

Subdivided Module Catalogue for the Subject

Mathematical Physics

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

Examination regulations version: 2022 Responsible: Faculty of Mathematics and Computer Science Responsible: Faculty of Physics and Astronomy

JMU Würzburg • generated 19-Apr-2025 • exam. reg. data record 88|b55|-|-|H|2022



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, auch fremdsprachiger, Fachliteratur in aktuelle Forschungsgebiete der Mathematischen Physik 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 vertiefte Kenntnisse der mathematischen Grundlagen der klassischen und Quantenphysik.
- Die Absolventinnen und Absolventen besitzen die für selbstständiges wissenschaftliches Arbeiten, insbesondere für ein Promotionsstudium erforderlichen Fach- und Methodenkenntnisse, sowie Denk- und Arbeitsweisen.
- 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 Mathematischen Physik 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 Mathematischen Physik.
- Die Absolventinnen und Absolventen sind in der Lage, mit internationalen Fachvertretern und -vertreterinnen auf dem aktuellen Stand der Forschung Fragestellungen der Mathematischen Physik zu diskutieren.
- Die Absolventinnen und Absolventen kennen angrenzende Gebiete der Mathematik und Physik, und erkennen interdisziplinäre Zusammenhänge.

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 und physikalischen 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 internationalen, interdisziplinär zusammengesetzten 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 sind in der Lage, auch bei unvollständig vorliegenden Informationen mathematisch-physikalische Probleme wissenschaftlich und unter Beachtung der

Master's with 1 major Mathematical Physics (2022)

Regeln guter wissenschaftlicher Praxis selbstständig zu bearbeiten und die Ergebnisse und Folgen ihrer Arbeit darzustellen, zu bewerten und zu vertreten.

Persönlichkeitsentwicklung

UNIVERSITÄT

WÜRZBURG

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

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)):

02-Feb-2022 (2022-1) 16-Nov-2022 (2022-80) 12-Jun-2024 (2024-77) 14-Nov-2024 (2024-98)

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.

Master's with 1 major Mathematical Physics (2022)

The subject is divided into

Abbreviation	Module title	ECTS credits	Method of grading	pag
Compulsory Courses (20 E	CTS credits)			
10-M=MP1-161-m01	Analysis and Geometry of Classical Systems	10	NUM	89
10-M=MP2-161-m01	Algebra and Dynamics of Quantum Systems	10	NUM	91
Compulsory Electives (50 I	ECTS credits)			
Subfield Mathematics (8	ECTS credits)			
10-M=AAAN-161-m01	Applied Analysis	10	NUM	9
10-M=AALG-161-m01	Topics in Algebra	10	NUM	11
10-M=ADGM-161-m01	Differential Geometry	10	NUM	1/
10-M=AFTH-161-m01	Complex Analysis	10	NUM	18
10-M=AGMS-161-m01	Geometric Structures	10	NUM	20
10-M=AIST-161-m01	Industrial Statistics 1	10	NUM	2.
10-M=ALTH-161-m01	Lie Theory	10	NUM	2
10-M=ANGG-161-m01	Numeric of Large Systems of Equations	10	NUM	2
10-M=AOPT-161-m01	Basics in Optimization	10	NUM	3
10-M=ARTH-161-m01	Control Theory	10	NUM	3
10-M=ASMR-161-m01	Stochastic Models of Risk Management	10	NUM	3
10-M=ASTP-161-m01	Stochastical Processes	10	NUM	3
10-M=ATOP-161-m01	Topology	10	NUM	3
10-M=AZRA-212-m01	Time Series Analysis	10	NUM	4
10-M=AZTH-161-m01	Number Theory	10	NUM	4
10-M=AGPCin-152-m01	Giovanni Prodi Lecture (Master)	5	NUM	2
10-M=VANA-161-m01	Selected Topics in Analysis	10	NUM	12
10-M=VATP-161-m01	Algebraic Topology	10	NUM	12
10-M=VGDS-161-m01	Groups and their Representations	10	NUM	13
10-M=VGEM-161-m01	Geometrical Mechanics	10	NUM	13
10-M=VIST-161-m01	Industrial Statistics 2	10	NUM	15
10-M=VKAR-161-m01	Field Arithmetics	10	NUM	15
10-M=VNPE-161-m01	Numeric of Partial Differential Equations	10	NUM	17
10-M=VOPT-161-m01	Selected Topics in Optimization	10	NUM	17
10-M=VSTA-212-m01	Mathematical Statistics	10	NUM	18
10-M=VDIM-161-m01	Discrete Mathematics	5	NUM	13
10-M=VDSY-161-m01	Dynamical Systems	5	NUM	13
10-M=VGEO-161-m01	Aspects of Geometry	5	NUM	1/
10-M=VKOM-161-m01	Mathematical Continuum Mechanics	5	NUM	16
10-M=VMBV-161-m01	Mathematical Imaging	5	NUM	16
10-M=VMPH-161-m01	Selected Topics in Mathematical Physics	10	NUM	16
10-M=VTRT-161-m01	Selected Topics in Control Theory	10	NUM	18
10-M=VIPR-222-m01	Inverse Problems 1	5	NUM	15
10-M=VMTH-161-m01	Module Theory	5	NUM	16
10-M=VNAN-161-m01	Non-linear Analysis	5	NUM	17
10-M=VOST-161-m01	Optimal Control	5	NUM	17
10-M=VVSY-161-m01	Networked Systems	5	NUM	18
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10-M=VIP2-222-m01	Inverse Problems 2	5	NUM	151
10-M=VAFT-222-m01	Selected Topics in Complex Analysis	5	NUM	121
10-M=AAZT-222-m01	Analytic Number Theory	10	NUM	13
10-M=VKGE-161-m01	Complex Geometry	10	NUM	159
10-M=VPDP-161-m01	Partial Differential Equations of Mathematical Physics	10	NUM	181
10-M=VPRG-161-m01	Pseudo Riemannian and Riemannian Geometry	10	NUM	183
10-M=AFAN-161-m01	Functional Analysis	10	NUM	16
10-M=VADG-161-m01	Applied Differential Geometry	10	NUM	119
10-M=VGPSin-152-m01	Giovanni Prodi Lecture Selected Topics (Master)	10	NUM	149
10-M=VGPAin-152-m01	Giovanni Prodi Lecture Advanced Topics (Master)	10	NUM	145
10-M=VGPMin-152-m01	Giovanni Prodi Lecture Modern Topics (Master)	10	NUM	147
10-M=VGFT-192-m01	Geometric Complex Analysis	10	NUM	143
10-M=VNAM-192-m01	Selected Topics in Numerical and Applied Mathematics	10	NUM	171
10-M=VKRY-192-m01	Cryptography/Coding Theory	10	NUM	163
10-M=VCAL-192-m01	Computer Algebra	10	NUM	131
10-M=VAZT-192-m01	Algorithmic Number Theory	10	NUM	129
10-M=VAGE-192-m01	Algebraic Geometry	10	NUM	123
10-M=SALG-161-m01	Seminar in Algebra	5	NUM	95
10-M=SDSC-161-m01	Seminar in Dynamical Systems and Control	5	NUM	10:
10-M=SCOA-161-m01	Seminar in Complex Analysis	5	NUM	99
10-M=SADG-161-m01	Seminar in Applied Differential Geometry	5	NUM	93
10-M=SGT0-161-m01	Seminar in Geometry and Topology	5	NUM	10
10-M=SGPCin-152-m01	Giovanni Prodi Seminar (Master)	5	NUM	10
10-M=SIDC-161-m01	Interdisciplinary Seminar	5	NUM	107
10-M=SMSC-161-m01	Seminar Mathematics in the Sciences	5	NUM	109
10-M=SNMA-161-m01	Seminar in Numerical Mathematics and Applied Analysis	5	NUM	113
10-M=SOPT-161-m01	Seminar in Optimization	5	NUM	115
10-M=SSTA-161-m01	Seminar in Statistics	5	NUM	117
10-M=SNLA-161-m01	Seminar in Non-linear Analysis	5	NUM	111
10-M=SAMA-192-m01	Seminar Applied Mathematics	5	NUM	97
10-M=ELT1-192-m01	Learning by Teaching 1	5	B/NB	44
Subfield Physics (8 ECTS	credits)		1	
Module Group General	Theory of Physics			
11-QM2-161-m01	Quantum Mechanics II	8	NUM	253
11-TQ0-221-m01	Theoretical Quantum Optics	8	NUM	27
11-RTT-161-m01	Theory of Relativity	6	NUM	257
11-RMFT-161-m01	Renormalization Group Methods in Field Theory	8	NUM	25
11-PKS-161-m01	Physics of Complex Systems	6	NUM	24
	Advanced Theory of Quantum Computing and Quantum Infor-			
11-QIC-201-m01	mation	6	NUM	251
11-SLQ-232-m01	Black Holes	6	NUM	259
11-APM-242-m01	Astrophysics	6	NUM	206
11-ATP-242-m01	Atmospheric Physics	6	NUM	210
11-0QS-242-m01	Open Quantum Systems	6	NUM	242
	cal Solid State Physics		I	<u> </u>
module oroup meeter				
11-TFK-161-m01	Theoretical Solid State Physics	8	NUM	269

11-TFK2-161-m01	Theoretical Solid State Physics 2	8	NUM	271
11-PTS-201-m01	Phenomenology and Theory of Superconductivity	6	NUM	245
11-TEFK-201-m01	Topological Effects in Solid State Physics	8	NUM	265
11-FFK-201-m01	Field Theory in Solid State Physics	8	NUM	228
11-AKTF-201-m01	Selected Topics of Theoretical Solid State Physics	6	NUM	202
11-CMS-161-m01	Computational Materials Science (DFT)	8	NUM	218
11-KFT-161-m01	Conformal Field Theory	6	NUM	234
11-KFT2-161-m01	Conformal Field Theory 2	6	NUM	236
11-TPSM-211-m01	Particle Physics (Standard Model)	8	NUM	273
11-CRP-161-m01	Renormalization Group and Critical Phenomena	6	NUM	220
11-BWW-161-m01	Bosonisation and Interactions in One Dimension	6	NUM	216
11-GGD-161-m01	Introduction to Gauge/Gravity Duality	8	NUM	231
Module Group Astrophy	sics			
11-AKM-161-m01	Cosmology	6	NUM	200
11-AST-161-m01	Theoretical Astrophysics	6	NUM	208
11-EPP-161-m01	Introduction to Plasma Physics	6	NUM	222
11-APL-161-m01	High Energy Astrophysics	6	NUM	204
11-NMA-161-m01	Computational Astrophysics	6	NUM	240
Module Group Theoretic	al Elementary Particle Physics			•
11-QFT1-201-m01	Quantum Field Theory I	8	NUM	247
11-QFT2-161-m01	Quantum Field Theory II	8	NUM	249
11-TEP-161-m01	Theoretical Elementary Particle Physics	8	NUM	267
11-ATTP-161-m01	Selected Topics of Theoretical Elementary Particle Physics	6	NUM	212
11-STRG1-171-m01	String Theory 1	8	NUM	261
11-STRG2-171-m01	String Theory 2	6	NUM	263
11-BSM-161-m01	Models Beyond the Standard Model of Elementary Particle	6	NUM	214
11-05/0-101-001	Physics	0	NOM	214
Module Group Current T	opics			
11-EXMP5-161-m01	Current Topics of Mathematical Physics	5	NUM	224
11-EXMP6-161-m01	Current Topics of Mathematical Physics	6	NUM	225
11-EXMP7-161-m01	Current Topics of Mathematical Physics	7	NUM	226
11-EXMP8-161-m01	Current Topics of Mathematical Physics	8	NUM	227
Subfield Research in Gro	ups (10 ECTS credits)			
10-M=GALG-161-m01	Research in Groups - Algebra	10	NUM	47
10-M=GDIM-161-m01	Research in Groups - Discrete Mathematics	10	NUM	56
10-M=GDSC-161-m01	Research in Groups - Dynamical Systems and Control Theory	10	NUM	58
10-M=GCOA-161-m01	Research in Groups - Complex Analysis	10	NUM	49
10-M=GGMT-161-m01	Research in Groups - Geometry and Topology	10	NUM	61
10-M=GMCX-161-m01	Research in Groups - Mathematics in Context	10	NUM	71
10-M=GMSC-161-m01	Research in Groups - Mathematics in the Sciences	10	NUM	73
10-M=GMAI-161-m01	Research in Groups - Measure and Integral	10	NUM	67
10-M=GNMA-161-m01	Research in Groups - Numerical Mathematics and Applied Ana- lysis	10	NUM	77
10-M=GROC-161-m01	Research in Groups - Robotics, Optimization and Control Theo- ry	10	NUM	83
10-M=GTSA-161-m01	Research in Groups - Time Series Analysis	10	NUM	87
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10-M=GSTA-161-m01	Research in Groups - Statistics	10	NUM	85
10-M=GNTH-161-m01	Research in Groups - Number Theory	10	NUM	79
10-M=GCQS-161-m01	Research in Groups - Control Theory of Quantum Mechanical Systems	10	NUM	51
10-M=GDGE-161-m01	Research in Groups - Differential Geometry	10	NUM	54
10-M=GDFQ-161-m01	Research in Groups - Deformation Quantization	10	NUM	52
10-M=GNLA-161-m01	Research in Groups - Non-linear Analysis	10	NUM	75
10-M=GOPA-161-m01	Research in Groups - Operator Algebras	10	NUM	81
10-M=GLIE-192-m01	Research in Groups - Lie Theory	10	NUM	66
10-M=GADG-192-m01	Research in Groups - Applied Differential Geometry	10	NUM	45
10-M=GMAP-192-m01	Research in Groups - Mathematical Physics	10	NUM	69
10-M=GHST-222-m01	Research in Groups - Higher Structures	10	NUM	63
10-M=GFAN-222-m01	Research in Groups - Functional Analysis	10	NUM	60
10-M=GINP-222-m01	Research in Groups - Inverse Problems	10	NUM	64
11-AG-MDG-161-m01	Study Group Modern Differential Geometry	10	NUM	193
11-AG-SPG-161-m01	Study Group Symplectic and Poisson Geometry	10	NUM	198
11-AG-OAD-161-m01	Study Group Operator Algebras and Representation Theory	10	NUM	195
11-AG-HAL-161-m01	Study Group Hopf Algebras	10	NUM	191
11-AG-KFT-161-m01	Study Group Conformal Field Theory	10	NUM	192
11-AG-STM-161-m01	Study Group Statistical Mechanics	10	NUM	199
11-AG-QFT-161-m01	Study Group Quantum Field Theory	10	NUM	196
11-AG-RGE-161-m01	Study Group Riemannian Geometry	10	NUM	197
11-AG-MPH-161-m01	Study Group Mathematical Physics	10	NUM	194
Thesis (50 ECTS credits)		•		•
11-FS-MP-161-m01	Professional Specialization Mathematical Physics	10	B/NB	230
11-MP-MP-161-mo1 Scientific Methods and Project Management Mathematical Physics		10	B/NB	239
11-MA-MP-161-m01	Master Thesis Mathematical Physics	30	NUM	238

