's w	ith 1 majoi	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 299 / 403

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 300 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation	
Pseudo Riemannian and Riemannian G	eometry		10-M=VPRG-161-mc)1
Module coordinator		Module offered by		
Dean of Studies Mathematik (Mathema	atics)	Institute of Mathem	atics	
ECTS Method of grading	Only after succ. com	pl. of module(s)		
10 numerical grade				
Duration Module level	Other prerequisites			
1 semester graduate				
Contents				
The module builds on the topics covered nian and pseudo-Riemannian manifold map, Jacobi fields, comparison theorer Laplace operators, causal structure of I theory.	ed in module 10-M=A ls, Levi-Civita connec ns in Riemannian geo Lorenz manifolds, Ein	DGM and discusses tion and curvature, g ometry, submanifold istein equations and	these in more detail geodesics and the ex s, integration, d'Ale applications in gen	: Rieman- (ponential mbert and eral relativity
Recommended previous knowledge: Advanced knowledge of differential geo Geometry". Knowledge of the contents "Lie Theory" is also recommended.	ometry is required, su of the modules "Intro	uch as can be acquir oduction to Topology	ed in the module "D ", "Geometric Mech	ifferential anics" and
Intended learning outcomes				
The student is acquainted with advanc manifolds. He/She is able to establish thematics and questions in physics.	ed topics in different a connection betwee	ial geometry on Riem en his/her acquired s	nannian and pseudo kills and other bran	-Riemannian ches of ma-
Courses (type, number of weekly conta	ct hours, language —	- if other than Germa	n)	
V (4) + Ü (2) Module taught in: German and/or Engl	ish			
Method of assessment (type, scope, la ster, information on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) written examination (approx. 90 to 1 b) oral examination of one candidate e c) oral examination in groups (groups of Language of assessment: German or En Assessment offered: In the semester in creditable for bonus	20 minutes, usually o ach (approx. 20 minu of 2, 15 minutes per co nglish which the course is	chosen) or ites) or andidate) offered and in the su	ıbsequent semester	
Allocation of places				
Additional information				
Workload				
300 h				
Teaching cycle	Teaching cycle			
Referred to in LPO I (examination regulations for teaching-degree programmes)				
		<u> </u>		
Module appears in				
Master's degree (1 major) Mathematics	(2016)			
Master's degree (1 major) Physics (2016)				
Master's degree (1 major) Mathematica	ll Physics (2016)			
Master's with 1 major Mathematics (2019)	JMU Würzburg data record N	; • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 301 / 403

Master's degree (1 major) Computational Mathematics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) exchange program Mathematics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Mathematical Data Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 302 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation					Abbreviation		
Statist	Statistical Analysis 10-M=VSTA-161-m01						
Module coordinator Modu				Module offered by	Nodule offered by		
Dean o	f Studie	es Mathematik (Mathem	atics)	Institute of Mathem	atics		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)			
10	nume	rical grade					
Duratio	on l	Module level	Other prerequisites				
1 seme	ster	graduate					
Conten	its		·				
Conting crimina	gency ta ant func	ables, categorical regres tion analysis, cluster an	sion, one-factorial va alysis, principal comp	riance analysis, two- oonent analysis, fact	factorial variance an or analysis.	alysis, dis-	
Recom Basic k	mende nowled	d previous knowledge: Ige of stochastics is requ	uired, such as that ac	quired in the "Stocha	astics 1" module. Kno	owledge of	
the cor	ntents o	f the module "Stochasti	cs 2" is also recomme	ended.			
Intend	ed learr	ning outcomes					
The stu proble	ıdent is ms.	acquainted with the fur	idamental methods ir	n statistical analysis	and can apply them	to practical	
Course	s (type.	number of weekly conta	act hours, language –	- if other than Germa	n)		
V (4) +	Ü (2)						
Module	e taugh	t in: German and/or Eng	lish				
Metho ster, in	d of ass formati	e essment (type, scope, la on on whether module c	anguage — if other the an be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-	
a) writt	en exar	nination (approx. 90 to :	120 minutes, usually	chosen) or			
b) oral	examin	ation of one candidate e	each (approx. 20 minu	ites) or			
c) oral	examin	ation in groups (groups	of 2, 15 minutes per c	andidate)			
Assess	ment o	ffered: In the semester i	n which the course is	offered and in the su	ibsequent semester		
credita	ble for	bonus					
Allocat	ion of p	olaces					
Additio	onal info	ormation	-				
Worklo	ad						
300 h							
Teachi	ng cycl	9					
Referre	ed to in	LPOI (examination regu	ulations for teaching-o	degree programmes)			
Module	e annea	rs in					
Master	's degre	e (1 major) Mathematic	s (2016)				
Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Economathematics (2016)							
Master	's degre	ee (1 major) Mathematic	al Physics (2016)				
Master's degree (1 major) Computational Mathematics (2016)							
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)							
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)							
Master's degree (1 major) Computational Mathematics (2019)							
Master	's degre	ee (1 major) Mathematic	s (2019)				
waster's w	itn 1 major	mathematics (2019)	JMU Würzburg data record J	; • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 303 / 403	

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 304 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title					Abbreviation	
Selected Topics in Control Theory 10-M=VTRT-161-m01						
Modul	e coord	inator		Module offered by		
Dean c	of Studie	es Mathematik (Mather	matics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade		•		
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
Selecte bilinea	ed topic Ir syster	s in linear and non-line ns.	ear control theory, e. g.	networked linear co	ntrol systems, contr	ollability of
Recom	mende	d previous knowledge: the contents of the mo	dule "Mathematical Co	ntrol Theory" or "Cor	ntrol Theory" is requ	ired.
Intend	ed lear	ning outcomes			liter incerty is requ	il cui
The sti	ident g	ains insight into conter	 nporary research probl	ems in control theor	, He/She masters a	dvanced
technie	ques in	this field and can appl	y them to complex prol	olems.	, ne, she musters a	avancea
Course	es (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taugh	t in: German and/or En	glish			
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
a) writt	ten exai	nination (approx. 90 to	120 minutes, usually	chosen) or		
b) oral	examin	ation of one candidate	each (approx. 20 mini	utes) or		
l angua	age of a	ssessment: German or	Fnglish	anuluale)		
Assess	sment o	ffered: In the semester	in which the course is	offered and in the su	ıbsequent semester	
credita	ble for	bonus				
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	bad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Module appears in						
Master	's degr	ee (1 major) Mathemati	cs (2016)			
Master's degree (1 major) Economathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master	's degr	ee (1 major) Computati	onal Mathematics (201	6)		
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2010)						
master	Juegn	ce (I major) matricillati	~~ (201 3)			I
Master's w	vith 1 majoi	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 305 / 403

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Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Economathematics (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Economathematics (2022) Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 306 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation						
Insura	Insurance Mathematics 2 10-M=VVSM-161-m01					
Module coordinator				Module offered by		
Dean of Studies Mathematik (Mathematics)			natics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade		• • • •		
Duratio	n l	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its	0				
This mo lives: n Markov ons, jo Recom Familia	This module discusses modern valuation approaches and multiple decrement models regarding one life or two lives: modern valuation in life insurance mathematics, axiomatic derivation of the product measure approach, Markov chain models, Kolmogorov's differential equations, Thiele's differential equations, numerical applicati- ons, joint life policies. Recommended previous knowledge:					
matics	is stro	ngly recommended.				
Intend	ed learr	ning outcomes				
The stu contem	ident is iporary	acquainted with advar research questions in i	nced methods in insuration insuration in the second s	ance mathematics. H s and can apply his/l	e gains the ability to her skills to complex	work on problems.
Course	s (type,	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taugh	t in: German and/or Eng	glish			
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt b) oral c) oral Langua Assess credita	en exar examin examin age of a ment o ble for	nination (approx. 90 to ation of one candidate ation in groups (groups ssessment: German or ffered: In the semester bonus	120 minutes, usually each (approx. 20 minu of 2, 15 minutes per c English in which the course is	chosen) or utes) or andidate) offered and in the su	bsequent semester	
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Worklo	ad					
300 h						
Teachi	ng cycl	9				
reaction	ing cycu	5				
	1			<u>ا</u>		
		LPOT (examination reg	ulations for teaching-	degree programmes)		
Module	e appea	irs in				
Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Economathematics (2016) Master's degree (1 major) Computational Mathematics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019)						
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg	• generated 19-Apr-2025 • e	xam. reg.	page 307 / 403
			data record	Master (120 ECTS) Mathemati	k - 2019	

Master's degree (1 major) Mathematics (2019)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Economathematics (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Economathematics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's degree (1 major) Economathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Economathematics (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 308 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Networked Systems 10-M=VVSY-161-m01						
Module coordinator				Module offered by		
Dean c	of Studie	es Mathematik (Mathe	natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
Conter system	nporary 1s); ana	topics in networked lin lysis of control-theoret	near and non-linear dy ical aspects (controllal	namical systems (ho pility, accessibility, e	mogenous and non- tc.).	homogenous
Recom	mende	d previous knowledge:				
Basic	<u>nowlec</u>	lge of the contents of t	he module "Ordinary D	ifferential Equations	" is useful.	
Intend	ed learı	ning outcomes				
The stu	ident is tempor	acquainted with adva ary research questions	nced methods in the fi in networked systems	eld of networked sys [.]	tems. He gains the a	bility to work
Course	es (type	, number of weekly cor	tact hours, language -	- - if other than Germa	ın)	
V (3) +	Ü (1)					
Modul	e taugh	t in: German and/or En	glish			
Metho ster, in	d of ass formati	s essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt	en exai	mination (approx. 60 to	90 minutes, usually c	hosen) or		
b) oral	examin	ation of one candidate	each (approx. 15 minu	ites) or		
c) oral	examin	ation in groups (group	s of 2, approx. 10 minu	tes per candidate)		
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	,
credita	ble for	bonus				
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	e				
	_					
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT leacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master	's teacl	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	020)
Master's w	ith 1 majoi	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 309 / 403

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Mathematics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's degree (1 major) Mathematical Data Science (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 310 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation						
Time S	Time Series Analysis 2 10-M=VZRA-161-m01)1
Module coordinator				Module offered by		
Dean o	of Studie	es Mathematik (Mathe	matics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade		• • • •		
Duratio	on	Module level	Other prerequisites	6		
1 seme	ster	graduate				
Conter	nts					
State-s varianc	space m ce funct	odels, Kalman filter, fr ions.	equency spaces, Fourie	er analysis, periodog	rams, characterisati	on of autoco-
Intend	ed learr	ning outcomes				
The stu tempor	udent is rary res	acquainted with adva earch questions in this	nced methods in time s field.	series analysis. He ga	ains the ability to wo	ork on con-
Course	s (type	number of weekly cor	itact hours, language –	- if other than Germa	ın)	
V (4) + Module	Ü (2) e taugh	t in: German and/or En	glish		·	
Metho ster in	d of ass	essment (type, scope,	language — if other th	an German, examina a bonus)	tion offered — if not	every seme-
		mination (approx. oo t	an be chosen to cam	chocon) or		
b) oral	en exar examin	ation of one candidate	each (approx 20 min	ites) or		
c) oral	examin	ation in groups (group	s of 2, 15 minutes per c	andidate)		
Langua	age of a	ssessment: German or	English	·		
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	
credita	ble for	bonus				
Allocat	tion of p	olaces				
Additio	onal info	ormation				
Worklo	oad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Modul	e appea	rs in				
Master	's degre	ee (1 major) Mathemat	ics (2016)			
Master	's degre	ee (1 major) Economatl	nematics (2016)			
Master	's degre	ee (1 major) Mathemat	cal Physics (2016)			
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master's degree (1 major) Computational Mathematics (2019)						
Master's degree (1 major) Mathematics (2019)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supple Master	''s deor	y course mini reacher se (1 maior) Mathemati	ical Physics (2020)	ivelwork bavaria (EN	DJ (2020)	
	5 4651					
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 311 / 403

Module title				Abbreviation		
Introd	Introduction into Human-Computer Interaction 10-MCS=HCI-161-mo1					
Module coordinator				Module offered by		
holder	ofthe	Chair of Computer Scienc	e IX	Institute of Comput	er Science	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
Humar puting introdu user at existin The co ve syst niques deskto this fie Intend After th compu learn a Course V (2) + Metho ster, ir	ContentsHuman-Computer Interaction is concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them. This course gives an introduction into the principle biological, physiological, and psychological constraints as defined by the human user and relates these constraints to the conceptual and technical solutions of today's computer systems and existing as well as prospective interaction metaphors between humans and computers.The course covers topics about human perception and cognition, memory and attention, the design of interactive systems, prominent evaluation methods, the principles of computer systems, typical input processing techniques, interface technology, and examples of typical interaction metaphors, from text-based input to graphical desktops to multimodal interfaces. Accompanying lab-work will introduce students to typical tasks involved in this field, i.e., prominent evaluation methods and prototyping of interfaces.Intended learning outcomesAfter the course, the students will have a broad understanding of the underlying principles of human users and computer systems. They will understand the constraints and capabilities of current user interfaces and they will learn about the necessary steps applied in user-centered design and development approaches.Courses (type, number of weekly contact hours, language — if other than German)V (2) + Ü (2)Method of assessment (type, scope, language — if other than German, examination offered — if not every seme-					
preser Langua credita	itation age of a ible for	of project results (approx ssessment: German and, bonus	. 30 minutes) /or English			
Alloca	tion of	places				
Additi	onal inf	ormation				
Worklo	bad					
150 h						
Teachi	ng cycl	e				
Referred to in LPO L (examination regulations for teaching-degree programmes)						
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Maste	Master's degree (1 major) Computational Mathematics (2016)					
Maste	r's degr	ee (1 major) Computation	al Mathematics (201	9)		
Maste	Master's degree (1 major) Mathematics (2019)					