Applied Analysis 10-M=AAAN-161-m01						
Module coordinator Module offered by						
Dean of Studies Mathematik (Mathematics) Institute of Mathematics						
ECTS Method of grading Only after succ. compl. of module(s)						
10 numerical grade						
Duration Module level Other prerequisites						
1 semester graduate						
Contents						
In-depth study of functional analysis and operator theory, Sobolev spaces and partial differential equa theory of Hilbert spaces and Fourier analysis, spectral theory and quantum mechanics, numerical meth particular FEM methods), principles of functional analysis, function spaces, embedding theorems, com theory of elliptic, parabolic and hyperbolic partial differential equations with methods from functional Recommended previous knowledge:	hods (in npactness,					
Familiarity with the contents of the module "Functional Analysis" is strongly recommended.						
Intended learning outcomes						
The student is acquainted with the fundamental notions, methods and results of higher analysis. He/S to establish a connection between his/her acquired skills and other branches of mathematics and que physics and other natural and engineering sciences.						
Courses (type, number of weekly contact hours, language — if other than German)						
V (4) + Ü (2) Module taught in: German and/or English						
Method of assessment (type, scope, language — if other than German, examination offered — if not ev ster, information on whether module can be chosen to earn a bonus)	very 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						
Additional information						
Workload						
300 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) 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)						
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Mathematical Physics

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)

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Module	e title				Abbreviation							
Topics	in Alge	bra			10-M=AALG-161-mo	1						
Module coordinator Module offered by												
Dean of Studies Mathematik (Mathematics)				Institute of Mathematics								
ECTS	1	od of grading	Only after succ. con									
10	· · · · · · · · · · · · · · · · · · ·	rical grade										
Duratio	· · · · ·	Module level	Other prerequisites									
1 seme		graduate										
Conten	its											
Conten algebra		topics in algebra, for exa	ample coding theory,	elliptic curves, algeb	oraic combinatorics	or computer						
Basic k		d previous knowledge: Ige of algebra is assumed ora".	d, such as can be acc	uired in the modules	s "Introduction to Al	gebra" and						
Intend	ed learr	ning outcomes										
		acquainted with fundam se skills to complex ques		nethods in a contem	porary field of algeb	ra, and is ab-						
Course	s (type	, number of weekly conta	ct hours, language –	· if other than Germa	n)							
V (4) +		<i>`</i>			•							
		t in: German and/or Engli	ish									
		essment (type, scope, la			tion offered — if not	every seme-						
ster, in	formati	on on whether module ca	an be chosen to earn	a bonus)								
		nination (approx. 90 to 1										
		ation of one candidate e ation in groups (groups o										
		ssessment: German or Er										
Assess	ment o	ffered: In the semester in		offered and in the su	bsequent semester							
credita	ble for	oonus										
Allocat	ion of p	olaces										
Additio	onal inf	ormation										
Worklo	ad											
300 h												
Teachi	ng cycl	9										
Referre	ed to in	LPOI (examination regu	lations for teaching-o	legree programmes)								
Module	e appea	rs in										
		ee (1 major) Mathematics	5 (2016)									
	-	ee (1 major) Mathematica										
Master	's degre	ee (1 major) Computation	al Mathematics (201	6)								
		ning degree Gymnasium I				016)						
		y course MINT Teacher Ed			3) (2016)							
	-	ee (1 major) Computation		9)								
	-		-		Master's degree (1 major) Mathematics (2019)							
Imaster	's teacr	110g Gegree Gvmnasium i	WINT Leacher Fourat	on PLUS, Flite Netwo	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) 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)

Module	title			Abbreviation	
Analyti	c Number Theory			10-M=AAZT-222-m	01
AA - J I.					
Module coordinator			Module offered by		
	f Studies Mathematik (Mathem		Institute of Mathem	natics	
ECTS	Method of grading	Only after succ. con	ipl. of module(s)		
10	numerical grade				
Duratio		Other prerequisites			
1 seme	ster graduate				
Conten	ts	_			
on, sun	nnian Zeta-function, Euler prod ns of two squares, exponential		ries, prime number i	theorem in arithmeti	ic progressi-
Basic k	mended previous knowledge: nowledge of number theory an uction to Number Theory" and			an be acquired in th	e modules
	ed learning outcomes	•			
The stu	dents are fasmiliar with classions.	cal methods in analyti	c number theory. Th	ey are able to apply	them to rela-
	s (type, number of weekly cont	act hours, language –	- if other than Germa	ın)	
V (4) + Modula	Ü (2) e taught in: German and/or Eng	dich			
			- ·		
	d of assessment (type, scope, l formation on whether module			ition offered — if not	every seme-
	en examination (approx. 90 to examination of one candidate				
	examination in groups (groups		andidate)		
	ge of assessment: German or I		66 1 1 1 1		
	ment offered: In the semester i ble for bonus	n which the course is	offered and in the si	ubsequent semester	
		_			
Allocat	ion of places				
		_			
Additio	nal information	_			
Worklo	ad				
300 h					
Teachir	ng cycle				
	- <u></u>				
Referre	d to in LPO I (examination reg	ulations for teaching-o	degree programmes)		
	<u> </u>		<u> </u>		
	e appears in				
	's degree (1 major) Computatio		2)		
	's degree (1 major) Mathematic				
	's degree (1 major) Mathematic	•			
	ge program Mathematics (202)	-	0		
	's degree (1 major) Computatio		4)		
	's degree (1 major) Mathematic		ion DILIC Elito Noter	ork Rovaria (END) (a	025)
	's teaching degree Gymnasium mentary course MINT Teacher I				025)
	ith 1 major Mathematical Physics (2022)		generated 19-Apr-2025 • example		page 13 / 276
			(120 ECTS) Mathematische P		

Modul	e title				Abbreviation	
Differe	ntial G	eometry			10-M=ADGM-161-m	01
Modul	o coord	instor		Module offered by		
	1	`	r -	Institute of Mathem	latics	
ECTS	1	od of grading	Only after succ. con	npl. of module(s)		
10		rical grade				
Duratio		Module level	Other prerequisites			
1 seme		graduate				
	-				ntiskle and Discussion	
folds.	l anu au	dvanced results in differe	ntial geometry, in pa	nicular about uniere	Initable and Kleman	man mam-
		d previous knowledge: Ige from the modules "In	troduction to Differer	ntial Geometry", "Intr	oduction to Topolog	y" and "Geo-
metric	Analysi	s" is recommended.		-		
Intend	ed lear	ning outcomes				
The stu	udent is	acquainted with concep	ts and methods for d	ifferentiable manifol	ds or Riemannian m	anifolds, is
able to try.	apply	these methods and know	s about the interaction	on of local and globa	Il methods in differe	ntial geome-
Course	s (type	, number of weekly conta	ict hours, language –	- if other than Germa	n)	
V (4) + Modul		t in: German and/or Engl	ish			
		sessment (type, scope, la		an German, examina	tion offered — if not	every seme-
		on on whether module ca				every serie
a) writt	ten exai	mination (approx. 90 to 1	20 minutes, usually	chosen) or		
		ation of one candidate e		-		
		ation in groups (groups of		andidate)		
		ssessment: German or Er ffered: In the semester in		offered and in the su	ibcoquent comector	
	ble for		i willen the course is	onered and in the st	ibsequent semester	
Alloca	tion of p	olaces				
∆dditid	nal inf	ormation				
//duiti						
Worklo	ad					
300 h	-					
-	ng cycl	e				
	<u> </u>	-				
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)		
Modul	e appea	urs in				
		ee (1 major) Mathematics	5 (2016)			
	-	ee (1 major) Physics (201				
Master	's degr	ee (1 major) Mathematica	al Physics (2016)			
	Master's degree (1 major) Computational Mathematics (2016)					
Master	's teacl	ning degree Gymnasium I	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	016)
		y course MINT Teacher E			B) (2016)	
	-	ee (1 major) Computation	al Mathematics (201	9)		
Master's w	ith 1 majo	r Mathematical Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	•	page 14 / 276

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)

Module					Abbreviation		
Functional Analysis 10-M=AFAN-161-m01)1			
Module	e coord	inator		Module offered by	<u> </u>		
Dean o	of Studie	es Mathematik (Mathe	matics)	Institute of Mathem	natics		
ECTS		od of grading	Only after succ. cor	npl. of module(s)			
10	·	rical grade		•			
Duratio	on	Module level	Other prerequisites	1			
1 seme	ster	graduate					
Conten	ts						
			l operators, principles to other fields of math		s, further contempo	rary topics in	
		d previous knowledge: h the contents of the m	nodule "Advanced Anal	vsis" is strongly reco	mmended		
		ning outcomes		ysis is strongly rece			
		-	amental concepts and	methods in a contem	porary field of funct	ional analy-	
		e to apply these skills		methous in a conten	ipolary neta or funct	ionat anaty-	
Course	s (type	, number of weekly cor	itact hours, language –	- if other than Germa	ın)		
V (4) + Module		t in: German and/or En	ølish				
			language — if other th	an German examina	tion offered — if not	every seme-	
			can be chosen to earn			every seme	
			o 120 minutes, usually				
			e each (approx. 20 min s of 2, 15 minutes per c				
		ssessment: German or					
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	,	
	ble for						
Allocal	tion of p	naces					
Additio	onal inf	ormation					
Worklo	ad						
300 h							
-	ng cycl	e					
	<u> </u>	-					
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)	l.		
Module	e appea	irs in					
	-	ee (1 major) Mathemat					
	Master's degree (1 major) Mathematical Physics (2016)						
	-		onal Mathematics (201		ork Dovoria (END) (-	016)	
			n MINT Teacher Educat Education PLUS, Elite			010)	
		•	onal Mathematics (201		0, (2010)		
	-	ee (1 major) Mathemati		<i>,</i> ,			
	-	-	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	020)	
Master's w	ith 1 majoi	Mathematical Physics (2022)	-	• generated 19-Apr-2025 • ex (120 ECTS) Mathematische P	-	page 16 / 276	

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)

Modul	e title				Abbreviation	
Complex Analysis 10-M=AFTH-161-m01					1	
Modul	e coord	inator		Module offered by	<u> </u>	
Dean o	of Studie	es Mathematik (Mathema	atics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)		
10	·	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conter	its					
geome ons (e.	tric mei g. ellip	y of mapping properties of hods. Structural properti tic functions). d previous knowledge:				
		lge of the contents of the	module "Introductio	n to Complex Analys	is" is recommended	•
Intend	ed learı	ning outcomes				
ticular	the (ge	acquainted with the fun ometric) mapping proper ner acquired skills and ot	ties of holomorphic f	unctions. He/She is	able to establish a c	onnection
Course	s (type	, number of weekly conta	ict hours, language –	- if other than Germa	n)	
V (4) + Module		t in: German and/or Engl	ish			
		essment (type, scope, la		an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module c	an be chosen to earn	a bonus)		
		nination (approx. 90 to 1				
		ation of one candidate e		-		
		ation in groups (groups o ssessment: German or Ei		andidate)		
Assess		ffered: In the semester ir		offered and in the su	ıbsequent semester	
	tion of p					
Allocal						
	1. 6					
Additio	onal inf	ormation				
 Worklo						
300 h	au					
-	ng cycl	A				
	ing cycl	-				
Referre	ed to in	LPOI (examination regu	lations for teaching-	legree programmes)		
Modul	e appea	irs in				
Master	's degr	ee (1 major) Mathematics	5 (2016)			
Master	's degr	ee (1 major) Physics (201	6)			
	-	ee (1 major) Mathematica				
	-	ee (1 major) Computation				
		ning degree Gymnasium				016)
		y course MINT Teacher E			B) (2016)	
		ee (1 major) Computation		.		
waster's w	iin 1 majoi	Mathematical Physics (2022)	· · ·	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P		page 18 / 276

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)

Module	e title				Abbreviation	
Geometric Structures 10-M=AGMS-161-m01					01	
Module coordinator Module offered by						
Dean o	f Studie	es Mathematik (Mathema	atics)	Institute of Mathem	atics	
ECTS	1	od of grading	Only after succ. con			
10		rical grade				
Duratio	· · · · ·	Module level	Other prerequisites			
1 seme		graduate				
Conten	its	0	I			
		generalised polygons or s, classification results.	related geometric st	ructures, automorph	isms, BN pairs in gro	oups, Mouf-
	nowled	d previous knowledge: Ige from the modules "In	troduction to Differer	ntial Geometry" and '	'Introduction to Topo	ology" is re-
Intend	ed learr	ning outcomes				
structu	re. He/	acquainted with the fun She is able to establish a ractions of geometry and	a connection betweer	n these results and b		
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)	
V (4) + Module		t in: German and/or Engl	ish			
Metho	d of ass	essment (type, scope, la on on whether module ca	nguage — if other th		tion offered — if not	every seme-
		nination (approx. 90 to 1		•		
		ation of one candidate e				
		ation in groups (groups of		-		
Langua	age of a	ssessment: German or Er	nglish			
	ment o ble for	ffered: In the semester in bonus	which the course is	offered and in the su	ıbsequent semester	
Allocat	ion of p	olaces				
	· · ·					
Additio	nal inf	ormation				
Additio	matim					
Worklo	ad					
300 h						
_	ng cycl	e	·			
		•				
Referre	ed to in	LPOI (examination regu	lations for teaching-o	degree programmes)		
Module	e appea	irs in				
	-	ee (1 major) Mathematics				
	-	ee (1 major) Mathematica	•			
	-	ee (1 major) Computation				
	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)					
		•			B) (2016)	
	-	ee (1 major) Computation ee (1 major) Mathematics		9)		
	-	Mathematical Physics (2022)		generated 19-Apr-2025 • exa	am, reg. da-	page 20 / 276
	i majoi		-	(120 ECTS) Mathematische P	-	puge 20 / 2/0

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)

Module title				Abbreviation			
Giovanni Prodi Lecture (Master) 10-M=AGPCin-152-mo1					m01		
Module coordinator Module offered by							
				-			
	1	es Mathematik (Mathema	<u>,</u>	Institute of Mathem	natics		
ECTS		od of grading	Only after succ. con	npl. of module(s)			
5		rical grade					
Durati	-	Module level	Other prerequisites				
1 seme	ester	graduate					
Conter	nts						
Introdu	uction to	o a specialised topic in m	nathematics by an int	ernational expert.			
Intend	ed lear	ning outcomes					
thema	tics. He	acquainted with the fun /She is able to establish applications in other su	a connection betwee				
Course	es (type	, number of weekly conta	act hours, language –	- if other than Germa	ın)		
V (3) + Modul	• •	t in: English					
		s essment (type, scope, la on on whether module c			tion offered — if not	every seme-	
b) oral c) oral Langua Assess	examir examin age of a	nination (approx. 60 to 9 ation of one candidate e ation in groups (groups o ssessment: English ffered: In the semester ir bonus	each (approx. 15 minu of 2, approx. 10 minu	ites) or tes per candidate)	ubsequent semester		
Alloca	tion of p	olaces	-				
Additio	onal inf	ormation					
Worklo	nad		-				
150 h							
_							
Teachi	ng cycl	e					
Referre	ed to in	LPOI (examination regu	llations for teaching-	degree programmes)			
Modul	e appea	ars in					
Master	r's degr	ee (1 major) Mathematics	s International (2015)				
	-	ee (1 major) Mathematics					
Master	r's degr	ee (1 major) Mathematica	al Physics (2016)				
Master	Master's degree (1 major) Mathematical Mysics (2010) Master's degree (1 major) Computational Mathematics (2016)						
Master	Master's degree (1 major) Computational Mathematics (2010) Master's degree (1 major) Computational Mathematics (2019)						
Master	r's degr	ee (1 major) Mathematics	5 (2019)				
	-	ee (1 major) Mathematica	-				
Master	r's degr	ee (1 major) Mathematics	s International (2021)				
	-	ee (1 major) Computatior					
	-	ee (1 major) Mathematics					
	-	ee (1 major) Mathematica					
Master's w	vith 1 majo	Mathematical Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P		page 22 / 276	

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)

Module title					Abbreviation	
Indust	Industrial Statistics 1 10-M=AIST-161-m01					
Modul	e coord	inator		Module offered by		
Dean of Studies Mathematik (Mathematics)			natics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. compl. of module(s)			
10		rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
		meter and domain esti s, comparative analysi				irical distri-
Intend	ed learı	ning outcomes				
The stu	udent m	asters the fundamenta	l statistical methods fo	or industrial applicat	ions.	
Course	es (type	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
V (4) +		,			·	
		t in: German and/or En	glish			
		essment (type, scope, on on whether module			tion offered — if not	every seme-
-	-	nination (approx. 90 to		· · · · · · · · · · · · · · · · · · ·		
		ation of one candidate				
		ation in groups (groups		andidate)		
		ssessment: German or		CC 1 1 1 1		
	sment o Ible for	ffered: In the semester	in which the course is	offered and in the si	ibsequent semester	
Allocal	tion of p	Jaces				
Additio	onal info	ormation				
Worklo	pad					
300 h	_					
Teachi	ng cycl	9				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
	e appea					
	-	ee (1 major) Mathemati				
	-	ee (1 major) Economath				
	-	ee (1 major) Mathemati	-			
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)						
		-			в) (2016)	
	-	ee (1 major) Computatione (1 major) Mathemati		9)		
	-	ee (1 major) Mathemati ning degree Gymnasiun	-	ion DILIS Elito Notw	ork Bavaria (END) (a	020)
		y course MINT Teacher				020)
		ee (1 major) Mathemati			0, (2020)	
	-	ee (1 major) Economath	-			
·	_	-		concreted to Any	am rog da	
widster's W	nui i majoi	Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 24 / 276

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)

Module title					Abbreviation	
Lie The	Lie Theory 10-M=ALTH-161-m01					
Module	e coord	inator		Module offered by		
Dean of Studies Mathematik (Mathematics)		Institute of Mathematics				
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						
	-	ups and their Lie algebr olications, e.g. in phys		on, structure and cla	ssification of Lie alge	ebras, classic
Basic k	nowlea d. Furth	d previous knowledge: lge of the contents of the contents of the contents of the contents of the second se				
Intend	ed lear	ning outcomes				
	hese to	acquainted with the fu common problems, ar				
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	ın)	
V (4) + Module		t in: German and/or En	glish			
		sessment (type, scope, on on whether module			tion offered — if not	every seme-
b) oral c) oral Langua	examir examin age of a ment o	mination (approx. 90 to nation of one candidate ation in groups (groups ssessment: German or ffered: In the semester bonus	each (approx. 20 mini s of 2, 15 minutes per c English	utes) or andidate)	ubsequent semester	
Allocat	ion of p	olaces				
Additic	onal inf	ormation				
Worklo	ad					
	au					
300 h						
Teachi	ng cycl	е				
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)						
Supple	mentai	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master's w	ith 1 majo	r Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 26 / 276

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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)

Module title					Abbreviation	
Numeric of Large Systems of Equations					10-M=ANGG-161-m	01
Module coordinator				Module offered by		
Dean of Studies Mathematik (Mathematics)			atics)	Institute of Mathematics		
ECTS				Idlics		
10	1	rical grade	Only after succ. compl. of module(s)			
		-				
Duration 1 seme		Module level graduate	Other prerequisites			
Conter		glauuale	<u> </u>			
						d we at le a d a
Discret	lisation	of elliptic differential equ		ation methods, prec	onallioners, mulligr	la methoas.
Recom	mende	d previous knowledge:				
		lge of numerical mathem	atics, such as that a	cquired in the modul	es "Numerical Math	ematics 1"
and "N	umeric	al Mathematics 2", is req				
is also	recomr	nended.				
Intend	ed lear	ning outcomes				
		acquainted with the mos			stems of equations,	and knows
		ient way to solve a given			m)	
		, number of weekly conta	ict nours, language –	- If other than Germa	n)	
V (4) + Modul		t in: German and/or Engl	ish			
	-	sessment (type, scope, la		an German, examina	tion offered — if not	every seme-
		on on whether module ca				every senie-
a) writt	ten exai	nination (approx. 90 to 1	20 minutes, usually	chosen) or		
		ation of one candidate e				
		ation in groups (groups o		andidate)		
		ssessment: German or Ei		offered and in the or		
	ible for	ffered: In the semester in bonus	i which the course is	offered and in the st	ibsequent semester	
	tion of p					
Allocal		hates				
 Additid		ormation	·			
Auunu						
Worklo						
300 h						
	ng cycl	6				
	0 . 7	-				
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)		
Modul	e appea	rs in				
Master	r's degr	ee (1 major) Mathematics	5 (2016)			
Master's degree (1 major) Economathematics (2016)						
Master	r's degr	ee (1 major) Mathematica	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)						
		ee (1 major) Mathematics	-			
Master's w	ith 1 majo	Mathematical Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P		page 28 / 276



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-mo1						
Modul	e coord	inator		Module offered by			
			atics)	Institute of Mathematics			
	Dean of Studies Mathematik (Mathematics)				Iducs		
		Only after succ. con					
10	·	-					
Duration		Module level graduate	Other prerequisites	i			
Conter		glauuale]				
				·		1	
		methods and techniques ed optimization, examp					
Intend	ed learı	ning outcomes					
		nows the fundamental m ecide which method is tl			dge their strengths a	nd weaknes-	
Course	s (type	, number of weekly conta	act hours, language –	- if other than Germa	ın)		
V (4) + Module		t in: German and/or Eng	lish				
Metho	d of ass	essment (type, scope, la	anguage — if other th		tion offered — if not	every seme-	
ster, in	formati	on on whether module o	an be chosen to earn	a bonus)			
b) oral c) oral Langua Assess	examin examin age of a	nination (approx. 90 to station of one candidate e ation in groups (groups ssessment: German or E ffered: In the semester in bonus	each (approx. 20 mini of 2, 15 minutes per c nglish	utes) or andidate)	ubsequent semester		
Allocat	tion of p	olaces					
Additio	onal inf	ormation					
Worklo	ad a						
300 h							
		_					
Teachi	ng cycl	8					
Referre	ed to in	LPOI (examination regu	ulations for teaching-	degree programmes)			
Modul	e appea	irs in					
Master	's degr	ee (1 major) Mathematic	s (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 teacł	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	016)	
Supple	ementar	y course MINT Teacher E	ducation PLUS, Elite	Network Bavaria (EN	B) (2016)		
Master	's degr	ee (1 major) Computation	nal Mathematics (201	9)			
	-	ee (1 major) Mathematic	-				
	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Supple	ementar	ry course MINT Teacher E	ducation PLUS, Elite	Network Bavaria (EN	B) (2020)		
Master's w	rith 1 major	Mathematical Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P		page 30 / 276	

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) 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)

Module title					Abbreviation		
Control Theory 10-M=ARTH-161-mo1						01	
Module coordinator Module offered by							
Dean of Studies Mathematik (Mathema			aticc)				
ECTS	1		atics) Institute of Mathematics Only after succ. compl. of module(s)				
10		od of grading rical grade	Unity after Succ. com				
Duratio		Module level	Other prerequisites				
1 seme		graduate					
Conter		3	<u> </u>				
	Introduction to mathematical systems theory: stability, controllability and observability, state feedback and sta- bility, basics in optimal control.						
		d previous knowledge:	madula "Ordinary D	fforontial Fauntions	" in up of ul		
		lge of the contents of the	module "Ordinary D	Interential Equations	is useful.		
		ning outcomes					
blish a	conne	acquainted with the function between these results of mathematics.					
Course	es (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)		
V (4) +	-	,			,		
		t in: German and/or Engl	ish				
		essment (type, scope, la on on whether module ca			tion offered — if not	every seme-	
a) writt	ten exai	mination (approx. 90 to 1	20 minutes, usually	chosen) or			
		ation of one candidate e		-			
		ation in groups (groups of		andidate)			
		ssessment: German or Er ffered: In the semester in		offered and in the su	ihsequent semester		
	ble for			oncrea and in the st	ibsequent semester		
Alloca	tion of p	olaces					
Additio	onal inf	ormation					
Worklo	ad						
300 h			,				
Teachi	ng cycl	e					
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)			
Modul	e appea	urs in					
			(2016)				
Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Economathematics (2016)							
	-	ee (1 major) Mathematica					
	-	ee (1 major) Computation	-	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)							
	-	ee (1 major) Computation		9)			
	-	ee (1 major) Mathematics				· · ·	
Master's w	ith 1 majo	r Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 32 / 276	



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						
Modul	e coord	inator		Module offered by			
Dean of Studies Mathematik (Mathematics)			matics)	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		graduate					
Conter	nts						
res, va la, moo estima series	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.						
Intend	ed lear	ning outcomes					
The stu	udent is	acquainted with the fu	undamental methods o	f stochastic risk ana	lysis.		
Course	es (type	, number of weekly cor	itact hours, language –	- if other than Germa	in)		
V (4) + Modul		t in: German and/or En	glish				
			language — if other th can be chosen to earn		ition offered — if not	every seme-	
c) oral Langua Assess	examin age of a	ation in groups (group ssessment: German or ffered: In the semester	e each (approx. 20 minus s of 2, 15 minutes per c English r in which the course is	andidate)	ubsequent semester		
Allocat	tion of p	olaces					
Additio	onal inf	ormation					
Worklo	oad						
300 h							
Teachi	ng cycl	е					
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)	I.		
Module appears in							
Master's degree (1 major) Mathematics (2016)							
Master's degree (1 major) Economathematics (2016)							
1	-	ee (1 major) Mathemati ee (1 major) Computati	ical Physics (2016) onal Mathematics (201	6)			
	-		n MINT Teacher Educat		ork Bavaria (ENB) (2	016)	
1			Education PLUS, Elite			,	
	-		onal Mathematics (201	9)			
Master	r's degr	ee (1 major) Mathemat	ics (2019)				
Master's w	vith 1 majo	r Mathematical Physics (2022)	_	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 34 / 276	



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	
Stochastical Processes 10-M=ASTP-161-m01)1
Modul	e coord	inator		Module offered by		
Dean of Studies Mathematik (Mathematics)			matics)	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	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.
Pocom	mondo	d previous knowledge:				
		lge of stochastics is red	quired, such as that ac	auired in the "Stocha	astics 1" module. Kn	owledge of
		of the module "Stochas				0
Intend	ed lear	ning outcomes				
		acquainted with the fuctor acquainted with the fuctor acquire to the second sec	undamental notions an	d methods of stocha	stical processes and	d can apply
		, number of weekly con	tact hours, language –	- if other than Germa	ın)	
V (4) +						
Modul	e taugh	t in: German and/or En	glish			
		essment (type, scope, on on whether module			tion offered — if not	every seme-
-	-	nination (approx. 90 to		-		
		ation of one candidate				
		ation in groups (group		andidate)		
		ssessment: German or ffered: In the semester		offered and in the c	ibcoquent comector	
	ble for		III WIIICH LIE COUISE IS	onered and in the st	ibsequent semester	
	tion of p					
Additio	onal inf	ormation				
Worklo	bad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPO I (examination reg	gulations for teaching-	degree programmes)		
Module appears in						
Master's degree (1 major) Mathematics (2016)						
Master's degree (1 major) Economathematics (2016)						
1	-	ee (1 major) Mathemati				
	-	ee (1 major) Computati				
1		ning degree Gymnasiur				016)
		y course MINT Teacher ee (1 major) Computati			в) (2016)	
	-	ee (1 major) Computati ee (1 major) Mathemati		97		
1	2 4051	(())			I
Master's w	vith 1 majo	Mathematical Physics (2022)		• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 36 / 276



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)