Module title				_	Abbreviation			
Cosmo	logy				11-AKM-161-m01			
Module	e coord	inator		Module offered by				
Managi and Asi	ing Dire trophys	ector of the Institute of sics	Theoretical Physics	Faculty of Physics a	nd Astronomy			
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)				
6	nume	rical grade						
Duratio	on	Module level	Other prerequisites					
1 seme	ster	graduate						
Conten	ts							
Expand matter, sters, in	ling sp , primo ntergal	ace-time, Friedmannia rdial nucleosynthesis, actic medium, cosmolo	n cosmology, basics of cosmic microwave bacl ogical parameters.	general relativity, the ‹ground, structure fo	e early universe, infla rmation, galaxies ar	ation, dark 1d galaxy clu-		
Intende	ed lear	ning outcomes						
The stu le to re scientif	Idents late the fic ques	have basic knowledge em to observations. Th stions.	of cosmology. They kno ey have gained insights	ow the theoretical me s into current researc	ethods of cosmology h topics and are abl	and are ab- e to process		
Course	s (type	, number of weekly cor	ntact hours, language –	- if other than Germa	n)			
V (3) + Module	R (1) e taugh	t in: German or English						
Methoo ster, in	d of ass formati	sessment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-		
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 								
Allocat	ion of _l	olaces						
Additio	onal inf	ormation						
Worklo	ad							
180 h	-							
Teachi	ng cycl	e						
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)				
			<u></u>					
Module	2 20002	are in						
Master	's dear	ee (1 maior) Mathemat	ics (2016)					
Master	's degr	ee (1 major) Physics (2	016)					
Master's degree (1 major) Mathematical Physics (2016)								
Master	Master's degree (1 major) Computational Mathematics (2016)							
Master's wi	ith 1 majo	r Mathematics (2019)	JMU Würzburg	• generated 19-Apr-2025 • e	xam. reg.	page 313 / 403		
			data record	Master (120 ECTS) Mathemati	k - 2019			

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) exchange program Physics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Module title /				Abbreviation		
High Energy Astrophysics					11-APL-161-m01	
Module	coord	inator		Module offered by		
Managi and Ast	ng Dire trophys	ector of the Institute of T sics	heoretical Physics	Faculty of Physics a	nd Astronomy	
ECTS	Methe	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	n	Module level	Other prerequisites	5		
1 semes	ster	graduate				
Conten	ts					
Radiativ cesses,	ve proo , pion p	cesses, interaction of lig production, astrophysica	ht with matter, particl al shock waves, kineti	e acceleration proces c equations	sses, pair creation, r	uclear pro-
Intende	ed lear	ning outcomes				
The stu non-the	dent g ermal r	ains knowledge in funda adiative processes in as	amentals of High-Ener trophysical objects	gy Astrophysics, suc	h as particle acceler	ation and
Courses	s (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (3) + I Module	R (1) e taugh	t in: German or English				
Method ster, inf	l of ass formati	sessment (type, scope, l ion on whether module	anguage — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
 c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 						
Additio	nal inf	ormation				
Worklo	ad					
180 h						
Teachir	ng cựcl	Δ				
reaction	is cyci					
Referre	a to in	LPUT (examination reg	ulations for teaching-	degree programmes)		
Module	annes	ars in				
Mastor	s dogr	ee (1 major) Mathematic	s (2016)			
Master'	s deor	ee (1 major) Physics (20	16)			
Master'	s degr	ee (1 major) Mathematic	al Physics (2016)			
Master's degree (1 major) (manificational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education DILIS Elite Network Bayaria (ENR) (2014)						
Sunnlei	Master's teaching degree Gymnastum Mint Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Master's wi	th 1 majo	r Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e	xam. reg.	page 315 / 403
			data record	Master (120 ECTS) Mathemati	к - 2019	

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Physics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 316 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation		
Methods of Observational Astronomy			11-ASM-161-m01		
Module coordinator			Module offered by		
Managing Director of the Institute of Theoretical Physics and Astrophysics			Faculty of Physics and Astronomy		
ECTS Method of grading Only after succ. c			ompl. of module(s)		
6 nume	rical grade				
Duration	Module level	Other prerequisites	i		
1 semester	graduate				
Contents					
Methods of ob from radio, op	oservational astronomy a itical, X-ray and gamma-	across the electromag ray telescopes.	netic spectrum. Eval	uation of observatio	nal data
Intended lear	ning outcomes				
Overview of th dio, optical, X ability to conc	e methods used in obse -ray and gamma-ray ene luct astronomical obsen	ervational astronomy rgies). Knowledge of _l /ations.	in various parts of th principles and applic	e electromagnetic sp ations of these meth	pectrum (ra- nods and
Courses (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (3) + R (1) Module taugh	t in: German or English	_			
Method of ass ster, informati	sessment (type, scope, l ion on whether module o	anguage — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
 d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). lf a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester. 					
Allocation of places					
Additional information					
Workload		-			
180 h					
Teaching cycle					
Referred to in LPO I (examination regulations for teaching-degree programmes)					
Module appears in					
Master's degree (1 major) Mathematics (2016)					
Master's degree (1 major) Physics (2016)					
Master's degr	ee (1 major) Nanostructu	ire Technology (2016)			
Master's degr	ee (1 major) Computatio	nal Mathematics (201	6)		
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)					
Master's with 1 majo	r Mathematics (2019)	JMU Würzburş data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 317 / 403

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Nanostructure Technology (2020)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Quantum Technology (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

exchange program Physics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 318 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Introduction to Space Physics 11-ASP-161-m01					11-ASP-161-m01	
Module coordinator				Module offered by		
Managing Director of the Institute of Theoretical Physics and Astrophysics			eoretical Physics	Faculty of Physics and Astronomy		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	n	Module level	Other prerequisites	i i i i i i i i i i i i i i i i i i i		
1 seme	ster	graduate				
Conten	ts					
1. Overv 2. Dyna 3. Elem 4. The s 5. Acce	view mics of ents of sun and leration	f charged particles in ma space physics d heliosphere n and transport of energe s to measure energetic pa	gnetic and electric fi tic particles in the he articles in extraterres	elds eliosphere trial space		
Intende	ed lear	ning outcomes				
The stu mics of and cor	dents a charge respor	acquire basic knowledge ed particles in space and ading measuring methods	of Space Physics, in the heliosphere. The 5.	particular regarding y know relevant para	the characterisation of the dyna- ameters and theoretical concepts	
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	in)	
V (3) + I Module	R (1) e taugh	t in: German or English				
Method	l of ass	sessment (type, scope, la	nguage — if other th	an German, examina	tion offered — if not every seme-	
ster, in	formati	on on whether module ca	an be chosen to earn	a bonus)		
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 						
Allocation of places						
Additional information						
Workload						
180 h						
Teaching cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module	appea	urs in				
Master'	Master's degree (1 major) Mathematics (2016)					

Master's with 1 major Mathematics (2019)

Master's degree (1 major) Physics (2016) Master's degree (1 major) Nanostructure Technology (2016) Master's degree (1 major) Computational Mathematics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Nanostructure Technology (2020) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) exchange program Physics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Module title			Abbreviation			
Theoretical Astrophysics			11-AST-161-m01			
Module coordinator			Module offered by			
Managing Director of the Institute of Theoretical Physics and Astrophysics			heoretical Physics	Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	Its					
Topics accretion	in theo on and	retical astrophysics suc jets, shock waves, radia	h as e.g. white dwarfs ition transport, and gr	, neutron stars and b avitational lensing	lack holes, supernov	vae, pulsars,
Intende	ed lear	ning outcomes				
Knowle	edge of	basic processes and me	thods of Theoretical A	Astrophysics. Ability	to formulate theoreti	ical models.
Course	s (type	, number of weekly cont	act hours. language –	- if other than Germa	n)	
V(2) +	R(2)	,			,	
Module	e taugh	t in: German or English				
Metho ster, in	d of as format	sessment (type, scope, l ion on whether module of	anguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt	en exa	mination (approx. 90 to	120 minutes) or			
b) oral	examir	nation of one candidate	each (approx. 30 minu	ites) or		
c) oral	examin	iation in groups (groups	or 2, approx. 30 minu	tes per candidate) of	ſ	
e) pres	entatio	n/talk (approx. 30 minu	tes).			
If a writ	tten exa	amination was chosen a	s method of assessme	ent, this may be char	nged and assessmen	nt may in-
stead t	ake the	e form of an oral examina	ation of one candidate	e each or an oral exa	mination in groups. I	f the method
of asse	essmen	t is changed, the lecture	r must inform student	s about this by four	weeks prior to the or	iginal exami-
nation	uate at	. IIIe Idlest. Issessment: German and	l/or English			
Assess	ment o	ffered: In the semester i	n which the course is	offered and in the su	ıbsequent semester	
Allocat	ion of I	places			,	
Additional information						
Workload						
180 h						
Teaching cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Physics (2016)						
Master's degree (1 major) Mathematical Physics (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Supplementary course MINT leacher Education PLUS, Elite Network Bavaria (ENB) (2016)						
Master	's degr	ee (1 major) Computatio	nal Mathematics (201	9)	r	,
Master's w	ith 1 majo	r Mathematics (2019)	JMU Würzburg data record J	; • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 321 / 403

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Physics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 322 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation		
Selected Topics of Theoretical Elementary Particle Physics 11-ATTP-161-m01					
Module coordinator			Module offered by		
Managing Director of the Institute of Theoretical Physics and Astrophysics			Faculty of Physics and Astronomy		
ECTS Met	hod of grading	Only after succ. con	mpl. of module(s)		
6 num	erical grade		• • • •		
Duration	Module level	Other prerequisites			
1 semester	graduate				
Contents		P			
A selection of 1. Advanced 2. Phenome 3. Higgs phy 4. Top quark	of topics from the following techniques for precision of nology of particle accelera sics physics	g fields will be covere alculations of scatter tors	d in different years: 'ng amplitudes		
Intended lea	rning outcomes				
The students neutrino phy test these ex	s are familiar with the tests vsics. They are able to form tensions in low energy ex	s and limits of the sta nulate extensions of t periments, at high en	ndard model of Parti he standard model. ergy colliders and in	icle Physics, Higgs p Furthermore, they kr cosmology.	hysics and now how to
Courses (typ	e, number of weekly conta	act hours, language –	- if other than Germa	n)	
V (3) + R (1) Module taug	ht in: German or English				
Method of a ster, informa	ssessment (type, scope, la Ition on whether module c	anguage — if other th an be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 					
Allocation o	fplaces				
Additional information					
Workload					
180 h					
Teaching cycle					
Referred to in LPO I (examination regulations for teaching-degree programmes)					
Module app	ears in				
Master's des	gree (1 major) Mathematics	5 (2016)			
Master's degree (1 major) Physics (2016)					
Master's with 1 ma	jor Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e	xam. reg.	page 323 / 403

Master's degree (1 major) Mathematical Physics (2016) Master's degree (1 major) Computational Mathematics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Module	Module title Abbreviation			Abbreviation	
Models Beyond the Standard Model of Elementary Particle Physics 11-BSM-161-m01			11-BSM-161-m01		
Module	coord	inator		Module offered by	
Managi	ng Dire	ector of the Institute of Th	eoretical Physics	Faculty of Physics a	nd Astronomy
and Ast	rophys	ics			
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
0 Duratio	numer	Modulo loval	 Other prorequisites		
1 semes	ster	graduate			
Conten	ts	5.00000			
1. Princ 2. Tests 3. Neuti 4. Higgs	 Principles of the standard model of Elementary Particle Physics Tests of the standard model in low energy experiments and at high energy colliders Neutrino physics Higgs physics. 				
 In addition, a selection of topics from the following fields will be covered in different years: Phenomenology of experiments at the LHC, particle cosmology, extended gauge theories, models with extended Higgs sectors, supersymmetry, models with extended procestime dimensions. 			erent years:		
Intende	ed learr	ning outcomes			
The stu neutrin test the	dents a o physi se exte	are familiar with the tests ics. They are able to form ensions in low energy ext	and limits of the sta ulate extensions of t periments, at high en	ndard model of Parti he standard model. I ergy colliders and in	icle Physics, Higgs physics and Furthermore, they know how to cosmology.
Courses	s (type,	number of weekly conta	ct hours, language –	- if other than Germa	n)
V (3) + I Module	R (1) taught	t in: German or English			
Method	l of ass	essment (type, scope, la	nguage — if other th	an German, examina	tion offered — if not every seme-
ster, inf	ormati	on on whether module ca	an be chosen to earn	a bonus)	
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 					
Allocati	Allocation of places				
Additio	nal info	ormation			
Worklo	ad				
180 h					

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.
	data record Master (120 ECTS) Mathematik - 2019