Modul	Module title Abbreviation					
Topolo	gy				10-M=ATOP-161-mc	01
Modul	e coord	inator		Module offered by		
		es Mathematik (Mathe	matics)	Institute of Mathem		
ECTS	1	od of grading	Only after succ. con		Iducs	
10		rical grade				
Durati		Module level	Other prorequisites			
1 seme		graduate	Other prerequisites			
Conter		5.44444				
	-	opology, topological ir	nvariants (e. g. fundam	ental group, connect	ion), construction of	ftopological
		ng spaces.			····/,	
Intend	ed learı	ning outcomes				
		acquainted with the function of the function o	undamental results, the	eorems and methods	s in topology and is a	able to apply
		· · ·	itact hours, language –	- if other than Germa	ın)	
V (4) +		· · · ·				
Modul	e taugh	t in: German and/or En	glish			
			language — if other th can be chosen to earn		ition offered — if not	every seme-
-			o 120 minutes, usually			
			e each (approx. 20 mini			
			s of 2, 15 minutes per c	andidate)		
		ssessment: German or				
	sment o able for		in which the course is	offered and in the su	ubsequent semester	
	tion of p					
		haces				
Additi	onal inf	ormation				
Worklo						
300 h						
-	ng cycl	a				
	ing cyce	•				
Referr	ed to in	LPO I (examination re	gulations for teaching-	degree programmes)		
Modul	e appea	in in				
		ee (1 major) Mathemat	ics (2016)			
	-	ee (1 major) Physics (2				
	-	ee (1 major) Mathemat	-			
	-		onal Mathematics (201	6)		
	-		n MINT Teacher Educat		ork Bavaria (ENB) (2	016)
			Education PLUS, Elite			-
Maste	r's degre	ee (1 major) Computati	onal Mathematics (201	9)		
Maste	r's degre	ee (1 major) Mathemat	ics (2019)			
	-	ee (1 major) Physics (2				
			n MINT Teacher Educat Education PLUS, Elite			020)
		Mathematical Physics (2022)		generated 19-Apr-2025 • exa		nago 28 / 27(
master S W	nai i maju	mathematical Physics (2022)	-	(120 ECTS) Mathematische P	-	page 38 / 276

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)

Modul	e title				Abbreviation	
Time S	Series A	nalysis			10-M=AZRA-212-mc	01
Modul	e coord	inator		Module offered by		
Dean o	of Studi	es Mathematik (Mather	natics)	Institute of Mathem	natics	
ECTS	Meth	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				
Conte	nts					
Additiv	ve mode	el, linear filters, autocor	rrelation, moving avera	ige, autoregressive p	rocesses, Box-Jenki	ns method.
Docom	manda	d provious knowledge.				
		d previous knowledge: Ige of stochastics is rec	nuired, such as that ac	auired in the "Stoch	astics 1" module. Kn	owledge of
		of the module "Stochast				
Intend	ed lear	ning outcomes				
The stu proble		acquainted with the fu	ndamental methods o	f time series analysi	s and can apply then	n to practical
·		, number of weekly con	tact hours, language –	- if other than Germa	ın)	
V (4) + Modul		t in: German and/or En	glish			
		sessment (type, scope,	_	an German, examina	tion offered — if not	every seme-
		on on whether module				every serie
		mination (approx. 90 to				
		ation of one candidate ation in groups (groups				
		ssessment: German or				
		ffered: in the semester	in which the course is	offered and in the su	ubsequent semester	
	able for					
Alloca	tion of _l	Diaces				
Additi	onal inf	ormation				
Workle	oad					
300 h						
Teachi	ing cycl	e				
Referr	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)		
Modul	e appea	ars in				
	-	ee (1 major) Economath				
	-	ee (1 major) Computatio		22)		
	-	ee (1 major) Mathemati ee (1 major) Mathemati				
	-	ee (1 major) Kathemath				
	-	gram Mathematics (202				
		ee (1 major) Computatio	-	24)		
Maste	r's degr	ee (1 major) Mathemati	cs (2024)			
Master's v	vith 1 majo	r Mathematical Physics (2022)	-	• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 40 / 276

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)

Number Theory10-M=AZTH-161-m01Module offered byDean J Studies Mathematik (Mathematics)Institute of MathematicsDean J Studies Mathematik (Mathematics)Institute of MathematicsECTSMethod of gradingOnly after succ. compl. of module(s)DurationModule levelOther prerequisitesDurationModule levelOther prerequisitesI semestergraduateContentsNumber-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-
Dean of Studies Mathematik (Mathematics) Institute of Mathematics ECTS Method of grading Only after succ. compl. of module(s) 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents Vumber-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-
ECTS Method of grading Only after succ. compl. of module(s) 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents Vumber-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-
ECTS Method of grading Only after succ. compl. of module(s) 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents Vumber-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-
10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents 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-
Duration Module level Other prerequisites 1 semester graduate Contents 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-
1 semester graduate Contents
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-
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-
on to Algebra", "Introduction to Number Theory" and "Applied Algebra".
Intended learning outcomes
The student is acquainted with the fundamental methods of analytics number theory, can deal with algebraic
structures in number theory and knows methods for the solution of diophantine equations. He/She has insight into modern developments in number theory.
Courses (type, number of weekly contact hours, language — if other than German)
V (4) + Ü (2) Module taught in: German and/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, 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
Additional information
Workload
300 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) Mathematical 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 with 1 major Mathematical Physics (2022) JMU Würzburg • generated 19-Apr-2025 • exam. reg. da- ta record Master (120 ECTS) Mathematische Physik - 2022 page 42 / 276

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)

Module	e title				Abbreviation
Learnir	ig by To	eaching 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	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	dent g			rsity mathematics. H	e/She knows basic didactical
		, number of weekly conta		- if other than Germa	n)
Ü (2)	- (-)	,,,,,			
Method		Sessment (type, scope, la ion on whether module ca			tion offered — if not every seme-
		f tutoring activities by su ssessment: German	pervising lecturers or	r 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	mathematics	
Worklo			0		
150 h					
Teachi		0			
Teacini	ig cycl	C			
 Deferme			lationa fontes abing a		
Referre	αιοιη	LPOI (examination regu	tations for teaching-c	legree programmes)	
Module				<u>``</u>	
		ee (1 major) Computation		9)	
	-	ee (1 major) Mathematics	-		
	-	ee (1 major) Mathematica	-		
	-	ee (1 major) Economathe ee (1 major) Computation		2)	
	-	ee (1 major) Mathematics		2)	
	-	ee (1 major) Mathematica			
	-	ee (1 major) Economathe	-		
	-	gram Mathematics (2023)			
		ee (1 major) Computation		/)	
		ee (1 major) Mathematics		ب ד	
	-	ee (1 major) Economathe			
		ee (1 major) Economathe			

	e title			Abbreviation	
Resea	rch in Groups - Applied Diffe	rential Geometry		10-M=GADG-192-m	01
Modul	e coordinator		Module offered by		
	of Studies Mathematik (Math	omatics)	Institute of Mathem	atics	
ECTS	Method of grading		Only after succ. compl. of module(s)		
10	numerical grade				
Durati		Other prorequisites			
1 seme		Other prerequisites			
Conte					
Recom Advan al Geo	ed modern topics in Applied mended previous knowledg ced knowledge of differentia metry". Knowledge of the co do-Riemannian and Riemann	e: l geometry is required, si ntents of the modules "Ir	troduction to Topolo	gy", "Geometric Me	
Intend	ed learning outcomes				
	udent gains insight into cont	emporary research probl	ems in Applied Diffe	ential Geometry, He	/She ma-
	idvanced techniques in this f				, ee mu
	es (type, number of weekly co				
V (2) +				,	
	e taught in: German and/or I	English			
Metho	d of assessment (type, scop	e, language — if other the	an German, examina	tion offered — if not	everv seme
	formation on whether modu				,
talk (6	o to 120 minutes)				
Langu	age of assessment: German				
Assess	sment offered: in the semest	er in which the course is	offered and in the su	bsequent semester	
Alloca	tion of places				
Additi	onal information				
Workle	nad				
WOIN					
anah					
-		· · · · · · · · · · · · · · · · · · ·			
-	ing cycle				
-	ing cycle				
Teachi	ing cycle ed to in LPO I (examination	regulations for teaching-o	degree programmes)		
		regulations for teaching-o	degree programmes)		
Teachi Referro		regulations for teaching-o	degree programmes)		
Teachi Referro Modul	ed to in LPO I (examination)		degree programmes)		
Teachi Referra Modul Maste	ed to in LPO I (examination) e appears in	atics (2019)		ork Bavaria (ENB) (20	020)
Teachi Referro Modul Maste Maste	ed to in LPO I (examination) e appears in r's degree (1 major) Mathema	atics (2019) um MINT Teacher Educat	ion PLUS, Elite Netwo		
Teachi Referro Modul Maste Maste Supple	ed to in LPO I (examination) e appears in r's degree (1 major) Mathema r's teaching degree Gymnasi	atics (2019) um MINT Teacher Educat er Education PLUS, Elite	ion PLUS, Elite Netwo		020)
Teachi Referro Modul Maste Maste Supple Maste	ed to in LPO I (examination) e appears in r's degree (1 major) Mathema r's teaching degree Gymnasi ementary course MINT Teach	atics (2019) um MINT Teacher Educat er Education PLUS, Elite atical Physics (2020)	ion PLUS, Elite Netwo Network Bavaria (ENI		020)
Teachi Referro Maste Maste Maste Maste Maste Maste	ed to in LPO I (examination e appears in r's degree (1 major) Mathema r's teaching degree Gymnasi ementary course MINT Teach r's degree (1 major) Mathema r's degree (1 major) Computa r's degree (1 major) Mathema	atics (2019) um MINT Teacher Educat er Education PLUS, Elite atical Physics (2020) itional Mathematics (202 atics (2022)	ion PLUS, Elite Netwo Network Bavaria (ENI		020)
Teachi Referr Maste Maste Maste Maste Maste Maste Maste	ed to in LPO I (examination e appears in r's degree (1 major) Mathema r's teaching degree Gymnasi ementary course MINT Teach r's degree (1 major) Mathema r's degree (1 major) Mathema r's degree (1 major) Mathema	atics (2019) um MINT Teacher Educat er Education PLUS, Elite atical Physics (2020) Itional Mathematics (202 atics (2022) atical Physics (2022)	ion PLUS, Elite Netwo Network Bavaria (ENI		020)
Teachi Referro Maste Maste Maste Maste Maste Maste Maste exchai	ed to in LPO I (examination e appears in r's degree (1 major) Mathema r's teaching degree Gymnasi ementary course MINT Teach r's degree (1 major) Mathema r's degree (1 major) Mathema r's degree (1 major) Mathema nge program Mathematics (2	atics (2019) um MINT Teacher Educat er Education PLUS, Elite atical Physics (2020) aticnal Mathematics (202 atics (2022) atical Physics (2022) 023)	ion PLUS, Elite Netwo Network Bavaria (ENI 2)		020)
Teachi Referro Maste Maste Maste Maste Maste Maste Maste Maste Maste	ed to in LPO I (examination e appears in r's degree (1 major) Mathema r's teaching degree Gymnasi ementary course MINT Teach r's degree (1 major) Mathema r's degree (1 major) Computa r's degree (1 major) Mathema r's degree (1 major) Mathema r's degree (1 major) Mathema r's degree (1 major) Computa	atics (2019) um MINT Teacher Educat er Education PLUS, Elite atical Physics (2020) itional Mathematics (202 atics (2022) atical Physics (2022) 023) itional Mathematics (202	ion PLUS, Elite Netwo Network Bavaria (ENI 2)		020)
Teachi Referra Maste Maste Maste Maste Maste Maste Maste Maste Maste	ed to in LPO I (examination e appears in r's degree (1 major) Mathema r's teaching degree Gymnasi ementary course MINT Teach r's degree (1 major) Mathema r's degree (1 major) Mathema r's degree (1 major) Mathema nge program Mathematics (2	atics (2019) um MINT Teacher Educat er Education PLUS, Elite atical Physics (2020) itional Mathematics (202 atics (2022) atical Physics (2022) 023) itional Mathematics (202	ion PLUS, Elite Netwo Network Bavaria (ENI 2)		020)
Teachi Referr Maste Maste Maste Maste Maste Maste exchai Maste Maste	ed to in LPO I (examination e appears in r's degree (1 major) Mathema r's teaching degree Gymnasi ementary course MINT Teach r's degree (1 major) Mathema r's degree (1 major) Computa r's degree (1 major) Mathema r's degree (1 major) Mathema r's degree (1 major) Mathema r's degree (1 major) Computa	atics (2019) um MINT Teacher Educat er Education PLUS, Elite atical Physics (2020) itional Mathematics (202 atics (2022) atical Physics (2022) 023) itional Mathematics (202 atics (2024)	ion PLUS, Elite Netwo Network Bavaria (ENI 2)	3) (2020)	020) page 45 / 27



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	e title				Abbreviation	
Resear	rch in G	roups - Algebra		-	10-M=GALG-161-m	01
Module	e coord	inator		Module offered by		
Dean o	of Studie	es Mathematik (Mathema	atics)	Institute of Mathem	atics	
ECTS		od of grading	Only after succ. con			
10		rical grade		, ,,		
Duratio	on	Module level	Other prerequisites			
1 seme		graduate				
Conten	nts	-				
		ern topics in algebra (e. s algebras, division rings,	,	itative algebra, diffe	rential algebra, local	fields, com-
Basic k		d previous knowledge: lge of algebra is assume ora".	d, such as can be acc	quired in the module	s "Introduction to Al	gebra" and
		ning outcomes				
The stu	udent ga	ains insight into contemp eld and can apply them t			She masters advance	ed techni-
		, number of weekly conta	· · ·		n)	
V (2) +		, number of weekly conte				
		t in: German and/or Engl	lish			
		e ssment (type, scope, la on on whether module c			tion offered — if not	every seme-
talk (60	o to 120	minutes)				
Langua	age of a	ssessment: German or E ffered: In the semester ir		offered and in the su	ıbsequent semester	
	tion of p		-		•	
	<u></u>					
Additio	onal info	ormation				
Worklo						
300 h						
-						
Teachi	ng cycl	8	_			
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)		
	e appea					
	-	ee (1 major) Mathematics				
	-	ee (1 major) Mathematica	-			
		ning degree Gymnasium				016)
		y course MINT Teacher E		Network Bavaria (EN	B) (2016)	
	-	ee (1 major) Mathematics	-	ion DLUS Elito Notw	ork Povorio (ENP) (o	220)
		ning degree Gymnasium y course MINT Teacher E				020)
		ee (1 major) Mathematica		Network Davalla (EIN		
		ee (1 major) Computation		2)		
		ee (1 major) Mathematics		,		
Master's w	ith 1 major	Mathematical Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 47 / 276

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)

Modul	e title				Abbreviation	
Resear	rch in G	roups - Complex Analysi	S		10-M=GCOA-161-m	01
Modul	e coord	inator		Module offered by	<u> </u>	
Dean c	of Studie	es Mathematik (Mathem	atics)	Institute of Mathem	atics	
ECTS	T	od of grading	Only after succ. con			
10		rical grade				
Durati	on	Module level	Other prerequisites			
1 seme	-	graduate				
Conter	nts					
		ern topics in complex an Iplex analysis, value dis		imation theory, pote	ntial theory, comple	ex dynamics,
Depen	ding on	d previous knowledge: the current focus of the cturer at the beginning o			f analysis is required	l. Consultati-
		ning outcomes				
		ains insight into contemp	porary research probl	ems in complex anal	ysis. He/She maste	rs advanced
		this field and can apply				
		, number of weekly conta	act hours, language –	- if other than Germa	n)	
V (2) + Modul		t in: German and/or Engl	lish			
		essment (type, scope, la		an German, examina	tion offered — if not	everv seme-
		on on whether module c				every serie
talk (6	o to 120	minutes)				
		ssessment: German or E				
		ffered: In the semester in	n which the course is	offered and in the su	ibsequent semester	
Alloca	tion of p	olaces				
Additio	onal info	ormation				
Worklo	oad					
300 h						
Teachi	ing cycl	9				
Referre	ed to in	LPOI (examination regu	llations for teaching-	degree programmes)		
		, U				
Modul	e appea	irs in				
Master	r's degr	ee (1 major) Mathematics	s (2016)			
	-	ee (1 major) Mathematica				
		ning degree Gymnasium				016)
		y course MINT Teacher E		Network Bavaria (EN	B) (2016)	
	-	ee (1 major) Mathematics	-			
		ning degree Gymnasium y course MINT Teacher E				020)
		ee (1 major) Mathematica		ivelwoin Davalla (EN	טז (2020)	
	-	ee (1 major) Mathematica		2)		
	-	ee (1 major) Mathematics		,		
·	_	_				· · · · · · · · · · · · · · · · · · ·
Master's w	vith 1 majoi	Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 49 / 276

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)