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Teaching cycle

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Physics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Module	title				Abbreviation	
Image and Signal Processing in Physics				11-BSV-161-m01		
Module	Module coordinator		Module offered by			
Managing Director of the Institute of Applied Physics		Faculty of Physics a	nd Astronomy			
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	n	Module level	Other prerequisites	i		
1 seme	ster	graduate				
Conten	Contents					
Periodi	c and a	periodic signals; princ	iples of discreet and ex	kact Fourier transform	nation; principles of	digital signal
and ima	age pro	cessing; discretisation	of signals/sampling t	heorem (Shannon); h fimagos: the Parsiva	iomogeneous and li	near filters,
getic ob	oservat	ion: statistical signals	image noise, moment	s. stationary signals:	tomography: Hanke	el and Radon
transfo	rmatio	ı.		,,		
Intende	ed learr	ning outcomes				
The stu	dents ł	nave advanced knowle	dge of digital image an	d signal processing.	They know the phys	ical princip-
les of ir	nage p	rocessing and are fam	liar with different meth	ods of signal proces	sing. They are able t	o explain dif-
ferent n	nethod	s and to implement th	em, especially in the fi	eld of tomography.		
Courses	s (type,	number of weekly cor	itact hours, language –	- if other than Germa	n)	
V (2) +	Ü (2)					
Module	taugh	t in: German or English				
Method ster, inf	l of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writte	en exar	nination (approx. 90 to	o 120 minutes) or			
b) oral	examin	ation of one candidate	each (approx. 30 minu	utes) or		
c) oral e	examin	ation in groups (group	s of 2, approx. 30 minu	tes per candidate) of	ſ	
e) prese	entatio	n/talk (approx. 30 min	utes).			
lf a writ	ten exa	mination was chosen	as method of assessm	ent, this may be char	nged and assessme	nt may in-
stead ta	ake the	form of an oral exami	nation of one candidate	e each or an oral exam	mination in groups.	If the method
of asse	ssmen date at	t is changed, the lectur	er must inform studen	is about this by four	weeks prior to the of	riginal exami-
Langua	ge of a	ssessment: German ar	ıd/or English			
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ıbsequent semester	
Allocat	ion of p	olaces				
Additio	nal info	ormation				
Worklo	ad					
180 h						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master'	's degre	ee (1 major) Physics (2	016)			
Master'	's degre	ee (1 major) Nanostruc	ture Technology (2016)			
Master's wi	th 1 major	Mathematics (2019)	JMU Würzburg	• generated 19-Apr-2025 • e	xam. reg.	page 327 / 403
			data record	waster (120 ECIS) Mathemati	к - 2019	

Master's degree (1 major) Computational Mathematics (2016) Master's degree (1 major) Functional Materials (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Nanostructure Technology (2020) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022) Master's degree (1 major) Mathematics (2022) exchange program Physics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Functional Materials (2025)

Module	Module title Abbreviation					
Bosonisation and Interactions in One Dimension11-BWW-161-m01						
Module	e coord	inator		Module offered by		
Manag and As	ing Dire trophys	ector of the Institute of sics	Theoretical Physics	Faculty of Physics a	and Astronomy	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites	j		
1 seme	ster	graduate	uate			
Conten	ts					
 1.Instability of Fermi systems in one dimension (1D) 2.Abelian bosonisation and Luttinger liquids (spinless fermions, correlation functions, models with spin, renormalization group, and the sine-Gordon model). 						
3.Intera 4.Betho 5.Spin- 6.Disor 7.Non-a lodchik	The below mentioned topics will be presented in different years: 3.Interacting fermions on a lattice (Hubbard model, t/J model, transport properties) 4.Bethe ansatz 5.Spin-1/2 chains 6.Disordered systems 7.Non-abelian bosonisation and the WZW model (Kac-Moody algebras, Sugawara construction, Knizhnik-Zamo-				hnik-Zamo-	
Intende	ed learı	ning outcomes				
The students become familiar with the peculiarities of one-dimensional (1D) electron systems and acquire the theoretical tools to understand phenomena relevant to experiments, including disorder effects and transport in 1D.						
$\frac{1}{V(2) + P(1)}$						
Module	e taugh	t in: German or English				
Metho ster, in	d of ass formati	s essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 						
Allocat	ion of p	olaces				
Additio	Additional information					
Workload						
180 h						
Teachi	ng cycl	6				
	3 59 51	.				
Master's w	ith 1 major	Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • 6 Master (120 ECTS) Mathemat	exam. reg. ik - 2019	page 329 / 403

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Module appears in

Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Physics (2016) Master's degree (1 major) Mathematical Physics (2016) Master's degree (1 major) Computational Mathematics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) exchange program Physics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 330 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module	e title				Abbreviation	
Compu	Computational Materials Science (DFT) 11-CMS-161-m01					
Module	Module coordinator			Module offered by		
Managi and Ast	ing Dire trophys	ector of the Institute of sics	Theoretical Physics	Faculty of Physics a	ind Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Duratio	on	Module level	Other prerequisites	i		
1 seme	ster	graduate				
Conten	Contents					
1. Dens 2. Wan 3. Num 4. Hartr 5. Many 6. And 7. Dyna 8. DFT - 9. Stror	 Density functional theory (DFT) Wannier functions and localized basis functions Numerical evaluation of topological invariants Hartree-Fock and static mean-field theory Many-body methods for solid state physics Anderson impurity model (AIM) and Kondo physics Dynamical mean-field theory (DMFT) DFT + DMFT methods for realistic modeling of solids 					
Intende	ed lear	ning outcomes				
Aside from the theoretical discussion of these topics, the students carry out hands-on exercises from the CIP pool. The participants are introduced to the use of DFT software packages such as VASP or Wien2k and to the construction of maximally localised Wannier functions through the projection of DFT results on atom orbitals with the software wannier90. Furthermore, the students learn how to construct many-particle solutions of AIM and observe border cases such as the Kondo regime. Impurity solvers such as exact diagonalisation or continuous-time quantum Monte Carlo are utilised to solve the self consistency equations of dynamic molecular field theory (DMFT). These steps are necessary to reach the peak of the lecture: a DFT-DMFT calculation of a strongly correla-						
Course	s (type	number of weekly cor	itact hours, language –	- if other than Germa	in)	
V (4) + Modulo	R(2)	t in Cormon or English				
Mothod			languago if other th	an Corman, ovamina	tion offered if not	ovorucomo
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		every seme-
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester. 						
Allocation of places						
Additio	nal inf	ormation				
	-					
Workload						
240 h	uu					
240 11						
Master's wi	ith 1 majo	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 331 / 403

Teaching cycle

Referred to in LPO I (examination regulations for teaching-degree programmes)

Module appears in Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Physics (2016) Master's degree (1 major) Mathematical Physics (2016) Master's degree (1 major) Computational Mathematics (2016) Master's degree (1 major) Functional Materials (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Functional Materials (2025)

Module	Module title Abbreviation					
Renorm	Renormalization Group and Critical Phenomena 11-CRP-161-mo1					
Module	e coord	inator		Module offered by	~ ·	
Managi and Ast	ing Dire trophys	ector of the Institute of sics	Theoretical Physics	Faculty of Physics a	and Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	n	Module level	Other prerequisites	;		
1 seme	ster	graduate				
Conten	ts					
1. Phas 2. Mean 3. The c 4. Pertu 5. Low- 6. Conf	 Phase transitions Mean field theory The concept of the renormalization group (RG) Phase diagrams and fixed points Perturbation-theoretical renormalization group Low-dimensional systems Conformal symmetry 					
Intende	ed learn	ning outcomes				
The stu (RG) in statistic	dents a Statisti cal and	acquire profound know ical Physics. They unde quantum field theory.	ledge of the principles rstand the concept of	of scale invariance a RG flow with respect	and of the renormalis to effective field the	sation group ories in both
Course	s (type,	, number of weekly con	tact hours, language –	– if other than Germa	ın)	
V (3) + Module	R (1) taugh	t in: German or English				
Methoo ster, inf	l of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 				nt may in- If the method riginal exami-		
Allocat	ion of p	olaces				
Additio	nal info	ormation				
Worklo	Workload					
180 h						
Poferred to in LPO L (examination regulations for teaching degree programmer)						
Module	annos	rs in				
Master	's dear	e (1 major) Mathemati	(2016)			
Master's wi	th 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 333 / 403

Master's degree (1 major) Physics (2016) Master's degree (1 major) Mathematical Physics (2016) Master's degree (1 major) Computational Mathematics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Mathematical Physics (2022) exchange program Physics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 334 / 403
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Module	Module title Abbreviation					
Introduction to Fractional Quantisation 11-EFQ-161-mo1						
Module	Module coordinator		Module offered by			
Managing Director of the Institute of Theoretical Physics and Astrophysics		Theoretical Physics	Faculty of Physics a	Ind Astronomy		
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites	5		
1 seme	ester	graduate				
Conten	nts					
The co followi	The course will elaborate on instances of fractional quantisation in nature, mostly employing examples from the following list:					
1. Midg 2. Abel Chern-	gap stat lian qua Simons	es in polyacethylene antised Hall states (Lau theory)	ghlin states, fractiona	l charge and statistic	s, hierarchy states, e	effective
3. Non- states)	-Abelia	n quantised Hall states	(Pfaffian states, Major	rana fermions, non-A	belian statistics, Rea	ad-Rezayi
4. Spin Yangia	n chains n symm	s (Haldane-Shastry mod netry)	lel, spinon excitations,	, holon excitations in	the Kuramoto-Yoko	yama model,
5. Chira	al spin	liquids (Abelian and no	on-Abelian) 6. Kitaev m	odels (toric code mo	del, honeycomb mo	del).
Intend	ed lear	ning outcomes				
The students become familiar with emergent phenomena in many-particle systems and with Anderson's philoso- phical principle of "More is different" by studying specific examples of quantum condensates exhibiting fractio- nal quantisation.			on's philoso- iting fractio-			
Course	s (type	, number of weekly cor	tact hours, language –	– if other than Germa	ın)	
V (3) + Module	R (1) e taugh	t in: German or English				
Metho ster, in	d of ass formati	sessment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina 1 a bonus)	tion offered — if not	every seme-
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 			nt may in- If the method riginal exami-			
Allocat	tion of r	places				
Additional information						
Workload						
Teachi	ing cycl	e				
Master's w	ith 1 majo	r Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. ik - 2019	page 335 / 403

Referred to in LPO I (examination regulations for teaching-degree programmes)

Module appears in

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 336 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title Abbreviation			Abbreviation		
Gauge Th	neories				11-EIT-161-m01
Module c	coordina	ator		Module offered by	
Managing and Astro	g Direct ophysic	or of the Institute of Th s	eoretical Physics	Faculty of Physics a	nd Astronomy
ECTS N	Nethod	of grading	Only after succ. com	pl. of module(s)	
6 n	numeric	al grade			
Duration	м	lodule level	Other prerequisites		
1 semeste	er gi	raduate			
Contents	Contents				
The main topic of the course will usually be lattice gauge theories. The concepts may be taught and illustrated by elaborating on the role of lattice gauge theories in spin systems.					
A possible 1. Introdu 2. Phase t	le outlir uction to transiti	ne might be: o lattice gauge theories ons	for spin systems		
 The transfer matrix The two-dimensional (2D) Ising model Ising lattice gauge theory Abelian lattice gauge theories The planar Heisenberg (XY) model in 2D (Kosterlitz-Thouless transition) 					
Intended	learnin	ng outcomes			
The students acquire in-depth understanding of gauge fields in classical and Quantum Physics. They are able to apply this knowledge to spin systems, illustrating the interplay between microscopic models and field-theoretic descriptions.					
Courses ((type, n	umber of weekly conta	ct hours, language —	· if other than Germa	n)
V (3) + R (Module ta	(1) aught ir	n: German or English			
Method o ster, infor	of asses rmation	ssment (type, scope, la n on whether module ca	nguage — if other tha In be chosen to earn	an German, examina [.] a bonus)	tion offered — if not every seme-
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. 					
Assessment offered: In the semester in which the course is offered and in the subsequent semester					
Allocatio	n of pla	ices			
Additiona	al inforr	mation			
Workload	d				
180 h	1				

Mactor's with 1 major Mathematics (2010)	IMIL Würzburg • generated 10 Apr 2025 • exam reg
Master S with I major Mathematics (2019)	Jino wuizbuig • generated 19-Api-2025 • exam. reg.
	data record Master (120 ECTS) Mathematik - 2019

Teaching cycle

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 338 / 403
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Module title			Abbreviation			
Solid S	tate Ph	ysics 2			11-FK2-161-m01	
Module	e coord	inator		Module offered by		
Managi	Managing Director of the Institute of Applied Physics		Applied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Duratio	on .	Module level	Other prerequisites	i		
1 seme	ster	graduate				
Moderr and exc gation of gnetic a of excit agreem Intende	n scatte citation of magi and ele rations ient. ed learr	ring methods; neutron s such as phonons and netic, orbital and charg ctronic properties of th in solids and thin films ing outcomes	scattering as a method d magnetic waves; reso ge order; X-ray and neu- in films and superlattic ; STEM ("scanning trar	d to investigate the a onant elastic X-ray sc tron reflectometry; ir ces; resonant inelast ismission electron m	atomic and magnetic attering and absorp ivestigation of the st ic X-ray scattering; i icroscopy"); further	structure tion; investi- ructural, ma- nvestigation topics upon
The stu tering, are fam	dents moderr iiliar wi	know different modern n scattering theory, X-ra th the theoretical princ	scattering methods su ay and neutron reflecto iples and applications	ch as neutron scatte metry and resonant i of these methods.	ring, resonant elasti inelastic X-ray scatte	c X-ray scat- rring. They
Course	s (type	number of weekly cor	tact hours, language –	- if other than Germa	n)	
V (4) + Module	R (2) e taugh	t in: German or English				
Methoo ster, inf	l of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writte b) oral e c) oral e d) proje e) prese If a writ stead ta of asse nation e Langua Assess Allocat	a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may in- stead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original exami- nation date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester Allocation of places					
Additio	nal info	ormation				
Worklo	ad					
240 h						
Teachir	ng cycl	9				
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)					
Module	e appea	rs in				
Master Master	's degre 's degre	ee (1 major) Mathemati ee (1 major) Physics (20	cs (2016) 016)			
Master's wi	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 339 / 403