Module	atitla				Abbreviation
		roups - Control Theory of	Ouantum Mechanica	al Systems	10-M=GCQS-161-m01
			~~~		10-M=GCQ3-101-III01
Module	e coord	inator		Module offered by	
Dean o	f Studie	es Mathematik (Mathema	atics)	Institute of Mather	natics
ECTS	Metho	od of grading	Only after succ. com	pl. 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 control theo	ry of quantum mecha	anical systems.	
Intend	ed learı	ning outcomes			
			orary research proble	ems in control theor	ry of quantum mechanical sy-
		e masters advanced tech			
Course	s (type	, number of weekly conta	ct hours, language —	· if other than Germa	an)
V (2) +		,			
		t in: German and/or Engl	ish		
Metho	d of ass	essment (type, scope, la	nguage — if other tha	an German, examina	ation offered — if not every seme-
		on on whether module ca			
talk (60	o to 120	minutes)			
		ssessment: German or Er			
Assess	ment o	ffered: In the semester in	which the course is	offered and in the s	ubsequent semester
Allocat	ion of p	olaces			
Additio	onal inf	ormation			
Worklo	ad				
300 h					
Teachi	ng cycl	a			
	ing cycl	•			
Doforro	d to in	LPOI (examination regu	lations for toaching s)
Referre		LFUT (examination regu		legiee programmes)
		•			
Module			()		
	-	ee (1 major) Mathematics			
	-	ee (1 major) Mathematica	•	on DULC Elite Note	(and Deverie (END) (and ()
		y course MINT Teacher E			vork Bavaria (ENB) (2016) JB) (2016)
		ee (1 major) Mathematics			(2010)
	-		-	ion PLUS, Elite Netw	vork Bavaria (ENB) (2020)
		y course MINT Teacher E			
		ee (1 major) Mathematica			
	-	ee (1 major) Computation		2)	
	-	ee (1 major) Mathematics			
	-	ee (1 major) Mathematica	•		
exchan	ige prog	gram Mathematics (2023))		

Module	e title			Abbreviation		
Resear	ch in Groups - Deformation Qua	antization		10-M=GDFQ-161-m	01	
Module	e coordinator		Module offered by			
	f Studies Mathematik (Mathem	atics)	Institute of Mathem	atics		
ECTS	Method of grading	Only after succ. com		latics		
10	numerical grade					
Duratio		Other prerequisites				
1 seme	······					
Conten		1				
	ed modern topics in deformation	n quantization.				
	mended previous knowledge:	quantization				
	edge of the contents of the mod	ules "Differential Geo	metrv" and "Geomet	ric Mechanics" is ree	commended.	
	ed learning outcomes					
	dent gains insight into contem	norary research proble	ems in Deformation	Quantization He/Sh	e masters	
	ed techniques in this field and				ie musiers	
	s (type, number of weekly conta			n)		
V (2) +						
• •	e taught in: German and/or Eng	lish				
Metho	d of assessment (type, scope, la	anguage — if other tha	an German, examina	tion offered — if not	every seme-	
ster, in	formation on whether module c	an be chosen to earn	a bonus)			
	o to 120 minutes)					
	ge of assessment: German or E		- ff			
	ment offered: In the semester in	n which the course is	offered and in the st	ibsequent semester		
Allocat	ion of places					
Additio	nal information					
Worklo	ad					
300 h	,					
Teachi	ng cycle					
Referre	d to in LPO I (examination regu	ulations for teaching-o	legree programmes)			
Module	e appears in					
Master	's degree (1 major) Mathematic	s (2016)				
Master	's degree (1 major) Mathematic	al Physics (2016)				
Master	's teaching degree Gymnasium	MINT Teacher Educati	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	016)	
Supple	mentary course MINT Teacher E	ducation PLUS, Elite I	Network Bavaria (EN	B) (2016)		
	's degree (1 major) Mathematic	÷				
	's teaching degree Gymnasium				020)	
	mentary course MINT Teacher E		Network Bavaria (EN	B) (2020)		
	's degree (1 major) Mathematic	•				
	's degree (1 major) Computation		2)			
	's degree (1 major) Mathematic					
	's degree (1 major) Mathematic	•				
exchan	ge program Mathematics (2023	3)				
Master's w	ith 1 major Mathematical Physics (2022)		generated 19-Apr-2025 • exa	-	page 52 / 276	
		ta record Master	(120 ECTS) Mathematische P	hysik - 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 title Abbre					
Resear	rch in Groups - Differential Ge	ometry		10-M=GDGE-161-m	01
Modul	e coordinator		Module offered by	<u> </u>	
Dean c	of Studies Mathematik (Mathe	matics)	Institute of Mathematics		
ECTS	Method of grading	Only after succ. cor			
10	numerical grade				
Durati	on Module level	Other prerequisites	;		
1 seme					
Conter	nts				
Select	ed modern topics in differenti	al geometry.			
	mended previous knowledge: ced knowledge of differential		uch as can be acquir	ed in the module "D	ifferential
Geome	etry". Knowledge of the conter lo-Riemannian and Riemannia	its of the modules "App	lied Differential Geo	metry", "Geometric l	
Intend	ed learning outcomes				
	udent gains insight into conte chniques in this field and can			eometry. He/She ma	asters advan-
Course	es (type, number of weekly con	ntact hours, language -	– if other than Germa	ın)	
V (2) +				,	
	e taught in: German and/or Er	nglish			
	d of assessment (type, scope, formation on whether module			tion offered — if not	every seme-
talk (6	o to 120 minutes)				
	age of assessment: German or				
Assess	ment offered: In the semeste	r in which the course is	offered and in the su	ubsequent semester	
Alloca	tion of places				
Additio	onal information				
Worklo	bad				
300 h					
Teachi	ng cycle				
Referre	ed to in LPO I (examination re	gulations for teaching-	degree programmes)		
		galations for teaching			
Modul	e appears in				
Master	r's degree (1 major) Mathemat	ics (2016)			
Master	r's degree (1 major) Mathemat	ical Physics (2016)			
Master	r's teaching degree Gymnasiu	m MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	016)
	ementary course MINT Teache		Network Bavaria (EN	B) (2016)	
	's degree (1 major) Mathemat	-			
	's teaching degree Gymnasiu				020)
	ementary course MINT Teacher		Network Bavaria (EN	B) (2020)	
	r's degree (1 major) Mathemat r's degree (1 major) Computati				
	r's degree (1 major) Computati r's degree (1 major) Mathemat		22)		
master	Sacgree (I major) Mathemat	103 (2022)			
Master's w	ith 1 major Mathematical Physics (2022)	-	• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 54 / 276

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)

Module	e title				Abbreviation	
Resear	rch in G	roups - Discrete Mathe	matics		10-M=GDIM-161-m	01
Modul	e coord	inator		Module offered by		
				Module offered by		
	1	es Mathematik (Mather		Institute of Mathem	latics	
ECTS 10		od of grading rical grade	Only after succ. con			
-	·	-				
Duratio		Module level graduate	Other prerequisites			
1 seme		glauuale				
Conten						
Selecte	ed mod	ern topics in discrete m	athematics.			
Intend	ed learı	ning outcomes				
		ains insight into conten			nematics. He/She ma	asters advan
ced teo	chnique	s in this field and can a	apply them to complex	problems.		
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	in)	
V (2) +	S (2)					
Module	e taugh	t in: German and/or En	glish			
Metho	d of ass	sessment (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)		
talk (60	o to 120	o minutes)				
		ssessment: German or				
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	e				
Referre	ed to in	LPO I (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) Mathemati	cal Physics (2016)			
Master	's teacl	ning degree Gymnasiun	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	's degr	ee (1 major) Mathemati	cs (2019)			
Master	's teacl	ning degree Gymnasiun	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (20	020)
		y course MINT Teacher		Network Bavaria (EN	B) (2020)	
	-	ee (1 major) Mathemati		,		
	-	ee (1 major) Computatio		2)		
	-	ee (1 major) Mathemati				
	-	ee (1 major) Mathemati				
		gram Mathematics (202 ee (1 major) Computatio	-	()		
	-	ee (1 major) Computationee (1 major) Mathemati		4)		
	-	ning degree Gymnasiun	•	ion PLUS Flite Netwo	ork Bayaria (FNR) (a	025)
		Mathematical Physics (2022)				-
Anctor	1016111111101	mathematical Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P		page 56 / 276



Modul	e title				Abbreviation	
Resea	rch in G	roups - Dynamical Syste	ems and Control Theor	ry	10-M=GDSC-161-m	01
Modul	e coord	instor		Module offered by		
		es Mathematik (Mathem	(atics)	Institute of Mathematics		
ECTS	1	od of grading	Only after succ. com		Iducs	
10		rical grade				
Durati	· · · · ·	Module level	Other prorequicites			
1 seme		graduate	Other prerequisites			
Conter						
Select	ed mod	ern topics in dynamical	systems and control th	neory.		
Recom	imende	d previous knowledge:				
		the contents of the mod	lule "Mathematical Co	ntrol Theory" or "Co	ntrol Theory" is requi	ired.
		ning outcomes		•		
		ains insight into contem		ems in dynamical sy	stems and control th	eory He/
		dvanced techniques in t				
		number of weekly cont	· · ·	· · ·		
V (2) +		in the of the entry control			,	
• •	• •	t in: German and/or Eng	lish			
		essment (type, scope, l		an German, examina	tion offered — if not	everv seme-
		on on whether module of				every serife
		minutes)		,		
		ssessment: German or E	Inglish			
		ffered: In the semester i		offered and in the su	ubsequent semester	
Alloca	tion of p	laces				
Additi	onal info	ormation				
Worklo						
	Jau					
300 h						
Teachi	ng cycl	<u>;</u>	_			
			_			
Referre	ed to in	LPOI (examination reg	ulations for teaching-o	legree programmes)		
Modul	e appea	rs in				
Master	r's degre	ee (1 major) Mathematic	s (2016)			
	-	ee (1 major) Economathe				
Maste	r's degre	ee (1 major) Mathematic	al Physics (2016)			
		ning degree Gymnasium				016)
		y course MINT Teacher E		Network Bavaria (EN	B) (2016)	
		ee (1 major) Mathematic				
		ning degree Gymnasium				020)
		y course MINT Teacher E		Network Bavaria (EN	B) (2020)	
	r's degre	ee (1 major) Mathematic	•			
Maste	- المار	to (a mode of Feet and a fill				
Master Master	-	ee (1 major) Economathe		2)		
Master Master Master	r's degre	ee (1 major) Computatio	nal Mathematics (202	2)		
Master Master Master Master	r's degre r's degre	-	nal Mathematics (202	2)		



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

Module					Abbreviation
Resear	ch in G	roups - Functional A	Inalysis		10-M=GFAN-222-m01
Module	e coord	inator		Module offered by	l
Dean o	of Studi	es Mathematik (Mat	hematics)	Institute of Mathem	natics
ECTS		od of grading	Only after succ. con		
10		rical grade			
Duratio	I	Module level	Other prerequisites		
1 seme	-	graduate			
Conten		Siduate			
researo analysi Recom	ch in gr is. mende	oups treats concept d previous knowled	ional foundations of fuctio	onal analysis as well	tral theory, global analysis. The as relations to other fields of her knowledge from other areas
		ay also be useful.			
Intend	ed lear	ning outcomes			
			ntemporary research probl pply them to complex prol		alysis. He/She masters advance
Course	s (type	, number of weekly	contact hours, language –	- if other than Germa	an)
V (2) + Module	• •	t in: German and/o	English		
			pe, language — if other th ule can be chosen to earn		tion offered — if not every seme
Langua	age of a	o minutes) ssessment: Germar ffered: In the semes	n or English ster in which the course is	offered and in the su	ubsequent semester
Allocat	ion of _l	olaces			
Additio	onal inf	ormation			
/ la arcie					
Worklo	ad				
300 h					
Teachi	ng cycl	e			
Referre	ed to in	LPOI (examination	regulations for teaching-	degree programmes)	
Module	e appea	ars in			
Master	's degr	ee (1 major) Compu	tational Mathematics (202	.2)	
Master	's degr	ee (1 major) Mathen	natics (2022)		
	-	ee (1 major) Mathen	natical Physics (2022)		
			-		
exchan		gram Mathematics (2023)		
exchan		-	-	24)	
exchan Master Master	's degr 's degr	ee (1 major) Compu ee (1 major) Mathen	2023) tational Mathematics (202 natics (2024)		
exchan Master Master Master	's degr 's degr 's teacl	ee (1 major) Compu ee (1 major) Mathen ning degree Gymnas	2023) tational Mathematics (202	ion PLUS, Elite Netw	

Module	title			Abbreviation	
Researc	ch in Groups - Geometry and T	opology		10-M=GGMT-161-m	01
Modula	coordinator		Module offered by		
	f Studies Mathematik (Mathem	(a)	Institute of Mathem		
	Method of grading	Only after succ. con		Idlics	
10	numerical grade				
Duratio		Other prerequisites			
1 semes					
Content	1-				
	d modern topics in geometry a	ind topology.			
	ed learning outcomes				
	dent gains insight into contem techniques in this field and ca			l topology. He/She r	nasters ad-
Courses	s (type, number of weekly cont	act hours, language –	if other than Germa	ın)	
V (2) + 5	S (2)				
Module	taught in: German and/or Eng	llish			
	l of assessment (type, scope, formation on whether module			tion offered — if not	every seme-
	to 120 minutes)				
•	ge of assessment: German or I	English			
Assessr	ment offered: In the semester	n which the course is	offered and in the su	ubsequent semester	
Allocati	ion of places				
Additio	nal information				
Workloa	ad				
300 h					
Teachin	ng cycle				
Referre	d to in LPO I (examination reg	ulations for teaching-	legree programmes)		
Modulo	appears in				
	s degree (1 major) Mathematic	·c (2016)			
	s degree (1 major) Mathematic				
	s teaching degree Gymnasium		ion PLUS, Flite Netw	ork Bavaria (FNB) (2	016)
	mentary course MINT Teacher				
	s degree (1 major) Mathematic			/	
	s teaching degree Gymnasium	-	ion PLUS, Elite Netw	ork Bavaria (ENB) (20	020)
	mentary course MINT Teacher		Network Bavaria (EN	B) (2020)	
	s degree (1 major) Mathematic	•			
	s degree (1 major) Computatio		2)		
	s degree (1 major) Mathematic				
	s degree (1 major) Mathematic go program Mathematics (202	•			
	ge program Mathematics (202 s degree (1 major) Computatio	-	()		
	s degree (1 major) Mathematic		4 7		
	s teaching degree Gymnasium	•	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	025)
Master's wit	th 1 major Mathematical Physics (2022)		generated 19-Apr-2025 • exa		page 61 / 276
		ta record Master	(120 ECTS) Mathematische P	пуык - 2022	



Module	e title				Abbreviation
Resear	ch in G	roups - Higher Structures	5		10-M=GHST-222-m01
Module	coord	inator		Module offered by	
Dean of	f Studie	es Mathematik (Mathema	atics)	Institute of Mathem	atics
ECTS		od of grading	Only after succ. com		
10	· · · · · · · · · · · · · · · · · · ·	rical grade		•	
Duratio	n	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
Selecte	d topic	s on higher structures ar	d higher symmetries	in differential geom	etry and topology.
		d previous knowledge:		an to Differential Co	
		ommended. Basic knowle			ometry" and "Introduction to To-
		ning outcomes			
		0	nt problems in the st	udy of higher struct	ures (e.g. multiple vector bundles
					, representations up to homoto-
py).	•				
Course	s (type,	, number of weekly conta	ct hours, language —	if other than Germa	in)
V (2) + 2	S (2)				
Module	e taugh	t in: German and/or Engl	ish		
					tion offered — if not every seme-
		on on whether module ca	an de chosen to eann	a Dollus)	
		o minutes) ssessment: German or Er	nglish		
-	•	ffered: In the semester in	•	offered and in the su	ubsequent semester
Allocat	ion of p	olaces			
Additio	nal info	ormation			
Worklo	ad				
300 h					
Teachir	ng cycl	٩			
	<u>15 cycc</u>	•			
Referre	d to in	LPOI (examination regu	lations for teaching.	legree programmes)	
			tations for teaching-t		
		arc in			
Module		ee (1 major) Computation	al Mathematics (202	2)	
	-	ee (1 major) Computation		<i>∠)</i>	
	0	ee (1 major) Mathematica	. ,		
	-	gram Mathematics (2023)			
	-	ee (1 major) Computation		4)	
	-	ee (1 major) Mathematics			
		ning degree Gymnasium I			
Supple	mentar	y course MINT Teacher E	ucation PLUS, Elite I	vetwork Bavaria (EN	b) (2025)

Modul	e title				Abbreviation	
Resear	rch in G	roups - Inverse Probler	ns		10-M=GINP-222-m	01
Modul	e coord	inator		Module offered by	1	
Dean c	of Studio	es Mathematik (Mathe	natics)	Institute of Mathem	natics	
ECTS		od of grading	Only after succ. cor	npl. of module(s)		
10		rical grade		• • • •		
Durati	on	Module level	Other prerequisites	5		
1 seme	ester	graduate				
Conter	nts					
Select	ed mod	ern topics in inverse pr	oblems.			
Decom	manda	d new inclusion days				
		d previous knowledge: tion with the lecturer, p	prior knowledge from th	ne modules "Inverse	Problems 1" and po	ssibly "Inver-
		" is recommended. The				
vious s	semeste	er.				
Intend	ed lear	ning outcomes				
		ains insight into conter			ems. He/She maste	rs advanced
		this field and can appl	<u> </u>		```	
		, number of weekly con	tact hours, language -	– if other than Germa	in)	
V (2) +		tin, Corman and lar En	alich			
	_	t in: German and/or En	-	- · ·		
		essment (type, scope, on on whether module			ition offered — if not	every seme-
talk (6	o to 120	minutes)				
		ssessment: German or				
		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	ng cycl	e				
Referre	ed to in	LPOI (examination reg	gulations for teaching-	degree programmes)	I	
Modul	e appea	in in				
		ee (1 major) Computati	onal Mathematics (202	22)		
	-	ee (1 major) Mathemati				
	-	ee (1 major) Mathemati				
Master	r's degr	ee (1 major) Economatł	nematics (2022)			
exchar	nge prog	gram Mathematics (202	23)			
	-	ee (1 major) Computati		24)		
	-	ee (1 major) Mathemati				
	-	ee (1 major) Economath	•			
		ning degree Gymnasiur				025)
Supple	ementai	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2025)	
Master's w	ith 1 majo	Mathematical Physics (2022)	-	• generated 19-Apr-2025 • exa r (120 ECTS) Mathematische P	-	page 64 / 276



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

Research in Groups - Lie Theory 10-M=GLIE-192-m01 Module coordinator Module offered by Dean of Studies Mathematik (Mathematics) Institute of Mathematics ECTS Method of grading Only after succ. compl. of module(s) 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents Selected modern topics in Lie Theory. Recommended previous knowledge: Knowledge of the contents of the module "Lie theory" is required.	Module title			Abbreviation	
Dean of Studies Mathematik (Mathematics) Institute of Mathematics ECTS Method of grading Only after succ. compl. of module(s) 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents Selected modern topics in Lie Theory. Recommended previous knowledge:	Research in Groups - Lie Theory			10-M=GLIE-192-mo	1
ECTS Method of grading Only after succ. compl. of module(s) 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents Selected modern topics in Lie Theory. Recommended previous knowledge:	Module coordinator		Module offered by		
10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents Selected modern topics in Lie Theory. Recommended previous knowledge:	Dean of Studies Mathematik (Mathema	atics)	Institute of Mathem	atics	
Duration Module level Other prerequisites 1 semester graduate Contents Selected modern topics in Lie Theory. Recommended previous knowledge:	ECTS Method of grading	Only after succ. com	pl. of module(s)		
1 semester graduate Contents	10 numerical grade				
Contents Selected modern topics in Lie Theory. Recommended previous knowledge:	Duration Module level	Other prerequisites			
Selected modern topics in Lie Theory. Recommended previous knowledge:	1 semester graduate				
Recommended previous knowledge:	Contents				
	Selected modern topics in Lie Theory.				
		ule "Lie theory" is req	uired.		
Intended learning outcomes	Intended learning outcomes				
The student gains insight into contemporary research problems in Lie Theory. He/She masters advanced techni-			ems in Lie Theory. He	e/She masters adva	nced techni-
ques in this field and can apply them to complex problems. Courses (type, number of weekly contact hours, language — if other than German)			if other than Germa	n)	
V (2) + S (2)	V (2) + S (2)			,	
Module taught in: German and/or English Method of assessment (type, scope, language — if other than German, examination offered — if not every seme-			an Corman, ovamina	tion offered if not	ovorucomo
ster, information on whether module can be chosen to earn a bonus)				tion onered — if not	every seme-
talk (60 to 120 minutes) Language of assessment: German or English	Language of assessment: German or E				
Assessment offered: in the semester in which the course is offered and in the subsequent semester		n which the course is	offered and in the st	ibsequent semester	
Allocation of places	Allocation of places				
Additional information	Additional information				
Workload					
300 h					
Teaching cycle	Teaching cycle	_			
Referred to in LPO I (examination regulations for teaching-degree programmes)	Referred to in LPO I (examination regu	ulations for teaching-o	legree programmes)		
Module appears in	Module appears in				
Master's degree (1 major) Mathematics (2019)	Master's degree (1 major) Mathematics	s (2019)			
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)	,				020)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)			Network Bavaria (EN	B) (2020)	
Master's degree (1 major) Mathematical Physics (2020)		•	、 、		
Master's degree (1 major) Computational Mathematics (2022)			2)		
Master's degree (1 major) Mathematics (2022)					
Master's degree (1 major) Mathematical Physics (2022)		·			
exchange program Mathematics (2023)			0		
Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024)			4)		
Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)			on PILIS Flite Netwo	ork Bayaria (FNR) (a	025)
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)					02 <i>)</i>
Master's with 1 major Mathematical Physics (2022) JMU Würzburg • generated 19-Apr-2025 • exam. reg. da- ta record Master (120 ECTS) Mathematische Physik - 2022	Master's with 1 major Mathematical Physics (2022)				page 66 / 276

Module title				Abbreviation	
	iroups - Measure and Int	egral		10-M=GMAI-161-m	01
Module coord	linator		Module offered by		
		atics)		atics	
	es Mathematik (Mathem		Institute of Mathem	latics	
	od of grading erical grade	Only after succ. com			
Duration	Module level	Other prorequisites			
1 semester	graduate	Other prerequisites			
	graduate				
Contents		<u> </u>			
functions and	easure and integration th I Lebesgue integrals, sele n rule), Lp spaces and al	ected applications, e.	g. product measures	s (with Fubini's theo	
Intended lear	ning outcomes				
	ains insight into contem ed techniques in this field				He/She ma-
Courses (type	e, number of weekly cont	act hours, language —	if other than Germa	n)	
V (2) + S (2)					
Module taugh	nt in: German and/or Eng	lish			
	sessment (type, scope, l			tion offered — if not	every seme-
	ion on whether module o	can be chosen to earn	a bonus)		
talk (60 to 12	-				
• •	assessment: German or E offered: In the semester i	-	offered and in the su	ibsoquent somostor	
				ibsequent semester	
Allocation of	places	_			
Additional in	ormation				
		_			
Workload					
300 h					
Teaching cyc	le				
Referred to ir	LPOI (examination reg	ulations for teaching-c	legree programmes)		
Module appe	ars in				
	ree (1 major) Mathematic	s (2016)			
-	ree (1 major) Economathe				
-	ree (1 major) Mathematic				
Master's teac	hing degree Gymnasium	MINT Teacher Educati	on PLUS, Elite Netwo	ork Bavaria (ENB) (2	016)
	ry course MINT Teacher E		Network Bavaria (EN	B) (2016)	
	ree (1 major) Mathematic				
	hing degree Gymnasium				020)
	ry course MINT Teacher E		Network Bavaria (EN	B) (2020)	
-	ree (1 major) Mathematic				
-	ree (1 major) Economathe ree (1 major) Computatio		2)		
			<i>∠</i>)		
Master's dom					
	ree (1 major) Mathematic ree (1 maior) Mathematic				
Master's deg	ree (1 major) Mathematic	al Physics (2022)	generated 19-Apr-2025 • exa	nm rog da	page 67 / 276

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)

Modul	e title				Abbreviation	
Resea	rch in G	roups - Mathematical Pl	nysics		10-M=GMAP-192-m	101
Modul	e coord	inator		Module offered by	<u>I</u>	
Dean	of Studio	es Mathematik (Mathem	atics)	Institute of Mathem	natics	
ECTS		od of grading	Only after succ. con			
10		rical grade				
Durati		Module level	Other prerequisites			
1 seme		graduate				
Conte	nts	0				
Select	ed mod	ern topics in Mathematio	cal Physics.			
		d previous knowledge: the content, basic and a	advanced knowledge	from different areas	of analysis and/or d	lifferential
		quired. In case of doubt				
Intend	ed lear	ning outcomes				
		ains insight into contem ques in this field and ca			l Physics. He/She m	asters ad-
Course	es (type	, number of weekly conta	act hours, language –	- if other than Germa	ın)	
V (2) + Modul	• •	t in: German and/or Eng	lish			
Metho	d of ass	essment (type, scope, la on on whether module o	anguage — if other th		ition offered — if not	every seme-
		minutes)				
Langu	age of a	ssessment: German or E ffered: in the semester i		offered and in the su	ubsequent semester	
	tion of p				•	
Additi	onal inf	ormation				
Workl	oad					
300 h						
Teach	ing cycl	e				
Referr	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)	I	
Modul	e appea	ars in				
Maste	r's degr	ee (1 major) Mathematic	s (2019)			
Maste	r's teacl	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	020)
		y course MINT Teacher E		Network Bavaria (EN	B) (2020)	
1		ee (1 major) Mathematic				
	-	ee (1 major) Computation		22)		
1		ee (1 major) Mathematic				
	-	ee (1 major) Mathematic	•			
		gram Mathematics (202 <u>3</u> ee (1 major) Computation				
	-	ee (1 major) Computation		-47		
	-	ning degree Gymnasium		ion PLUS, Elite Netw	ork Bavaria (ENB) (2	025)
Master's v	vith 1 majo	Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 69 / 276



ECTS Method of grading Only after succ. compl. of model 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents Reflection on mathematics in a cultural context, for example by discussive by a historical period, a geographic region or a particular field of m the connection of mathematics with literature, language, music, art or the student realises the cultural dimension of mathematics and its relation of the student realises the cultural dimension of mathematics and its relation of assessment (type, scope, language — if other than German, ster, information on whether module can be chosen to earn a bonus) talk (60 to 120 minutes) Language of assessment: German or English Additional information Module aught in: German or English Additional information Additional information Module appears in Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Mathematics (2019)	Mathematics ile(s) ing part of the history of mathematics, gi- athematics. Other possibilities arise from he media. ition to other cultural fields. an German) examination offered — if not every seme-
Dean of Studies Mathematik (Mathematics) Institute of ECTS Method of grading Only after succ. compl. of model 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents Reflection on mathematics in a cultural context, for example by discuss ven by a historical period, a geographic region or a particular field of m the connection of mathematics with literature, language, music, art or for intended lear-ing outcomes The student realises the cultural dimension of mathematics and its relation on whether of weekly contact hours, language — if other that a series (type, number of weekly contact hours, language — if other than German, ster, information on whether module can be chosen to earn a bonus) talk (60 to 120 minutes) Language of assessment: German or English Additional information	Mathematics ile(s) ing part of the history of mathematics, gi- athematics. Other possibilities arise from he media. ition to other cultural fields. an German) examination offered — if not every seme-
Dean of Studies Mathematik (Mathematics) Institute of ECTS Method of grading Only after succ. compl. of model 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents Reflection on mathematics in a cultural context, for example by discuss ven by a historical period, a geographic region or a particular field of m the connection of mathematics with literature, language, music, art or to intended learning outcomes The student realises the cultural dimension of mathematics and its relation on whether module can be chosen to earn a bonus) talk for the the discense of the discense discense discense of the discense of the discense of t	Mathematics ile(s) ing part of the history of mathematics, gi- athematics. Other possibilities arise from he media. ition to other cultural fields. an German) examination offered — if not every seme-
ECTS Method of grading Only after succ. compl. of model 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents Reflection on mathematics in a cultural context, for example by discusse ven by a historical period, a geographic region or a particular field of m the connection of mathematics with literature, language, music, art or the connection of mathematics with literature, language, music, art or the student realises the cultural dimension of mathematics and its relation of mathematics and its relation of discesses (type, number of weekly contact hours, language — if other that Gourses (type, number of weekly contact hours, language — if other than German, ster, information on whether module can be chosen to earn a bonus) talk (60 to 120 minutes) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and Allocation of places Morkload 300 h Teaching cycle Module appears in Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Mathematics (2016) Master's degree (1 major) Mathematics (2019) Master's degree (1 major) Mathematics (2019) Master's degre	ile(s) ing part of the history of mathematics, gi- athematics. Other possibilities arise from he media. ition to other cultural fields. in German) examination offered — if not every seme-
10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents Reflection on mathematics in a cultural context, for example by discuss ven by a historical period, a geographic region or a particular field of m the connection of mathematics with literature, language, music, art or to Intended learning outcomes The student realises the cultural dimension of mathematics and its relate Courses (type, number of weekly contact hours, language — if other than German, ster, information on whether module can be chosen to earn a bonus) Module taught in: German and/or English Method of assessment (type, scope, language — if other than German, ster, information on whether module can be chosen to earn a bonus) Language of assessment: German or English Additional information	ing part of the history of mathematics, gi- athematics. Other possibilities arise from he media. ition to other cultural fields. in German) examination offered — if not every seme-
Duration Module level Other prerequisites 1 semester graduate Contents Reflection on mathematics in a cultural context, for example by discuss ven by a historical period, a geographic region or a particular field of m the connection of mathematics with literature, language, music, art or to Intended learning outcomes The student realises the cultural dimension of mathematics and its relat Courses (type, number of weekly contact hours, language — if other that V (2) + S (2) Module taught in: German and/or English Method of assessment (type, scope, language — if other than German, ster, information on whether module can be chosen to earn a bonus) talk (60 to 120 minutes) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and Allocation of places Morkload 300 h Teaching cycle 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 Ba' Master's degree (1 major) Mathematics (2019)	athematics. Other possibilities arise from he media. ntion to other cultural fields. n German) examination offered — if not every seme-
1 semester graduate Contents Reflection on mathematics in a cultural context, for example by discuss ven by a historical period, a geographic region or a particular field of m the connection of mathematics with literature, language, music, art or temperature in the connection of mathematics with literature, language, music, art or temperature, language, and language, music, art or temperature, language, and language, music, art or temperature, language, and language, and language, music, art or temperature, language, language, language, and language, and language, and language, and language, music, art or temperatex, language, lan	athematics. Other possibilities arise from he media. ntion to other cultural fields. n German) examination offered — if not every seme-
Reflection on mathematics in a cultural context, for example by discuss ven by a historical period, a geographic region or a particular field of m the connection of mathematics with literature, language, music, art or t Intended learning outcomes The student realises the cultural dimension of mathematics and its rela Courses (type, number of weekly contact hours, language — if other that V (2) + S (2) Module taught in: German and/or English Method of assessment (type, scope, language — if other than German, ster, information on whether module can be chosen to earn a bonus) talk (60 to 120 minutes) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and Allocation of places Modulional information Workload 300 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree prog Module appears in 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 Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019)	athematics. Other possibilities arise from he media. ntion to other cultural fields. n German) examination offered — if not every seme-
Reflection on mathematics in a cultural context, for example by discuss ven by a historical period, a geographic region or a particular field of m the connection of mathematics with literature, language, music, art or t Intended learning outcomes The student realises the cultural dimension of mathematics and its rela Courses (type, number of weekly contact hours, language — if other that V (2) + S (2) Module taught in: German and/or English Method of assessment (type, scope, language — if other than German, ster, information on whether module can be chosen to earn a bonus) talk (60 to 120 minutes) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and Allocation of places Modulional information Workload 300 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree prog Module appears in 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 Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019)	athematics. Other possibilities arise from he media. ntion to other cultural fields. n German) examination offered — if not every seme-
The student realises the cultural dimension of mathematics and its rela Courses (type, number of weekly contact hours, language — if other that V (2) + S (2) Module taught in: German and/or English Method of assessment (type, scope, language — if other than German, ster, information on whether module can be chosen to earn a bonus) talk (60 to 120 minutes) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and Allocation of places Additional information Workload 300 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree prog Module appears in Master's degree (1 major) Mathematics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar	n German) examination offered — if not every seme-
Courses (type, number of weekly contact hours, language — if other that V (2) + S (2) Module taught in: German and/or English Method of assessment (type, scope, language — if other than German, ster, information on whether module can be chosen to earn a bonus) talk (60 to 120 minutes) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and Allocation of places 	n German) examination offered — if not every seme-
V (2) + S (2) Module taught in: German and/or English Method of assessment (type, scope, language — if other than German, ster, information on whether module can be chosen to earn a bonus) talk (60 to 120 minutes) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and Allocation of places Additional information Workload 300 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree prog Module appears in Master's degree (1 major) Mathematics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, El Supplementary course MINT Teacher Education PLUS, El Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, El	examination offered — if not every seme-
V (2) + S (2) Module taught in: German and/or English Method of assessment (type, scope, language — if other than German, ster, information on whether module can be chosen to earn a bonus) talk (60 to 120 minutes) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and Allocation of places Additional information Workload 300 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree prog Module appears in Master's degree (1 major) Mathematics (2016) Master's teaching degree Gymnasium MINT Teacher Education PLUS, El Supplementary course MINT Teacher Education PLUS, El Master's teaching degree Gymnasium MINT Teacher Education PLUS, El	examination offered — if not every seme-
Module taught in: German and/or English Method of assessment (type, scope, language — if other than German, ster, information on whether module can be chosen to earn a bonus) talk (60 to 120 minutes) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and Allocation of places Additional information Workload 300 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree prog Module appears in 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 Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019)	
Method of assessment (type, scope, language — if other than German, ster, information on whether module can be chosen to earn a bonus) talk (60 to 120 minutes) Language of assessment: German or English Assessment offered: In the semester in which the course is offered and Allocation of places Additional information Workload 300 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree prog 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 Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar	
Language of assessment: German or English Assessment offered: In the semester in which the course is offered and Allocation of places Additional information Workload 300 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree prog 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, El Supplementary course MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar	in the subsequent semester
Assessment offered: In the semester in which the course is offered and Allocation of places Additional information Workload 300 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree prog 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, El Supplementary course MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar	in the subsequent semester
Allocation of places Additional information Workload 300 h Teaching cycle Referred to in LPO I (examination regulations for teaching-degree prog 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, El Supplementary course MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bar	in the subsequent semester
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Supplementary course MINT Teacher Education PLUS, Elite Network Bar Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, El	