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Master's degree (1 major) Nanostructure Technology (2016) Master's degree (1 major) Computational Mathematics (2016) Master's degree (1 major) Functional Materials (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019)

 Master's with 1 major Mathematics (2019)
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 data record Master (120 ECTS) Mathematik - 2019
 data record Master (120 ECTS) Mathematik - 2019
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Module title			Abbreviation			
Solid S	tate Sp	ectrocopy			11-FKS-161-m01	
Module	e coord	inator		Module offered by		
Manag	ing Dire	ector of the Institute of A	Applied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
Single- micros	and ma copy, X	any-particle pictures of -ray spectroscopy.	electrons in solids, lig	ht-matter interaction	, optical spectrosco	py, electron
Intende	ed learr	ning outcomes				
The stu types o develo	Idents h of spect pments	nave specific and advar roscopy and their fields in research.	nced knowledge in the of application. They u	field of solid-state s inderstand the theor	pectroscopy. They ki etical principles and	now different the current
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (3) + Module	R (1) e taugh	t in: German or English				
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
d) proje e) pres If a writ stead t of asse nation Langua Assess	 d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes) If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 					
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Worklo	ad					
180 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
			<u></u>			
Module	e appea	urs in				
Master Master Master Master Master Supple	's degre 's degre 's degre 's degre 's teach mentar	ee (1 major) Mathematio ee (1 major) Physics (20 ee (1 major) Nanostruct ee (1 major) Computatio ning degree Gymnasium y course MINT Teacher	cs (2016) 16) ure Technology (2016) onal Mathematics (201 o MINT Teacher Educat Education PLUS, Elite	6) ion PLUS, Elite Netwo Network Bavaria (EN	ork Bavaria (ENB) (20 B) (2016)	016)
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g ● generated 19-Apr-2025 ● e Waster (120 ECTS) Mathemati	xam. reg. k - 2019	page 341 / 403

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Nanostructure Technology (2020)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Quantum Technology (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

exchange program Physics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 342 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Field Theoretical Aspects of Solid State Physics			11-FTAS-161-m01			
Module coordinator			Module offered by			
Managing Director of the Institute of Theoretical Physics and Astrophysics			Faculty of Physics and Astronomy			
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites	5		
1 seme	ster	graduate				
Conten	ts					
The top classica theorie level k beyond	oics of t al field s as eff Wess-Z l the Vi	he course will vary from theory (the Higgs mech fective descriptions of c Jumino-Witten model as rasoro algebra.	n year to year and may anism), non-linear sig Juantised Hall fluids an an example of a conf	include the descript ma models for spin o nd topological insula ormal field theory wi	ion of superconduct chains, Chern-Simon itors, respectively, o th a symmetry group	ors through s and axion r the SU(2) (or algebra)
Intende	ed lear	ning outcomes				
The stu most al	dents a Il areas	acquire an in-depth unc of Condensed Matter P	lerstanding of quantur hysics.	n field theory and its	fundamental impor	tance for al-
Course	s (type	, number of weekly con	tact hours, language –	– if other than Germa	n)	
V (3) + Module	R (1) e taugh	t in: German or English				
Methoo ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
b) oral c) oral of d) project e) present of a write stead to of assent nation Langua Assess	 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 					
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
180 h						
Teaching cycle						
Referre	d to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Module	annea	urs in				
Master Master	's degr	ee (1 major) Mathemati ee (1 major) Physics (20 aa (1 major) Mathemati	cs (2016) 116)			
Master's wi	ith 1 major	Mathematics (2019)	JMU Würzburş	g • generated 19-Apr-2025 • e	xam. reg.	page 343 / 403
			data record	Master (120 ECTS) Mathemati	k - 2019	

Julius-Maximilians-UNIVERSITÄT WÜRZBURG

Master's degree (1 major) Computational Mathematics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 344 / 403
	data record Master (120 ECTS) Mathematik - 2019	1

Master's with 1 major Mathematics (2019)

Module	title				Abbreviation	
Field Theory in Solid State Physics			11-FTFK-161-m01			
Module coordinator Modu			Module offered by			
Managing Director of the Institute of Theoretical Physics and Astrophysics			eoretical Physics	Faculty of Physics a	ind Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 semes	ster	graduate				
Conten	ts					
This wil outline 1. Cohe 2. The f 3. Pertu 4. Orde 5. Green	l usual could l rent sta unction rbation r paran n's fun	ly be a course on quantu be: ates and review of secon- nal integral formalism at n theory at T=o neters and broken symm- ctions theory of Fermi liquids	m many particle phy d quantization finite temperatures T etry	sics using the metho	od of functional integration. An	
7. Furth	er deve	elopments				
Intende	ed learr	ning outcomes				
The stu le syste	dents a ms. Th	are enabled to apply the ese methods complement	modern methods of p nt the traditional met	oath and functional i hods of Green's fund	ntegrals to quantum many-partic- ctions and Feyman diagrams.	
Courses	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	in)	
V (4) + I Module	R (2) taugh	t in: German or English				
Method	l of ass	essment (type, scope, la	nguage — if other th	an German, examina	tion offered — if not every seme-	
ster, inf	formati	on on whether module ca	an be chosen to earn	a bonus)		
a) writte b) oral e c) oral e d) proje e) prese If a writ stead ta of asse nation e Langua Assess	en exar examin examin ect repo entatio ten exa ake the ssmen date at ge of a ment o	nination (approx. 90 to 1 ation of one candidate e ation in groups (groups c ort (approx. 8 to 10 pages n/talk (approx. 30 minut amination was chosen as form of an oral examina t is changed, the lecturer the latest. ssessment: German and, ffered: In the semester in	20 minutes) or ach (approx. 30 minu of 2, approx. 30 minu o) or es). method of assessme tion of one candidate must inform student /or English	utes) or tes per candidate) o ent, this may be chan e each or an oral exa is about this by four offered and in the su	r nged and assessment may in- mination in groups. If the method weeks prior to the original exami- ubsequent semester	
Allocati	ion of p	olaces				
Additio	Additional information					
Worklo	ad					
240 h						
Teachir	ng cycl	e				
Referre	d to in	LPO I (examination regu	lations for teaching-	degree programmes)		

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Module appears in

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 346 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module	e title				Abbreviation	
Introduction to Gauge/Gravity Duality				11-GGD-161-m01		
Module coordinator				Module offered by		
Managing Director of the Institute of Theoretical Physics and Astrophysics			eoretical Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
8	numer	rical grade				
Duratio	n l	Module level	Other proroquisites			
	ctor	graduato	Other prerequisites			
1 Seine		glauuale				
Conten	ts					
1. Elem	ents of	quantum field theory:				
• 0	Juantis	ation of the free field				
• li	nteracti	ons				
• R	lenorma	alisation Group				
• @	iauge F	ields				
• 0	onform	al Symmetry				
• L	arge N	expansion				
• S	upersy	mmetry				
2. Elem	ents of	gravity				
	lanifold	as, coordinate covariance	e and metric			
	lemanr	i curvature				
		lly symmetric spacetimes)			
	onte of	string theony				
3. Liein	non an	d closed strings				
• 5	trings i	n hackground fields				
• T	vne IIR	String Theory				
• 0)-Brane	s				
4. The	AdS/CF	- T correspondence				
• S	stateme	ent of the correspondence	9			
• N	lear-ho	rizon limit of D3-Branes				
• F	ield-op	erator correspondence				
• T	ests of	the correspondence: Cor	relation functions			
• T	ests of	the correspondence: Cor	nformal anomaly			
• H	lologra	phic principle				
5. Exter	nsions	to non-conformal theorie	S			
• H	lologra	phic renormalisation gro	up			
• H	lologra	phic C-Theorem				
6. Appl	ication	s I: Thermo- and hydrody	namics			
• ()uantur	n field theory at finite ter	nperature			
• B	lack ho	bles				
	lologra	phic linear response form	nalism			
•	Iransport coefficients: Shear viscosity and conductivities					
7. Appi	ication:	s II: Condensed matter pl	NYSICS or Nordetröm block b			
	nnte ch	naige density and Reisshi morifical bobaviour	er-norustrom Dlack r	IUIES		
	lologra	n chicai Denavioui nhic fermione				
• H	1010graj	nhic superconductors				
• F	ntangle	ement entrony				
8. Annl	ication	s III: Particle nhysics				
• G	iravity o	dual of confinement				
• 6	iravity o	dual of chiral symmetry h	reaking			
• 0)uark-g	luon plasma	-			

Intended learning outcomes

The students acquire a thorough understanding of the foundations of gauge/gravity duality and the ability to carry out basic tests. Depending on the pre-existing knowledge and interests of the students, the module addresses a selection of the aforementioned topics. Knowledge of quantum mechanics and classical electrodynamics is a prerequisite for this course. Knowledge of quantum field theory and general relativity is useful, but not a prerequisite.

Courses (type, number of weekly contact hours, language — if other than German)

V (4) + R (2)

Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) written examination (approx. 90 to 120 minutes) or

- b) oral examination of one candidate each (approx. 30 minutes) or
- c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or

d) project report (approx. 8 to 10 pages) or

e) presentation/talk (approx. 30 minutes).

If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest.

Language of assessment: German and/or English

Assessment offered: In the semester in which the course is offered and in the subsequent semester

Allocation of places

--

Additional information

--

Workload

240 h

Teaching cycle

Referred to in LPO I (examination regulations for teaching-degree programmes)

--

Module appears in

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Physics (2023)

Master's degree (1 major) Computational Mathematics (2024)

 Master's with 1 major Mathematics (2019)
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 data record Master (120 ECTS) Mathematik - 2019
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Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 349 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Semiconductor Physics			11-HLPH-161-m01			
Module	e coord	inator		Module offered by	Module offered by	
Managing Director of the Institute of Applied Physics Fac		Faculty of Physics a	Faculty of Physics and Astronomy			
ECTS	Metho	d of grading	Only after succ. cor	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites	i		
1 seme	ster	graduate				
Conten	lts					
 Sympositic Sympositic Sympositi	metry p tal form cal exci tron-ph perature netic se	roperties ation and electronic b tations and their coup onon coupling e-dependent transport emiconductors	and structure ling effects properties			
Intend	ed learr	ning outcomes				
The stu conduc	idents a ctors an	are familiar with the pr d know their physical	inciples of Semiconduc properties and effects.	tor Physics. They un They know importan	derstand the structu t applications.	re of semi-
Course	s (type	number of weekly cor	ntact hours, language –	- if other than Germa	n)	
V (3) + Module	R (1) e taugh	t in: German or English				
Metho ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
 b) oral c) oral d) projection e) pression lf a wring stead to a ste	 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 					
Allocat	ion of p	olaces			I	
Additio	onal info	ormation				
Worklo	ad					
180 h						
Teachi	ng cycl	a				
		•				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Module	e appea	rs in				
Master Master Master	's degre 's degre 's degre	ee (1 major) Mathemat ee (1 major) Physics (2 ee (1 major) Nanostruc	ics (2016) 016) ture Technology (2016)			
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 350 / 403
					e e	

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Master's degree (1 major) Computational Mathematics (2016) Master's degree (1 major) Functional Materials (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 351 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title	Abbreviation				
Optical Properties of Semiconductor Nanostructures 11-HNS-161-m01					
Module coordinator		Module offered by			
Managing Director of the Institute of A	pplied Physics	Faculty of Physics a	nd Astronomy		
ECTS Method of grading Only after succ. compl. of module(s)					
6 numerical grade					
Duration Module level	Other prerequisites				
1 semester graduate					
Contents					
Semiconductor nanostructures are fre or macroscopic crystals, their electron ging their size. The lecture addresses tures of varying dimensions (2D, 1D, o with a focus on optical properties and of novel optoelectronic and quantum for quantum communication and quar	quently referred to as ic, optical and magne technological challen D). It provides the bas light-matter coupling photonic devices base tum computing archi	"artificial materials" etic properties can be ges in the preparatic sic theoretical conce . Moreover, it discus ed on such nanostru tectures.	. In contrast to atoms, molecules e systematically tailored by chan- on of semiconductor nanostruc- pts to describe their properties, ses the challenges and concepts ctures, including building blocks		
Intended learning outcomes					
The students know the theoretical prir knowledge of the technological metho devices. They are able to apply their k	nciples and charactering ods to fabricate such s nowledge to probleme	stics of semiconduc structures, and of the s in this field of resea	tor nanostructures. They have eir applications to novel photonic arch.		
Courses (type, number of weekly conta	act hours, language –	- if other than Germa	n)		
V (3) + R (1) Module taught in: German or English					
Method of assessment (type, scope, la	anguage — if other th	an German, examina	tion offered — if not every seme-		
ster, information on whether module of	an be chosen to earn	a bonus)			
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 					
Allocation of places					
Additional information					
Workload					
180 h					
Teaching cycle					
Referred to in LPO I (examination regi	llations for teaching-	degree programmes)			
Module appears in	Module appears in				
Master's degree (1 major) Mathematic	s (2016)				

Master's with 1 major Mathematics (2019)

Master's degree (1 major) Physics (2016) Master's degree (1 major) Nanostructure Technology (2016) Master's degree (1 major) Computational Mathematics (2016) Master's degree (1 major) Functional Materials (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Nanostructure Technology (2020) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022) Master's degree (1 major) Mathematics (2022) exchange program Physics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Functional Materials (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 353 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Conformal Field Theory 11-KFT-161-m01						
Module coordinator			Module offered by			
Managing Director of the Institute of Theoretical Physics and Astrophysics				Faculty of Physics a	nd Astronomy	
ECTS	Methe	od of grading	Only after succ. cor	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites	5		
1 seme	ster	graduate				
Conten	ts					
conformation two-dir (Ising, 1 scale in variance two dim relevan on, qua edge in particu ons, fo the firs o. Intro point) 1. Confi ctions) 2. Confi tion an on, the 3. Cent sation, weight 4. Kac o conform	Contents Conformal field theory (CFT) was developed in the 1980s and found immediate application in string theory and two-dimensional statistical mechanics, where critical exponents and correlation functions for many models (Ising, tricritical Ising, 3-state Potts, etc.) could be exactly calculated. The physical idea is that the principle of scale invariance is elevated from a global to a local invariance, which, for reasons of consistency, amounts to in- variance under conformal transformations. This, in turn, yields a rich and fascinating mathematical structure for two dimensional systems (either two space dimensions or one time and one space dimension). CFT has become relevant to many interesting areas of condensed matter physics, including Abelian and non-Abelian bosonisati- on, quantised Hall states (where the bulk wave function is described in terms of conformal correlators, and the edge in terms of 1+1 dimensional CFTs), the two-channel Kondo effect, fractional topological insulators, and in particular fault-tolerant topological quantum computers involving non-Abelian anyons (Ising and Fibonacci any- ons, for example, owe their names to the fusion rules of the associated conformal fields.) A potential syllabus for the first term of the course is: 0. Introduction (scale and conformal invariance, critical exponents, the transverse Ising model at the self-dual point) 1. Conformal theories in D dimensions (conformal group, conformal algebra in 2D, constraints on correlation fun- ctions) 2. Conformal theories in D=2 (primary fields and correlation functions, quantum field theory, canonical quantisa- tion and Noether's theorem, radial quantisation and Polyakov's theorem, time ordering and functional integrati- on, the free boson and vertex operators, conformal Ward identities) 3. Central charge and Virasoro algebra (central charge, the Schwarzian derivative, free fermion, (Abelian) bosoni- sation, mode expansions and Virasoro algebra, cylinder geometry and Casimir effect, in- and out-states, highest weight sta					
Intended learning outcomes						
The students acquire practical and conceptional familiarity with the methods of conformal field theory. As the completion of "Quantum Mechanics II" (11-QM2) is the only prerequisite to take part in this course, the students also acquire basic knowledge of critical phenomena, quantum field theory and functional integrals. The course is primarily addressed to students of Theoretical Physics and aims to increase their general level of knowledge by becoming acquainted with a sophisticated subdiscipline with applications in many subdisciplines of Condensed Matter Physics.						
Courses (type, number of weekly contact hours, language — if other than German)						
V (3) + R (1) Module taught in: German or English						
Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)						
a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes).						
widster's W	iti i majo	r mathematics (2019)	data record	s - generateu 19-Apr-2025 • e Master (120 ECTS) Mathemati	ik - 2019	page 354 / 403

If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest.

Language of assessment: German and/or English

Assessment offered: In the semester in which the course is offered and in the subsequent semester

Allocation of places

Additional information

--

Workload

180 h

Teaching cycle

--

Referred to in LPO I (examination regulations for teaching-degree programmes)

--

Module appears in

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Physics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 355 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Conformal Field Theory 2 11-KFT2-161-m01						
Module coordinator			Module offered by			
Managing Director of the Institute of Theoretical Physics and Astrophysics			Theoretical Physics	Faculty of Physics and Astronomy		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
 5. Minimal models (critical statistical mechanics models (Ising, tricritical Ising, 3 state Potts model, restricted solid-on-solid models), correlation functions of the critical Ising model, fusion rules and Verlinde algebra, Land-au-Ginzburg description of minimal models, modified Coulomb gas method and its application to the Ising model, superconformal models) 6. Free bosons and fermions (mode expansions, twist fields, fermionic zero modes and fermion parity) 7. Free fermions on the torus (operator implementation of the partition function, vacuum energies, representations of Virasoro algebra, modular group and fermionic spin structures, Virasoro characters, critical Ising model on the torus, Jacobi theta function identities) 8. Free bosons on the torus (Lagrangian formulation of the partition function, fermionisation, orbifolds in general, S1/Z2 orbifold, Gaussian and Askhin-Teller models, duality between original and orbifold theories, marginal operators, the space of c=1 theories) Intended learning outcomes The students acquire practical and conceptional familiarity with the methods of conformal field theory. As the completion of "Quantum Mechanics II" (11-QM2) is the only prerequisite to take part in this course, the students also acquire basic knowledge of critical phenomena, quantum field theory and functional integrals. The course is primarily addressed to students of Theoretical Physics and aims to increase their general level of knowledge by 						
Matter Course	Physics	s. . number of weekly cor	tact hours, language –	- if other than Germa	n)	
V (3) + I Module	R (1)	t in: German or English		in other than octing	,	
Method	I of ace	assment (type scope	language — if other th	an German, examina	tion offered — if not	every some.
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		every senie
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 						
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Workload						
180 h						
Master's wi	th 1 majo	Mathematics (2019)	JMU Würzburg data record	9 • generated 19-Apr-2025 • e Master (120 ECTS) <u>Mathemati</u>	xam. reg. k - 2019	page 356 / 403

Teaching cycle

Referred to in LPO I (examination regulations for teaching-degree programmes)

--

Module appears in

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Physics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Module	Module title				Abbreviation	
Magnetism 11-MAG-161-m01						
Module coordinator			Module offered by			
Managing Director of the Institute of Applied Physics Faculty of Physics and Astrono				nd Astronomy		
ECTS Method of grading Only after succ. compl. of module(s)						
6	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
Dia- an ture, na fect.	d paraı anomaş	nagnetism, exchange gnetism, superparama	nteraction, ferromagne gnetism, experimental i	tism, antiferromagno nethods to measure	etism, anisotropy, do magnetic properties	omain struc- 5, Kondo ef-
Intende	ed lear	ning outcomes				
The stu experin ches ar on prot	idents l nents; nd are a plems o	know basic terms, con they are skilled in simp able to apply them to ta of these areas; they are	epts and phenomena o le model building and asks in the stated areas able to evaluate the ac	of magnetism and m in the formulation of s; they have compete ccuracy of observatio	easuring methods fo mathematical-phys ncies in independer ons and analyses.	r magnetic ical approa- ntly working
Course	s (type	, number of weekly cor	tact hours, language –	- if other than Germa	n)	
V (3) + Module	R (1) e taugh	t in: German or English				
Methoo ster, in	d of ass formati	e ssment (type, scope, on on whether module	language — if other the can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
 b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 						
Allocat	Allocation of places					
	_					
Additio	nal inf	ormation				
Worklo	ad					
180 h						
Teachir	ng cycl	<u>م</u>				
	is eyer	•				
Referre	d to in	LPOI (examination re	gulations for teaching-o	degree programmes)		
		· · ·	<u> </u>	<u> </u>		
Module	e appea	rs in				
Master	's degr	ee (1 major) Mathemat	cs (2016)			
Master's degree (1 major) Physics (2016)						
Master	's degr	ee (1 major) Nanostruc	ure Technology (2016)			
Master	Master's degree (1 major) Computational Mathematics (2016)					
Master's wi	ith 1 majo	Mathematics (2019)	JMU Würzburg	• generated 19-Apr-2025 • e	xam. reg.	page 358 / 403
			data record l	waster (120 ECIS) Mathemati	к - 2019	

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Nanostructure Technology (2020) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) exchange program Physics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Module title			Abbreviation			
Multi-wavelength Astronomy 11-MAS-161-mo1						
Module coordinator			Module offered by			
Managing Director of the Institute of Theoretical Physics			Faculty of Physics a	nd Astronomy		
and Astrophysics						
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conte	nts					
1. Phe	nomeno	ology of active galactic nu	uclei and extragalacti	c jets		
2. Jet-6	emissio	n processes				
3. VLB	lobser	ations of jets				
4. ⊓igi 5. Mul	timesse	y observations of jets				
Intend	ed lear	ning outcomes	-			
The et	udonto	acquire knowledge of m		omy by studying the	abconvations of acti	vo galactic
nuclei	and the	acquire knowledge of mu	utiwavelength astron	special not vet solve	observations of actions of actions of actions of actions of a strong of the strong of	ve galactic
practio	ce writir	ng an observational prop	osal.	special, not yet solve		
Course	es (type	, number of weekly conta	act hours, language –	- if other than Germa	n)	
V (3) +	R (1)	· · · · · · · · · · · · · · · · · · ·				
Modul	e taugh	it in: German or English				
Metho	d of as	sessment (type, scope, la	anguage — if other th	an German, examina	tion offered — if not	every seme-
ster, ir	nformat	ion on whether module c	an be chosen to earn	a bonus)		
a) writ	ten exa	mination (approx. 90 to :	120 minutes) or			
b) ora	exami	nation of one candidate e	each (approx. 30 mini	utes) or		
c) oral	examir	nation in groups (groups)	of 2, approx. 30 minu	tes per candidate) o	r	
	ject rep	on (approx. 8 to 10 page)	5) 01 (ac)			
lf a wr	itten ex	amination was chosen as	s method of assessm	ent. this may be chai	nged and assessme	nt mav in-
stead	take the	e form of an oral examina	tion of one candidate	e each or an oral exa	mination in groups.	If the method
of ass	essmen	t is changed, the lecture	r must inform student	s about this by four	weeks prior to the o	riginal exami-
nation	date at	t the latest.	/ - .			
Langu	Language of assessment: German and/or English					
Alloca	tion of			onered and in the st	ibsequent semester	
Alloca		places				
Additi	onal inf	ormation				
Workl	oad					
180 h						
Teach	ing cyci	e	<u>.</u>			
Referr	ed to in	LPOI (examination regu	ilations for teaching-	degree programmes)		
Module appears in						
Maste	r's degr	ee (1 major) Mathematic	5 (2016)			
Maste	r's degr	ee (1 major) Physics (201	.6)			
Master's v	vith 1 majo	r Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 360 / 403
Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

exchange program Physics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	
	data record Master (120 ECTS) Mathematik - 2019	

Module title					Abbreviation		
Magnet	tism ar	nd Spin Fluids			11-MSF-161-m01		
Module	e coord	inator		Module offered by			
Managing Director of the Institute of Theoretical Phy and Astrophysics			eoretical Physics	Faculty of Physics a	ind Astronomy		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)			
6	nume	rical grade					
Duratio	n	Module level	ule level Other prerequisites				
1 seme	ster	graduate					
Conten	ts						
The contents of the course vary from year to year and include topics such as spin-wave theory, spin-chains, spin ladders and spin liquids with topological orders. Depending on the lecturer, the focus may lie on magnetically or dered systems or on spin liquids. Possible topics are: 1. Principles of magnetism. Ferromagnetic and antiferromagnetic exchange, super-exchange, Hubbard, t-j- and Heisenberg models 2. Magnetic order (Holstein-Primakoff bosons and spin-wave theory) 3. Valence bond solids in spin chains (Majumdar-Gosh and AKLT Models, spinon confinement and the Haldane gap) 4. Critical spin-1/2 chains (spinon excitations in the Haldane-Shastry model, holon excitations in the Kuramo- to-Yokohama model) 5. Coupled spin chains and ladders 6. Chiral spin liquids (Abelian and possibly non-Abelian) 7. Kitaev's toric code model (spinon and vison excitations) 8. Kitaev's honeycomb lattice model (non-Abelian statistics). Intended learning outcomes The students develop an understanding of the electronic origins of magnetism, spin-wave theory, spin-charge se							
mensio	n in on	e dimensional systems a	na spin-liquias as ex		with a topological order in two di-		
Course	s (type	, number of weekly conta	ct hours, language –	- If other than Germa	in)		
V (3) + Module	R (1) e taugh	t in: German or English					
Method ster, inf	l of ass formati	sessment (type, scope, la ion on whether module ca	nguage — if other than an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-		
a) writt b) oral (c) oral (d) proje e) prese If a writ stead ta of asse nation (Langua Assess Allocat	en exa examir examin ect repo entatio ten exa ake the ssmen date at ge of a ment o ion of j	mination (approx. 90 to 1 nation of one candidate e lation in groups (groups of ort (approx. 8 to 10 pages n/talk (approx. 30 minut amination was chosen as e form of an oral examina t is changed, the lecturer the latest. ssessment: German and, ffered: In the semester ir blaces	20 minutes) or ach (approx. 30 minu of 2, approx. 30 minu s) or es). method of assessme tion of one candidate must inform student /or English which the course is	utes) or tes per candidate) o ent, this may be chan e each or an oral exa is about this by four offered and in the su	r nged and assessment may in- mination in groups. If the method weeks prior to the original exami- ubsequent semester		
Additio	nal inf	ormation					

Workload

180 h

Teaching cycle

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 363 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Physics of Complex Systems					11-PKS-161-m01	
Modul	e coord	inator		Module offered by		
Manag and As	ing Dir trophy	ector of the Institute of sics	Theoretical Physics	Faculty of Physics and Astronomy		
ECTS	Meth	od of grading	Only after succ. cor	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites	5		
1 seme	ster	graduate				
Conter	nts					
 Theory of critical phenomena in thermal equilibriumt Introduction into the physics out of equilibriumt Entropy production and fluctuationst Phase transitions away from equilibriumt Universalityt Spin glassest Theory of neural networks 						
Intend	ed lear	ning outcomes				
The students acquire in-depth knowledge of a wide variety of concepts and methods essential for a thorough un- derstanding of cooperative phenomena in complex many-particle systems. The main focus includes a thorough understanding of the concepts of entropy, entropy production and universality. The students are prepared for re- search activities in different areas of physics of complex systems.						
Course	s (type	, number of weekly con	tact hours, language -	– if other than Germa	n)	
V (2) + Module	R (2) e taugh	t in: German or English				
Metho ster, in	d of as format	sessment (type, scope, ion on whether module	language — if other th can be chosen to earr	an German, examina 1 a bonus)	ition offered — if not	every seme-
a) writt b) oral c) oral d) proj e) pres If a wri stead t of asse nation Langua Assess	en exa examir examir ect rep- entatio tten ex- cake the essmen date at age of a sment o	mination (approx. 90 to nation of one candidate nation in groups (groups ort (approx. 8 to 10 pag n/talk (approx. 30 min amination was chosen e form of an oral examin t is changed, the lectur t the latest. ssessment: German an ffered: In the semester	 120 minutes) or each (approx. 30 minutes) of 2, approx. 30 minutes) or as method of assessmention of one candidater must inform studen d/or English in which the course is 	utes) or ites per candidate) o ent, this may be cha e each or an oral exa ts about this by four offered and in the su	r nged and assessme mination in groups. weeks prior to the o ubsequent semester	nt may in- If the method riginal exami-
Allocat	tion of	places				
Additional information						
Workload						
180 h						
Teachi	ng cvcl	e				
Referre	ed to in	LPOI (examination reg	gulations for teaching.	degree programmes)		
L						
Master's w	ith 1 majo	r Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 364 / 403

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 365 / 40
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation		
Physics of Advanced Materials					11-PMM-161-m01	
Module coordinator				Module offered by		
Manag	Managing Director of the Institute of Applied Physics			Faculty of Physics a	nd Astronomy	
FCTS	Mothe	d of grading	Only after succ. con	nl of module(s)	ind Astronomy	
6	nume	rical grade				
Durati	Indific		044			
1 seme	on ster	graduate	Other prerequisites			
Conten	its	Siduate	1			
Genera	l nrone	rties of various material	groups such as liquid	le liquid crystals an	d polymers, magneti	c materials
and su	nercon	fuctors: thin films, hete	rostructures and sune	erlattices. Methods o	f characterising thes	e material
groups	; two-d	imensional layer materia	als.	indulices. Methods o	r characterising thes	
Intend	ed learr	ning outcomes				
The stu	ıdents l	know the properties and	characterization met	hods of some moder	n materials.	
Course	s (type,	number of weekly cont	act hours, language –	- if other than Germa	n)	
V (3) +	R (1)					
Module	e taugh	t in: German or English				
Metho ster. in	d of ass formati	essment (type, scope, l on on whether module o	anguage — if other th an be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt		mination (approx. oo to	120 minutes) or			
b) oral examination (approx. 90 to 120 minutes) or						
c) oral	examin	ation in groups (groups	of 2, approx. 30 minu	tes per candidate) o	r	
d) proj	ect repo	ort (approx. 8 to 10 page	s) or			
e) pres	entatio	n/talk (approx. 30 minu	tes).			
If a wri	tten exa	mination was chosen a	s method of assessme	ent, this may be chai	nged and assessmer	nt may in-
stead t	ake the	form of an oral examination	ation of one candidate	e each or an oral exa	mination in groups.	If the method
of asse	essment	t is changed, the lecture	r must inform student	s about this by four	weeks prior to the or	iginal exami-
langua	uale al	ille idlesi.	l/or English			
Assess	ment o	ffered: In the semester i	n which the course is	offered and in the su	ubsequent semester	
Allocat	ion of p	olaces			·	
Additio	onal info	ormation				
			_			
Worklo	ad					
180 h						
Teachi	ng cycl	9	<u>.</u>			
Referre	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Module	e appea	rs in				
Master	's degre	ee (1 major) Mathematic	s (2016)			
Master	's degre	ee (1 major) Physics (20:	16)			
Master	's degre	ee (1 major) Nanostructu	re Technology (2016)			
Master	's degre	ee (1 major) Computatio	nal Mathematics (201	6)		
Master	's degre	ee (1 major) Functional N	Aaterials (2016)			
Master	's teacł	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supple	mentar	y course MINT Teacher E	ducation PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg data record	g ● generated 19-Apr-2025 ● e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 366 / 403

Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Nanostructure Technology (2020) Master's degree (1 major) Physics (2020) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020) Master's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Functional Materials (2022) Master's degree (1 major) Mathematics (2022) exchange program Physics (2023) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Functional Materials (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Quantu	m Field	l Theory II			11-QFT2-161-m01	
Module coordinator				Module offered by		
Managing Director of the Institute of Theo and Astrophysics			eoretical Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Contents						
 Generating Functionals Path Integrals Renormalization Renormalization group Gauge theories Spontaneous Symmetry Breaking 						
Intende	dloar					
The students have advanced knowledge of the methods and concepts of quantum field theory. They have maste- red the principles, especially of renormalisation and gauge theories. They are able to formulate and solve pro- blems of quantum field theory by using the acquired calculation methods.						
V (4) + I Module	R (2) e taugh	t in: German or English				
Methoo ster, inf	l of ass formati	essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
a) writte b) oral e c) oral e d) proje e) prese If a writ stead ta of asse nation e Langua Assess	en exar examin ext repo entatio ten exa ake the ssmen date at ge of a ment o	mination (approx. 90 to 1 lation of one candidate e ation in groups (groups o ort (approx. 8 to 10 pages n/talk (approx. 30 minut amination was chosen as form of an oral examina- t is changed, the lecturer the latest. ssessment: German and, ffered: In the semester in	20 minutes) or ach (approx. 30 minu of 2, approx. 30 minu o) or es). method of assessme tion of one candidate must inform student /or English	utes) or tes per candidate) of ent, this may be char e each or an oral exa is about this by four offered and in the su	r nged and assessment may in- mination in groups. If the method weeks prior to the original exami- ubsequent semester	
Allocat	ion of p	olaces				
Additio	nal info	ormation				
Worklo	ad					
240 h						
Teachir	ng cycl	e				
Referre	d to in	LPOI (examination regu	lations for teaching-	degree programmes)		
Module	Module appears in					

Master's with 1 major Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 369 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation				
Quantum Information and Quantum Computing			-	11-QIC-161-m01			
Module	e coord	inator		Module offered by			
Managing Director of the Institute of Theoretical Physics and Astrophysics		Theoretical Physics	Faculty of Physics a	and Astronomy			
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)			
6	nume	rical grade	11-QM2 or 11-TFK				
Duratio	on	Module level	Other prerequisites	i			
1 seme	ster	graduate					
Conten	ts						
 Brief summary of classical information theory Quantum theory seen from the perspective of information theory Composite systems and the Schmidt decomposition Entanglement measures Quantum operations, POVMs, and the theorems of Kraus and Stinespring Quantum gates and quantum computers Elements of the theory of decoherence 							
Intende	ed lear	ning outcomes					
The students acquire a comprehensive understanding of quantum states and density matrices beyond the usual textbook interpretation. The learn how to safely handle tensor products and multipartite quantum systems. The main topics of the lecture include basic mathematical concepts of quantum information theory and the limits of quantum computing arising from decoherence.					nd the usual /stems. The the limits of		
Course	s (type	, number of weekly cor	itact hours, language –	- if other than Germa	ın)		
V (3) + Module	R (1) e taugh	t in: German or English					
Method ster, in	d of ass formati	sessment (type, scope, ion on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-	
a) writt b) oral c) oral d d) proje e) press If a writ stead t of asse nation Langua Assess	en exa examin examin ect repo entatio tten exa ake the essmen date at age of a ment o	mination (approx. 90 to nation of one candidate lation in groups (group ort (approx. 8 to 10 pag n/talk (approx. 30 min amination was chosen to form of an oral examination t is changed, the lecture the latest. ssessment: German ar ffered: In the semester	o 120 minutes) or e each (approx. 30 minu s of 2, approx. 30 minu res) or utes). as method of assessmenation of one candidate rer must inform student in which the course is	utes) or tes per candidate) o ent, this may be char e each or an oral exa is about this by four offered and in the su	r nged and assessmer mination in groups. weeks prior to the or ubsequent semester	nt may in- If the method riginal exami-	
Allocat	ion of _l	olaces					
Additio	onal inf	ormation					
Workload							
180 h							
Teaching cycle							
Referre	ed to in	LPOI (examination re		legree programmes)			
L							
Master's wi	ith 1 majo	r Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. ik - 2019	page 370 / 403	

Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Physics (2016) Master's degree (1 major) Nanostructure Technology (2016) Master's degree (1 major) Mathematical Physics (2016) Master's degree (1 major) Computational Mathematics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019) JMU Würzburg • generated 19-Apr-2025 • exam. reg. page 371 / 403 data record Master (120 ECTS) Mathematik - 2019

Module title					Abbreviation	
Quantu	m Mec	hanics II			11-QM2-161-m01	
Module	coord	inator		Module offered by		
Managing Director of the Institute of Th and Astrophysics			eoretical Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
8	numei	rical grade				
Duratio	n	Module level	Other prerequisites			
1 semes	ster	undergraduate				
Conten	ts	-				
Contents The contents of this lecture build upon and will be chosen in accordance with the topics of the Bachelor's degree course "Quantum Mechanics I". Topics might include: for QM: 1. Historical introduction 2. Single-particle states in a central potential 3. Principles of quantum mechanics 4. Spin and angular momentum 5. Approximations of energy eigenvalues 6. Approximations for time-dependent problems 7. Second quantisation 8. Potential scattering 9. General scattering theory 10. Canonical formalism 11. Charged particles in electromagnetic fields 12. Quantum theory of radiation 13. Quantum entanglement						
The stu most of The con	dents a the the npletio	acquire in-depth knowled eoretical Master's degree n of this course is highly	ge of advanced quar courses in Astrophy recommended.	ntum mechanics. Thi rsics, Particle Physics	s knowledge is highly relevant to and Condensed Matter Physics.	
Course	s (type,	number of weekly conta	ct hours, language –	- if other than Germa	n)	
V (4) + I Module	R (2) taugh	t in: German or English				
Method ster, inf	l of ass formati	essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 						
Allocat	ion of p	olaces				
Additio	nal info	ormation				

Aaster's with	1 major Mathematics	(2019)	

Workload

240 h

Teaching cycle

Referred to in LPO I (examination regulations for teaching-degree programmes)

Module appears in

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Nanostructure Technology (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Nanostructure Technology (2020)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Mathematical Physics (2020)

Master's degree (1 major) Quantum Technology (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

Master's degree (1 major) Mathematical Physics (2022)

exchange program Physics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.
	data record Master (120 ECTS) Mathematik - 2019

Module title			Abbreviation					
Quantum Transport 11-QTH-161-mo1								
Module coordinator			Module offered by					
Managi	ng Dire	ector of the Institute of <i>i</i>	Applied Physics Faculty of Physics and Astronomy					
ECTS	Metho	od of grading	Only after succ. con	Only after succ. compl. of module(s)				
6	nume	rical grade						
Duratio	n	Module level	Other prerequisites					
1 seme	ster	graduate						
Conten	ts							
The lect topics of phenor transpo	ture ad of: balli nena b ort pher	dresses the fundament stic and diffuse transp etween electrons, Coul nomena, topological in	al transport phenomer ort, electron interferen omb blockade, thermo sulators, solid-state qu	na of electrons in nai ce effects, quantisat electric properties, d antum computers.	nostructures. This in ion of conductivity, i lescription of spin-d	cludes the nteraction ependent		
Intende	ed learr	ning outcomes						
The stu ons and	dents l d appli	nave mastered the basi cations of respective co	cs of electronics of name of the section of the sec	nostructures in theor	y and practice. They	know functi-		
Course	s (type	number of weekly con	tact hours, language –	if other than Germa	n)			
V (3) + I Module	R (1) e taugh	t in: German or English						
Method	l of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-		
ster, in	formati	on on whether module	can be chosen to earn	a bonus)				
 b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 						nt may in- If the method riginal exami-		
Allocat	ion of p	olaces						
Additio	nal info	ormation						
Worklo	ad							
180 h								
Teachir		2						
reaciiii	IS LYLL	-						
Referred to in LPU I (examination regulations for teaching-degree programmes)								
Module	e appea	rs in						
Master'	's degre	ee (1 major) Mathemati	cs (2016)					
Master's degree (1 major) Physics (2016)								
Master's degree (1 major) Nanostructure rechnology (2016) Master's degree (1 major) Computational Mathematics (2016)								
Master	s uegre 's degre	e (1 major) Computation	Materials (2016)	0)				
Master's wi	th 1 maior	Mathematics (2019)	IMU Würzburg	• generated 19-Apr-2025 • e	xam. reg.	page 374 / 403		
	.,		data record l	Master (120 ECTS) Mathemati	k - 2019			

Julius-Maximilians-UNIVERSITÄT WÜRZBURG

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Functional Materials (2022) Master's degree (1 major) Functional Materials (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 375 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title					Abbreviation	
Quantı	Quantum Information Technology 11-QUI-161-mo1					
Module coordinator Module offered by						
Managing Director of the Institute of Applied Physics Faculty of Physics and Astronomy						
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6	numer	rical grade				
Duratio	on	Module level	Other prerequisites	i		
1 seme	ster	graduate				
Conten	its					
Basic c proach and qu	oncept es towa antum	s of quantum mechani ards quantum computi noise, quantum inform	cs, quantum bits and a ng (on the basis of pho ation and communicat	lgorithms, quantal m tons, ions and nucle ion.	neasurements, expen ar spins), quantum (rimental ap- operations
Intend	ed learr	ning outcomes				
The stu know e mation	idents a xperim	are familiar with the ba ental approaches for th	sic quantum mechanic ne realisation of quantu	al terms of quantum um computers and fo	information technol r the transfer of qua	ogy. They ntum infor-
Course	s (type,	number of weekly con	tact hours, language –	- if other than Germa	n)	
V (3) + Module	R (1) e taught	t in: German or English				
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
 b) oral examination (approx. 90 to 120 minutes) or c) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 						
Allocat	ion of p	olaces				
Additio	onal info	ormation				
Worklo	ad					
180 h						
Teachi	ng cycle	a				
		•				
Poforro	d to in	IPOL (examination re	ulations for teaching	degree programmes)		
Referred to in LFOT (examination regulations for teaching-degree programmes)						
Mactor	e appea	15 III	cc (2016)			
Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Physics (2016)						
Master's degree (1 major) Nanostructure Technology (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master	's teach	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Master's w	ith 1 major	Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e	xam. reg.	page 376 / 403
			uata record	master (120 בכוס) Mathemati	K - 2019	



Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 377 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Many Body Quantum Theory			11-QVTP-161-m01			
Module coordinator				Module offered by		
Manag and As	ing Dir trophy	ector of the Institute of T sics	heoretical Physics	Faculty of Physics a	nd Astronomy	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conter	Its					
In this thods of 1. Sing 2. Revi 3. Pertu 4. Pertu 5. Lanc 6. Sup	 In this lecture, Quantum Physics of many-particle systems are introduced on the basis of the perturbative methods of the Green's functions. A possible outline might be: 1. Single-particle Green's function 2. Review of second quantisation 3. Perturbation theory using many-particle Green's functions at temperature T=0 4. Perturbation theory for finite temperatures 5. Landau theory of Fermi liquids 6. Superconductivity 					
/. One	-diloar					
The stu ledge e and to	idents enables unders	acquire knowledge of th s them to study propertie tand the effects of intera	e methods of quantur s of Fermi liquids (an actions, including sup	n field theory in a no d bosonic systems) b erconductivity and tl	n-relativistic context beyond the one-parti he Kondo effect.	t. This know- icle picture,
Course	e s (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (4) + Module	R (2) e taugh	t in: German or English				
Metho ster, in	d of as format	sessment (type, scope, l ion on whether module o	anguage — if other th an be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writt b) oral c) oral d) proj e) pres If a wri stead t of asse nation Langua Assess	 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 					
Allocat	ion of	places				
Additio	onal inf	ormation				
Workload						
240 h						
Peferred to in LPO L (examination regulations for teaching degree programmed)						
Referre				active programmes)		
Master's w	ith 1 majo	r Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 378 / 403

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 379 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module	title				Abbreviation	
Relativistic Quantum Field Theory					11-RQFT-161-m01	
Module coordinator				Module offered by		
Managi and Ast	ng Dire rophys	ctor of the Institute of Th ics	eoretical Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
8	numer	ical grade				
Duratio	n	Module level	Other prerequisites			
1 semes	ster	graduate				
Content	ts					
 Symmetries Relativistic single-particle states Lagrange formalism for fields Field quantisation Scattering theory and S-matrix Gauge principle and interaction Perturbation theory Feynman rules Quantum electrodynamic processes in Born approximation Radiative corrections Renormalisation (optional) Intended learning outcomes The students have mastered the principles and underlying mathematics of relativistic quantum field theories. They know how to use perturbation theory and how to apply Feynman rules. They are able to calculate basics processes in the framework of quantum electrodynamics in leading order. Moreover, they have a basic understanding of radiative corrections and renormalisation. Courses (type, number of weekly contact hours, language — if other than German)						
Module Method	taught I of ass	t in: German or English essment (type, scope, la	nguage — if other th	an German, examina	tion offered — if not every seme-	
ster, inf	ormati	on on whether module ca	an be chosen to earn	a bonus)		
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 						
Allocation of places						
Additio	nal info	ormation				
Workloa	ad					
240 h						

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.
	data record Master (120 ECTS) Mathematik - 2019

Teaching cycle

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 381 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module	e title				Abbreviation	
Theory	Theory of Relativity 11-RTT-161-m01					
Module coordinator				Module offered by		
Managing Director of the Institute of Theoretical Physics and Astrophysics			neoretical Physics	Faculty of Physics and Astronomy		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
1. Math 2. Diffe 3. Brief 4. Elem 5. Elect 6. Field 7. Stella 8. Intro	ematic rential Summ ents of rodyna equati ar equi duction	al Foundations forms ary of the special relativ ^F differential geometry mics as an example of a fons of the fundamental librium and other astrop	ity relativistic gauge the structure of general re hysical applications	eory elativity		
Intende	d lear	ning outcomes				
The stu main to electroo to simp	dents l pics in dynami le moc	become familiar with the clude modern formulation ics as a gauge theory and lels of stellar equilibrium	principal physical ar on on the basis of diff d general relativity ar and are introduced t	d mathematical con erential forms. Furth e emphasised. The si to basic elements of	cepts of general rela ermore, the similarit tudents learn to app cosmology.	tivity. The ies between ly the theory
Course	s (type	, number of weekly conta	act hours, language –	- if other than Germa	n)	
V (3) + Module	R (1) e taugh	t in: German or English				
Methoo ster, in	l of ass formati	e ssment (type, scope, la on on whether module c	anguage — if other th an be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writte b) oral e c) oral e d) proje e) prese If a writ stead ta of asse nation Langua Assess	en exan examir examin ect repo entatio ten exa ake the ssmen date at ge of a ment o	mination (approx. 90 to a lation of one candidate of ation in groups (groups ort (approx. 8 to 10 page n/talk (approx. 30 minut amination was chosen as form of an oral examinat t is changed, the lecture the latest. ssessment: German and ffered: In the semester in	220 minutes) or each (approx. 30 minu of 2, approx. 30 minu s) or ces). s method of assessmution of one candidate r must inform student /or English n which the course is	utes) or tes per candidate) or ent, this may be char e each or an oral exam s about this by four offered and in the su	r nged and assessmer mination in groups. I weeks prior to the or Ibsequent semester	nt may in- If the method 'iginal exami-
Allocat	ion of p	olaces				
Additio	nal inf	ormation	-			
Workload						
180 h						
 D-(
Referre	d to in	LPUI (examination regi	liations for teaching-	legree programmes)		
Master's wi	th 1 majo	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 FCTS) Mathemati	xam. reg. k - 2019	page 382 / 403

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 383 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Spintro	onics				11-SPI-161-m01	
Module	e coord	inator		Module offered by		
Managi	ing Dire	ector of the Institute of	Applied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
This lec magnet spin dy	ture co toresist namice	overs the basic principl cance and tunnel magn and current-induced s	es of spin transport, wi etoresistance. As a las pin phenomena.	th a particular emph t point, we discuss n	asis on the phenom ew phenomena fron	ena of giant 1 the field of
Intende	ed learı	ning outcomes				
The stu mation nel mag	dents l techno gnetore	know the basic principl plogy. They have gained esistance).	es of spin transport mo an overview of curren	odels and the applica t findings in this field	ations of spin transp d (giant magnetoresi	ort in infor- stance, tun-
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (3) + Module	R (1) e taugh	t in: German or English				
Method	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
c) oral d d) proje e) prese If a writ stead ta of asse nation Langua	examin ect repo entatio ten exa ake the ssmen date at ge of a ment o	ation in groups (group ort (approx. 8 to 10 pag n/talk (approx. 30 min amination was chosen form of an oral examin t is changed, the lectur the latest. ssessment: German ar ffered: In the semester	each (applox. 30 minu s of 2, approx. 30 minu es) or utes). as method of assessm nation of one candidate er must inform student d/or English in which the course is	tes per candidate) of ent, this may be char e each or an oral exa ts about this by four offered and in the su	r nged and assessmer mination in groups. weeks prior to the or ubsequent semester	nt may in- If the method ʻiginal exami-
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
180 h						
Teachir		n				
reactin	IS CYC	5				
Deferre	d to in	IDOL (avamination ro		dagraa pragrammac)		
Referre				degree programmes)		
		•				
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Nanostructure Technology (2016)						
Master's degree (1 major) Computational Mathematics (2016)						
Master	's teacl	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Master's wi	ith 1 majoi	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 384 / 403

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Nanostructure Technology (2020)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Quantum Technology (2021)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

exchange program Physics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 385 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation		
Topological	Effects in Electronic Sys	tems		11-TEF-161-m01	
Module coor	dinator		Module offered by		
Managing Di and Astroph	rector of the Institute of ysics	Theoretical Physics	Faculty of Physics and Astronomy		
ECTS Met	nod of grading	Only after succ. cor	npl. of module(s)		
6 num	erical grade				
Duration	Module level	Other prerequisites	i		
1 semester	graduate				
Contents					
The continuc tors, and spi the students developmen	ous development of the n liquids requires a con understanding of conce ts. The specific choice o	field of topological pha inuous adaptation of t epts related to contemp f topics will vary with th	ses including topolo he graduate curriculu orary research and/o ne lecturers from yea	gical insulators, sup um. The course aims or to keep up with co r to year.	erconduc- to deepen ontemporary
Intended lea	rning outcomes				
The course o the Universit	ffers the opportunity to y of Würzburg.	get acquainted with to	pics of immediate rel	evance to research o	conducted at
Courses (typ	e, number of weekly cor	ntact hours, language –	- if other than Germa	n)	
V (3) + R (1) Module taug	ht in: German or English				
Method of as ster, informa	ssessment (type, scope, tion on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
 a) written ex b) oral exam c) oral exam d) project re e) presentati lf a written e stead take th of assessme nation date a Language of Assessment 	 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 				
Allocation of	places				
Additional in	Iformation				
Workload					
180 h					
Teaching cv	cle				
Referred to i	n LPO I (examination re	gulations for teaching-	degree programmes)		
		Sulations for teaching			
Modulo ann	arc in				
Mastor's dog	roo (1 major) Mathomat	ics (2016)			
Master's deg	rree (1 major) Mathemat	016)			
Master's degree (1 major) Mathematical Physics (2016)					
Master's deg	Master's degree (1 major) Computational Mathematics (2016)				
Master's with 1 ma	jor Mathematics (2019)	JMU Würzburg	g • generated 19-Apr-2025 • e	xam. reg.	page 386 / 403
		data record	Master (120 ECTS) Mathemati	k - 2019	

Julius-Maximilians-UNIVERSITÄT WÜRZBURG

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 387 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation			
Theore	tical El	ementary Particle Phys	sics		11-TEP-161-m01		
Module	e coord	inator		Module offered by	Module offered by		
Manag and As	ing Dire trophys	ector of the Institute of sics	Theoretical Physics	Faculty of Physics and Astronomy			
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)			
8	nume	rical grade					
Duratio	on	Module level	Other prerequisites	Other prerequisites			
1 seme	ster	graduate					
Conten	ts						
1. Fund 2. Sym 3. Quar 4. Quar 5. Princ 6. Gaus 7. Spor 8. Elect 9. Quar	lamenta metries rk mode rk parto ciples o ge theo ntaneou troweal ntum cl	al particles and forces and groups el of hadrons on model and deep ine f quantum field theory ries us symmetry breaking < standard model nrome dynamics	lastic scattering				
10. EXte	ensions	s of the standard mode	l				
Intende	ed lear	ning outcomes					
structu lation r re, they	re of th nethod y know	e standard model base s for the processing of the tests and limits of	ed on symmetry princip simple problems and the standard model an	t Elementary Particle bles and experimenta processes of Elemen d the basics of exten	a Physics. They under It observations. They tary Particle Physics. Ided theories.	rstand the v know calcu- . Furthermo-	
Course	s (type	, number of weekly cor			(11)		
V (4) + Module	R (2) e taugh	t in: German or English					
Methor ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-	
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 							
Allocat	ion of _l	olaces					
Additional information							
Workload							
240 h							
Master's w	ith 1 majo	r Mathematics (2019)	JMU Würzbur data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	exam. reg. ik - 2019	page 388 / 403	

Referred to in LPO I (examination regulations for teaching-degree programmes)

Module appears in

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 389 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module	title				Abbreviation
Theoret	tical So	olid State Physics			11-TFK-161-m01
Module coordinator				Module offered by	
Managing Director of the Institute of Theoretical Physics and Astrophysics			eoretical Physics	Faculty of Physics a	ind Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
8	nume	rical grade			
Duratio	n	Module level	Other prerequisites	i	
1 seme	ster	graduate			
Conten	ts				
The cor bus wh A possi 1 Band pologic 2 Electr ry, rand 3 Applie 4 BCS t	itents of ich cou ble syll structu al insu on-eleo lom ph cation heory o	of this two-term course w Id alternatively be offere labus may be: Ire (Sommerfeld theory of lators (TIs), bulk-surface ctron interactions in solic ase approximation (RPA) of mean field theory and of superconductivity	ill depend on the cho d as "Quantum Many f metals, Bloch theor correspondence, ger ls (path integral metl , density functional t the RPA to magnetism	bice of the lecturer, a y Body Physics" (11-C em, k.p approach an heral properties of Th hod for weakly intera heory) m	nd may include parts of the sylla- QVTP). Id effective Hamiltonians for to- s) Incting fermions, mean field theo-
Intende	ed learn	ning outcomes			
During sics, wh cepts a sics" ar	the two nich are nd the nd "Qua	o-semester lecture, the st e addressed in classical t methods of description. antum Mechanics".	udents acquire a bas extbooks, and there The course builds up	sic understanding of by advance their kno on the courses "Exp	many topics of Solid-State Phy- wledge of the underlying con- erimental Condensed Matter Phy-
Courses	s (type,	, number of weekly conta	ct hours, language –	- if other than Germa	in)
V (4) + I Module	R (2) e taugh	t in: German or English			
Method ster, inf	l of ass formati	e ssment (type, scope, la on on whether module ca	nguage — if other th an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. 					
Assess	ment o	ffered: In the semester in	which the course is	offered and in the su	ubsequent semester
Allocat	Allocation of places				
Additio	Additional information				
Worklo	ad				
240 h					
Teachir	ng cycl	e			

Referred to in LPO I (examination regulations for teaching-degree programmes)

Module appears in

Master's degree (1 major) Mathematics (2016)
Master's degree (1 major) Physics (2016)
Master's degree (1 major) Nanostructure Technology (2016)
Master's degree (1 major) Mathematical Physics (2016)
Master's degree (1 major) Computational Mathematics (2016)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)
Master's degree (1 major) Computational Mathematics (2019)
Master's degree (1 major) Mathematics (2019)
Master's degree (1 major) Nanostructure Technology (2020)
Master's degree (1 major) Physics (2020)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)
Master's degree (1 major) Mathematical Physics (2020)
Master's degree (1 major) Quantum Technology (2021)
Master's degree (1 major) Computational Mathematics (2022)
Master's degree (1 major) Mathematics (2022)
Master's degree (1 major) Mathematical Physics (2022)
exchange program Physics (2023)
Master's degree (1 major) Computational Mathematics (2024)
Master's degree (1 major) Mathematics (2024)
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 391 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module	title			-	Abbreviation
Theoret	tical So	olid State Physics 2			11-TFK2-161-m01
Module	coord	inator		Module offered by	
Managi and Ast	ng Dire rophys	ector of the Institute of Th ics	eoretical Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
8	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semes	ster	graduate			
Conten	ts				
A contir 5. Adva Anderso 6. Unco 7. Green 8. The k	nuatior nced to on-Higg nvention n's fun Kondo I	n of the first semester (11- opics of the theory of sup gs description of the Meis onal superconductors (e. ction methods and Feynn Effect (Anderson's "poor	TFK) might be the for erconductivity (Bogo ssner effect) G. copper-oxide high nan diagrammatic te mans scaling", renor	llowing syllabus: Niubov-de Gennes ec N-Tc superconductors chnique malization group)	quations, effective field theory,
Intende	ed learr	ning outcomes			
During t sics, wh cepts a sics" ar	the two nich are nd the nd "Qua	o-semester lecture, the st e addressed in classical t methods of description. antum Mechanics".	udents acquire a bas extbooks, and there The course builds up	sic understanding of by advance their kno on the courses "Exp	many topics of Solid-State Phy- wledge of the underlying con- erimental Condensed Matter Phy-
Courses	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)
V (4) + I Module	R (2) taugh	t in: German or English			
Method ster, inf	l of ass formati	essment (type, scope, la on on whether module ca	nguage — if other th an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
a) writte b) oral e c) oral e d) proje e) prese If a writ stead ta of asse nation e Langua Assessi	 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 				
Allocati	ion of p	olaces			
Additio	nal info	ormation			
Worklo	ad				
240 h					
Teachir	ng cvcl	9			
	3 29 50	-			
Referre	d to in	LPOI (examination regu	lations for teaching.	legree programmes)	
Module	appea	rs in			

Master's with 1 major Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 393 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Topolo	gy in So	olid State Physics			11-TFP-161-m01	
Module	e coordi	nator		Module offered by		
Managi	ing Dire	ctor of the Institute of Ap	plied Physics	Faculty of Physics a	aculty of Physics and Astronomy	
ECTS	Metho	d of grading	Only after succ. con	npl. of module(s)		
6	numer	ical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
1. Geon 2. Math 3. Time 4. Hall 0 5. Bulk- 6. Grap 7. Quar 8. Z2 in 9. Topo Intende The stu concep Würzbu Course:	 Geometric phase in quantum systems Mathematical basics of topology Time-reversal symmetry Hall conductance and Chern numbers Bulk-boundary correspondence Graphene (as a topological insulator) Quantum Spin Hall insulators Z2 invariants Topological superconductors Intended learning outcomes The students acquire a theoretical understanding of topological concepts in modern Solid-State Physics. These concepts serve as a basis of many research activities of the Faculty of Physics and Astronomy at the University of Würzburg.					
Course	s (type,		ict nours, language –		III <i>)</i>	
V (3) + Module	R (1) e taught	in: German or English				
Methoo ster, inf	d of ass formati	essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) writte b) oral e c) oral e d) proje e) prese If a writ stead ta of asse nation e Langua Assess	en exar examin examin ect repo entation tten exa ake the essment date at age of a ment of	nination (approx. 90 to 1 ation of one candidate e ation in groups (groups o ort (approx. 8 to 10 pages n/talk (approx. 30 minut mination was chosen as form of an oral examina is changed, the lecturer the latest. ssessment: German and, fered: In the semester in	20 minutes) or ach (approx. 30 minu of 2, approx. 30 minu s) or es). method of assessme tion of one candidate must inform student /or English which the course is	utes) or tes per candidate) o ent, this may be chan e each or an oral exa is about this by four offered and in the su	r nged and assessme mination in groups. weeks prior to the o ubsequent semester	nt may in- If the method riginal exami-
Allocat	ion of p	laces				
Additio	onal info	ormation				
Worklo	ad					
180 h						
Teachir	ng cycle	9				
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Master's wi	ith 1 maior	Mathematics (2019)	IMU Würzburg	• generated 19-Apr-2025 • e	xam. reg.	page 394 / 403

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 395 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title				Abbreviation			
Topological Order			11-TOPO-161-m01				
Module coordinator			Module offered by				
Manag	Managing Director of the Institute of Applied Physics		plied Physics	Faculty of Physics and Astronomy			
ECTS	Metho	d of grading	Only after succ. compl. of module(s)				
6	nume	rical grade					
Duratio	on	Module level	Other prerequisites				
1 seme	1 semester graduate						
Contents							
 Topologically ordered phases possess no order in the conventional sense (i.e., no broken symmetry and no local order parameter). The order is instead characterized by topological quantum numbers. In the course, the general concepts will be illustrated with the study of specific examples of systems with topological order. The topics discussed may include: Fractional charge and statistics in quantized Hall fluids Spin charge separation in spin chains and chiral spin liquids Non-Abelian statistics of fractionalized excitations Majorana zero modes in p-wave superconductors Topological degeneracies on higher genus surfaces (e.g., torus geometry) Spinons and visons in spin liquids including Kitaev models. 							
Intended learning outcomes							
The students acquire in-depth knowledge of topological order in quantum condensates.							
Courses (type, number of weekly contact hours, language — if other than German)							
V (3) + R (1) Module taught in: German or English							
Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)							
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 							
Allocation of places							
Additional information							
Workload							
180 h							
Teaching cycle							
Referred to in LPO I (examination regulations for teaching-degree programmes)							
Module appears in							

Master's with 1 major Mathematics (2019)
Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Physics (2016) Master's degree (1 major) Mathematical Physics (2016) Master's degree (1 major) Computational Mathematics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Computational Mathematics (2019) Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 397 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Experimental Particle Physics			11-TPE-161-m01			
Module coordinator		Module offered by				
Manag	ing Dire	ector of the Institute of A	pplied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	on ctor	Module level	Other prerequisites			
1 Seme	ster	graduate				
Conten	ts					
Physics supers as well of syste	s with n ymmeti as oth ematic	nodern particle detector ry and other physics bey er parameters of the sta errors.	s at the LHC and at the rond the standard mod ndard model. Introduc	e Tevatron. Discovery del. Determination of ction to modern meth	y of the Higgs boson f the top quark mass lods of analysis and	. Search for and W mass assessment
Intende	ed leari	ning outcomes				
The stu questic lysis ar	idents a ons of P nd are a	are familiar with the prir Particle Physics, which a Ible to put results into c	ciples of modern part re examined by using ontext and to assess t	icle detector physics these detectors. The heir systematic unce	, especially with cur y know modern met ertainties.	rently open hods of ana-
Course	s (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (3) + Module	R (1) e taugh	t in: German or English	_			
Metho ster, in	d of ass formati	essment (type, scope, l on on whether module	anguage — if other the can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
 b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English 						
Allocation of places						
Additio	onal info	ormation				
Workload						
180 h						
Teaching cycle						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Physics (2016) Master's degree (1 major) Computational Mathematics (2016)						
Master's w	ith 1 majoı	Mathematics (2019)	JMU Würzburg data record J	g • generated 19-Apr-2025 • e Master (120 FCTS) Mathemati	xam. reg. k - 2010	page 398 / 403
				naster (120 Eers) mathemati		

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Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's degree (1 major) Physics (2020)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)

Master's degree (1 major) Computational Mathematics (2022)

Master's degree (1 major) Mathematics (2022)

exchange program Physics (2023)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 399 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Topological Quantum Physics 11-TQP-161-m01						
Module	e coord	inator		Module offered by		
Managing Director of the Institute of Theoretical Physics and Astrophysics			Theoretical Physics	Faculty of Physics a	and Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	n	Module level	Other prerequisites	;		
1 seme	ster	graduate				
Conten	ts					
The cou ding on tors ass 1. Intro 2. Majo	urse is a the lea suming ductior orana fe	aimed at Masters stude cturers emphasis, it is only "Quantum mecha to superconductivity (ermions and topologica	ents pursuing either ex meant to provide an in inics II" (11-QM2) as a p including BCS theory) I superconductors in 1	perimental or theore troduction to topolog prerequisite. The con D (Kitaev wires)	tical work in their th gical superconducto tents may include:	esis. Depen- rs and insula-
3. Topo stics)	logical	superconductors in tw	o dimensions (2D) (inc	luding Majorana edg	ge states and non-Ab	oelian stati-
4. Integ 5. Berry 6. Time	er qua s phas revers	ntum Hall effect and Cl se and Chern invariant: al symmetry and topole insulators in 3D	nern insulators (Haldar 5 ogical insulators in 2D	ie model, Jackiw-Reb	bi solitons and edge	e states)
Intende		ning outcomes				
In-dept	h unde	rstanding of the topolo	gical concepts of Quai	ntum Physics relevar	nt to current research	n projects of
Course	c (type	number of weekly con	tact hours language	if other than Corma		
V(a)					ui <i>)</i>	
Module	e taugh	t in: German or English				
Method ster, in	l of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester 						
Allocation of places						
Additional information						
Workload						
180 h						
Teaching cycle						
Master's wi	th 1 major	Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • € Master (120 ECTS) Mathemat	exam. reg. ik - 2019	page 400 / 403

Referred to in LPO I (examination regulations for teaching-degree programmes)

Module appears in

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Nanostructure Technology (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

Master's degree (1 major) Computational Mathematics (2019)

Master's degree (1 major) Mathematics (2019)

Master's with 1 major Mathematics (2019)	JMU Würzburg • generated 19-Apr-2025 • exam. reg.	page 401 / 403
	data record Master (120 ECTS) Mathematik - 2019	

Module title			Abbreviation			
Theory of Superconductivity			11-TSL-161-m01			
Module coordinator			Module offered by			
Managing Director of the Institute of Theoretical Physics and Astrophysics		Theoretical Physics	Faculty of Physics and Astronomy			
ECTS	Metho	od of grading	Only after succ. con	ompl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites	i		
1 seme	ster	graduate				
Conten	ts					
Overvie for sup conduc man di tuation nism. In arch to	ew of the ercond ctors. E agrams s, and nterpla pics an	te phenomenology of c uctivity. Review of BCS xtension of the phenor and functional integra coupling to the electro y of magnetism and co d perspective on room	onventional and uncon theory and critical disc nenological Ginzburg-L Ils. Ward identities and magnetic field. Interpre nventional/unconventi -temperature supercon	eventional supercond cussion of its applica andau theory to a qu response functions etation of the Meissn onal superconductiv ductivity.	luctivity. Empirical A ability for different ty antum field theory a Goldstone modes, er effect using the H ity. Discussion of cu	Aatthias rules pes of super- using Feyn- phase fluc- liggs mecha- urrent rese-
Intende	ed lear	ningoutcomes	<u> </u>			
This led tism in supercon reby it develop ting con	This lecture focuses on the understanding of unconventional superconductivity and the interactions with magne- tism in the current research context. The first part of the lecture addresses conventional molecular field theory of superconductivity (BCS theory), which fails when applied to new material classes such as high-temperature su- perconductors. Subsequently, it introduces tools of quantum field theory necessary to expand BCS theory. The- reby it especially focuses on Meissner effect and Higgs mechanism. The last part of the lecture discusses current developments concerning the description and analysis of (un)conventional superconductors and their fascina- ting connection to competing magnetic phases.					
Courses (type, number of weekly contact hours, language — if other than German)						
V (3) + Module	R (1) e taugh	t in: German or English				
Method ster, in	d of ass formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
 a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes). If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest. Language of assessment: German and/or English Assessment offered: In the semester in which the course is offered and in the subsequent semester. 						
Allocation of places						
Additional information						
Workload						
180 h						
reduill	ig cycl	C				
Master's wi	ith 1 majo	r Mathematics (2019)	JMU Würzburg data record	g • generated 19-Apr-2025 • e Master (120 ECTS) Mathemati	xam. reg. k - 2019	page 402 / 403

Referred to in LPO I (examination regulations for teaching-degree programmes)

Module appears in

Master's degree (1 major) Mathematics (2016)

Master's degree (1 major) Physics (2016)

Master's degree (1 major) Mathematical Physics (2016)

Master's degree (1 major) Computational Mathematics (2016)

Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)

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