Master's degree (1 major) Mathematics (2019) Master's teaching degree Gymnasium MINT Teacher Education PLUS, E	
Master's teaching degree Gymnasium MINT Teacher Education PLUS, E	/aria (ENB) (2016)
,	
Supplementary course MINT Teacher Education PLUS, Elite Network Bay	ita Naturak Parasia (FNP) ()
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'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 with 1 major Mathematical Physics (2022) JMU Würzburg • generated 19-A ta record Master (120 ECTS) Math	



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)

Resear	e title				Abbreviation						
	rch in G	roups - Mathematics in t	the Sciences		10-M=GMSC-161-m	01					
Modul	e coord	inator		Module offered by							
		es Mathematik (Mathem	atics)	Institute of Mathematics							
ECTS		od of grading	Only after succ. com								
10		rical grade									
Duratio	·	Module level	Other prerequisites								
1 seme		graduate									
Conten		3									
		c in mathematics in the	sciences								
Recom Basic k	imende knowled	d previous knowledge: Ige from the modules "O recommended, as well a	rdinary Differential Ec		duction to Partial Dif	ferential					
Intend	ed learı	ning outcomes									
		ains insight into contem niques in this field and			in the sciences. He/	She masters					
Course	es (type	number of weekly conta	act hours, language —	- if other than Germa	n)						
V (2) +		, , , , , , , , , , , , , , , , , , , ,									
• •	• •	t in: German and/or Eng	lish								
		essment (type, scope, la on on whether module c			tion offered — if not	every seme-					
Assess		ssessment: German or E ffered: In the semester in Jlaces		offered and in the su	ubsequent semester						
Additic	onal inf	ormation									
						Additional information					
Worklo	bad										
300 h											
-	ng cycl	9									
300 h Teachi 	ng cycl	9									
Teachi		e LPOI (examination regu	ulations for teaching-o	degree programmes)							
Teachi			ulations for teaching-o	degree programmes)							
Teachi Referre Module	ed to in e appea	LPO I (examination regu		degree programmes)							
Teachi Teachi Referre Module Master Master Master Master Supple Master Supple Master	ed to in e appea r's degro r's degro r's teach ementar r's degro r's teach ementar r's degro r's teach ementar	LPOI (examination regu	s (2016) al Physics (2016) nal Mathematics (201 MINT Teacher Educati ducation PLUS, Elite I nal Mathematics (201 s (2019) MINT Teacher Educati ducation PLUS, Elite I al Physics (2020)	6) ion PLUS, Elite Netwo Network Bavaria (EN 9) ion PLUS, Elite Netwo Network Bavaria (EN	B) (2016) ork Bavaria (ENB) (20						

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)

Modul	Module title				Abbreviation	
Resea	rch in G	roups - Non-linear Analy	/sis		10-M=GNLA-161-m	01
Modul	e coord	inator		Module offered by	<u> </u>	
Dean o	of Studie	es Mathematik (Mathem	atics)	Institute of Mathem	atics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10		rical grade		• • • •		
Durati	on	Module level	Other prerequisites	6		
1 seme	ester	graduate				
Conte	nts					
Select	ed mod	ern topics in non-linear	analysis.			
Deserv						
		d previous knowledge: the content, basic and	advanced knowledge	from different areas	of analysis is requir	ad In case of
		commended to consult t		fioni unerent areas	or analysis is require	eu. In case of
		ning outcomes				
		ains insight into contem	porary research probl	ems in Non-linear Ar	alvsis. He/She mas	ters advan-
		s in this field and can a				
Course	es (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (2) + Modul	• •	t in: German and/or Eng	lish			
		essment (type, scope, l		an German, examina	tion offered — if not	avary sama.
		on on whether module of				every serie
		minutes)				
		ssessment: German or E		- ((
		ffered: In the semester i	n which the course is	offered and in the st	ibsequent semester	
Alloca	tion of p	naces				
 Additi	onalinf	ormation	_			
Auuiti						
Workle						
300 h						
-	ing cycl	a				
Teacin	ing cycu	5				
Doforr	od to in	LPOI (examination reg	ulations for toaching	dograa programmac)		
Referr				degree programmes)		
	e appea					
	-	ee (1 major) Mathematic ee (1 major) Mathematic				
	-	ning degree Gymnasium		ion PLUS Elite Netw	ork Bayaria (FNB) (2	016)
		y course MINT Teacher I				010)
		ee (1 major) Mathematic		litetwork Buvunu (Eli	D) (2010)	
	-	ning degree Gymnasium	-	ion PLUS, Elite Netw	ork Bavaria (FNB) (2	020)
		y course MINT Teacher I				
		ee (1 major) Mathematic				
	-	ee (1 major) Computatio	•	22)		
	-	ee (1 major) Mathematic				
	-	ee (1 major) Mathematic				
Master's v	vith 1 major	Mathematical Physics (2022)	-	• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 75 / 276

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 Mathematical Physics (2022)

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Modul	e title				Abbreviation	
Resear	rch in G	roups - Numerical Ma	athematics and Applied A	Analysis	10-M=GNMA-161-m	01
Modul	e coord	nator		Module offered by	<u> </u>	
		es Mathematik (Math	ematics)	Institute of Mathem	atics	
ECTS		od of grading	Only after succ. con		laties	
10		rical grade				
Durati	<u> </u>	Module level	Other prerequisites			
1 seme		graduate				
Conter	nts	<u> </u>				
		s in numerical mathe	ematics, applied analysis	s or scientific compu	ting.	
Depen	ding on		e: nd advanced knowledge bubt, it is recommended t			umerical ma
Intend	ed learr	ing outcomes				
			ntemporary research prol ues in this field and can			ied analysis.
Course	es (type,	number of weekly co	ontact hours, language –	- if other than Germa	ın)	
V (2) +						
		t in: German and/or I	-			
			e, language — if other th le can be chosen to earn		ition offered — if not	every seme-
Assess			or English er in which the course is	offered and in the s	ubsequent semester	
Additio	onal info	ormation				
Worklo	oad					
300 h						
Teachi	ing cycl	9				
Referre	ed to in	LPOI (examination I	regulations for teaching-o	degree programmes)		
Modul	e appea	rs in				
	r'e doar					
Master Master Master Supple Master Master Supple	r's degre r's degre r's teach ementar r's degre r's degre r's degre r's teach ementar	ning degree Gymnasi y course MINT Teach ee (1 major) Computa ee (1 major) Mathema ning degree Gymnasi y course MINT Teach	athematics (2016) atical Physics (2016) tional Mathematics (201 um MINT Teacher Educat er Education PLUS, Elite tional Mathematics (201 atics (2019) um MINT Teacher Educat er Education PLUS, Elite	ion PLUS, Elite Netw Network Bavaria (EN 9) ion PLUS, Elite Netw	B) (2016) ork Bavaria (ENB) (20	
Master Master Master Supple Master Master Supple Master	r's degre r's degre r's teach ementar r's degre r's degre r's teach ementar r's degre	ee (1 major) Economa ee (1 major) Mathema ee (1 major) Computa ning degree Gymnasi y course MINT Teach ee (1 major) Computa ee (1 major) Mathema ning degree Gymnasi	athematics (2016) atical Physics (2016) ational Mathematics (201 um MINT Teacher Educat er Education PLUS, Elite I aticnal Mathematics (201 atics (2019) um MINT Teacher Educat er Education PLUS, Elite I atical Physics (2020)	ion PLUS, Elite Netw Network Bavaria (EN 9) ion PLUS, Elite Netw	B) (2016) ork Bavaria (ENB) (20 B) (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		
Resear	rch in G	roups - Number Theory			10-M=GNTH-161-m	01
Modul	e coord	inator		Module offered by	<u> </u>	
		es Mathematik (Mathem	atics)	Institute of Mathematics		
ECTS	—	od of grading	Only after succ. con			
10		rical grade				
Durati	·	Module level	Other prerequisites			
1 seme		graduate				
Conter		0	1			
	-	ern topics in number the	ory (e. g. algebraic ni	umber theory, modul	ar forms, diophantin	ie analysis).
Select	cumou				ar ronno, arophantin	e unatysis).
Recom	mende	d previous knowledge:				
Basic knowledge of algebra and number theory is assumed, such as can be acquired in the modules "Introducti-						
on to A	Algebra"	, "Introduction to Numb	er Theory" and "Appli	ed Algebra".		
Intend	ed learı	ning outcomes				
		ains insight into contem			. He/She masters ac	lvanced tech-
		field and can apply then	·		、 、	
		, number of weekly conta	act hours, language –	- if other than Germa	n)	
V (2) + Modul		t in: German and/or Eng	lich			
-		essment (type, scope, la		an Corman, ovamina	tion offered if not	ovorucomo
		on on whether module of				every serile-
talk (6	o to 120	minutes)				
		ssessment: German or E				
Assess	sment o	ffered: In the semester i	n 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	ng cycl	e				
Referre	ed to in	LPOI (examination regu	ulations for teaching-	degree programmes)		
Modul	e appea	irs in				
Master	r's degr	ee (1 major) Mathematic	s (2016)			
Master	r's degre	ee (1 major) Mathematic	al Physics (2016)			
Master	r's teacł	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supple	ementar	y course MINT Teacher E	ducation PLUS, Elite	Network Bavaria (EN	B) (2016)	
Master	r's degro	ee (1 major) Mathematic	s (2019)			
Master	r's teacł	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	020)
Supple	ementar	y course MINT Teacher E	ducation PLUS, Elite	Network Bavaria (EN	B) (2020)	
Master	r's degre	ee (1 major) Mathematic	al Physics (2020)			
Master	r's degre	ee (1 major) Computation	nal Mathematics (202	2)		
Master	r's degre	ee (1 major) Mathematic	s (2022)			
Master	r's degr	ee (1 major) Mathematic	al Physics (2022)			
Master's w	vith 1 major	Mathematical Physics (2022)	-	9 generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 79 / 276

Module title				Abbreviation		
Resea	rch in G	roups - Operator Algebr	as		10-M=GOPA-161-m	01
Modul	e coord	inator		Module offered by		
Dean o	of Studie	es Mathematik (Mathem	atics)	Institute of Mathem	natics	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
10		rical grade		• • • •		
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts		•			
Select	ed mod	ern topics in operator al	gebras.			
Recommended previous knowledge:						
	Knowledge of the contents of the modules "Functional Analysis" and "Algebra and Dynamics of Quantum Sy-					
stems	' is reco	mmended.				
Intend	ed learr	ning outcomes				
		ains insight into contem this field and can apply			ebras. He/She maste	ers advanced
Course	es (type,	, number of weekly cont	act hours, language –	- if other than Germa	ın)	
V (2) + Modul	• •	t in: German and/or Eng	lish			
	_	essment (type, scope, l		an German examina	tion offered — if not	every seme-
		on on whether module of				every serie
		minutes)				
		ssessment: German or E ffered: In the semester i		offered and in the su	ubsequent semester	
Alloca	tion of p	olaces				
Additi	onal info	ormation				
Workle	bad					
300 h						
Teachi	ng cycl	e				
Referr	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Modul	e appea	irs in				
Maste	r's degre	ee (1 major) Mathematic	s (2016)			
Maste	r's degre	ee (1 major) Mathematic	al Physics (2016)			
Master	r's teacł	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	016)
		y course MINT Teacher E		Network Bavaria (EN	B) (2016)	
	-	ee (1 major) Mathematic	-			
		ning degree Gymnasium				020)
		y course MINT Teacher E		Network Bavaria (EN	B) (2020)	
	-	ee (1 major) Mathematic	•			
	-	ee (1 major) Computatio ee (1 major) Mathematic		2)		
	-	ee (1 major) Mathematic				
			· · · · · · · · · · · · · · · · · · ·			
Master's w	ith 1 major	Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 81 / 276

Module	e title				Abbreviation	
Resear	rch in Gro	ups - Robotics, Optin	nization and Control Th	neory	10-M=GROC-161-m	01
Module	e coordin	ator		Module offered by	<u> </u>	
		Mathematik (Mather	natics)	Institute of Mathen	natics	
ECTS	1	of grading	Only after succ. con		141105	
10		al grade				
Duratio	·	lodule level	Other prerequisites			
1 seme		raduate				
		laduate				
Conten	-			11		
Selecte	ed moder	n topics in robotics, c	optimisation and contro	ol theory.		
Recom	mended	previous knowledge:				
			dule "Mathematical Co	ntrol Theory" or "Co	ntrol Theorv" is reaui	red.
		ng outcomes		,,		
			nporary research probl	ame in robotice ont	imization and contro	lthoon, Ho/
			this field and can app			t theory. He/
		· · · ·	tact hours, language –	· · ·		
V (2) +		Competition weekly COII	all nours, language –		4117	
		n: German and/or En	olich			
			-	an Carman avamina	tion offered if not	
			language — if other that can be chosen to earn		illion offered — If not	every seme-
-	o to 120 r					
-		essment: German or	Fnglish			
			in which the course is	offered and in the s	ubsequent semester	
	tion of pla					
/						
ماداند	onal infor	mation				
Additio		mation				
Worklo	bad					
300 h						
Teachi	ng cycle					
Referre	ed to in Ll	POI (examination reg	gulations for teaching-o	legree programmes)		
			<u> </u>	<u> </u>		
Module	e appears	in				
			cc (2016)			
	-	(1 major) Mathemati (1 major) Economath				
	-	(1 major) Mathemati				
	-		onal Mathematics (201	6)		
	-				ork Bavaria (ENB) (20	016)
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)					
Supple		(1 major) Computatio	onal Mathematics (201	9)		
Supple Master	r's degree	(1 major) Computatio (1 major) Mathemati		9)		
Supple Master Master	r's degree r's degree	(1 major) Mathemati			ork Bavaria (ENB) (20	020)
Supple Master Master Master Supple	r's degree r's degree r's teachin ementary	(1 major) Mathemati ng degree Gymnasiun course MINT Teacher	cs (2019) n MINT Teacher Educat Education PLUS, Elite I	ion PLUS, Elite Netw		020)
Supple Master Master Master Supple Master	r's degree r's degree r's teachin ementary r's degree	(1 major) Mathemati ng degree Gymnasiun course MINT Teacher (1 major) Mathemati	cs (2019) n MINT Teacher Educat Education PLUS, Elite I cal Physics (2020)	ion PLUS, Elite Netw		020)
Supple Master Master Master Supple Master	r's degree r's degree r's teachin ementary r's degree	(1 major) Mathemati ng degree Gymnasiun course MINT Teacher	cs (2019) n MINT Teacher Educat Education PLUS, Elite I cal Physics (2020)	ion PLUS, Elite Netw		020)
Supple Master Master Master Supple Master Master	r's degree r's degree r's teachin ementary r's degree r's degree	(1 major) Mathemati ng degree Gymnasiun course MINT Teacher (1 major) Mathemati	cs (2019) n MINT Teacher Educat Education PLUS, Elite I cal Physics (2020) nematics (2021)	ion PLUS, Elite Netw	B) (2020)	020) page 83 / 276

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)

Module title				Abbreviation		
Resear	rch in G	roups - Statistics			10-M=GSTA-161-mc	01
Modul	e coord	inator		Module offered by		
		es Mathematik (Mathema	atics)	Institute of Mathematics		
ECTS		od of grading	Only after succ. con			
10	· · · · · · · · · · · · · · · · · · ·	rical grade				
Duratio	<u> </u>	Module level	Other proroquisitor			
1 seme		graduate	Other prerequisites			
Conter			1			
		ern topics in statistics.				
		d previous knowledge:				
	Basic knowledge of stochastics is required, such as that acquired in the "Stochastics 1" module. Knowledge of the contents of the module "Stochastics 2" is also recommended. Depending on the content of the course, other					
		If the module "Stochastic ge may also be helpful; c				course, other
		ning outcomes				
			arany receased much	ome in statistics. Us	Cho mastars adver	cod tochn:
		ains insight into contemp eld and can apply them t			i one masters advan	ceu tecnni-
Course	es (type,	, number of weekly conta	act hours, language –	- if other than Germa	n)	
	V(2) + S(2)					
		t in: German and/or Engl	lish			
		essment (type, scope, la			tion offered — if not	every seme-
		on on whether module c	an be chosen to earn	a bonus)		
		minutes)				
		ssessment: German or E ffered: In the semester ir		offered and in the su	ihsequent semester	
	tion of p				issequent semester	
		/11/03				
	nal inf	ormation				
Auditio	Jindt IIII					
			-			
Worklo	Jau					
300 h						
Teachi	ng cycl	9				
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)		
Modul	e appea	irs in				
		ee (1 major) Mathematics				
	-	ee (1 major) Economathe				
	-	ee (1 major) Mathematica				
		ning degree Gymnasium				016)
		y course MINT Teacher E		Network Bavaria (EN	в) (2016)	
	-	ee (1 major) Mathematics ning degree Gymnasium		ion DLUS Elito Notw	ork Boyoria (ENB) (a	020)
		y course MINT Teacher E				020)
		ee (1 major) Mathematica				
	-	ee (1 major) Economathe				
	_					· · · · · · · · · · · · · · · · · · ·
Master's w	ith 1 major	Mathematical Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P		page 85 / 276

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						
Resea	rch in G	roups - Time Series Ana	llysis	_	10-M=GTSA-161-mc)1
Modul	e coord	inator		Module offered by	<u> </u>	
Dean o	of Studio	es Mathematik (Mathem	natics)	Institute of Mathem	natics	
ECTS	1	od of grading	Only after succ. con	npl. of module(s)		
10		rical grade		• • • •		
Durati	on	Module level	Other prerequisites	;		
1 seme	ester	graduate				
Conte	nts					
Select	ed mod	ern topics in time series	s analysis.			
_						
		d previous knowledge: Ige of stochastics is req	wired such as that as	quirad in the "Stach	actice 1" modulo. Kn	owlodgo of
		of the module "Stochast			astics I module. Kin	owieuge of
	-	ning outcomes				
		ains insight into conter	porary research probl	ems in time series a	nalysis. He/She mas	sters advan-
		es in this field and can a			, ,	
Course	es (type	, number of weekly cont	tact hours, language –	- if other than Germa	ın)	
V (2) + Modul	• •	t in: German and/or Eng	zlish			
	_	essment (type, scope,		an German, examina	tion offered — if not	every seme-
		on on whether module				
		o minutes)				
		ssessment: German or l		- 66		
		ffered: In the semester	In which the course is	offered and in the st	lbsequent semester	
Alloca	tion of p	Jiaces				
Additi	onal inf	ormation				
Auuiti						
Workle	nad		_			
300 h						
-	ng cycl	٩				
	ing cyce	•				
Referr	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
Modul	e appea	urs in				
		ee (1 major) Mathematio	rs (2016)			
	-	ee (1 major) Economath				
1	-	ee (1 major) Mathematic				
1	-	ning degree Gymnasium	• • •	ion PLUS, Elite Netw	ork Bavaria (ENB) (20	016)
		y course MINT Teacher				
		ee (1 major) Mathematic		`		
		ning degree Gymnasium		ion PLUS, Elite Netw	ork Bavaria (ENB) (20	020)
1		y course MINT Teacher				
Maste	r's degr	ee (1 major) Mathematio	cal Physics (2020)			
Maste	r's degr	ee (1 major) Economath	ematics (2021)			
Maste	r's degr	ee (1 major) Computatio	onal Mathematics (202	22)		
Master's v	vith 1 majo	Mathematical Physics (2022)		• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P		page 87 / 276

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 Mathematical Physics (2022)

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Module Dean of ECTS	s and Geometry of Classical S coordinator Studies Mathematik (Mathem	ystems		10-M=MP1-161-mo:	l
Dean of ECTS 10 Duratior 1 semes	Studies Mathematik (Mathem				
ECTS 10 Duration 1 semes			Module offered by		
ECTS 10 Duration 1 semes		natics)	Institute of Mathem	natics	
10 Duratior 1 semes	Method of grading	1	Only after succ. compl. of module(s)		
Duration 1 semes	numerical grade				
1 semes	-	Other prerequisites			
Content					
	s				
geometr tion to o geometr ty theory Recomm	analytic methods (such as pa ry) for the description of class outer load (deformation of elas ric mechanics and symplectic y. nended previous knowledge: nowledge from the modules "[ical physics. Examples stic bodies, flow of a f geometry, classical fie	s include movements luid, stream of a gas eld theory and classi	s of deformable bodi). Additional exampl cal gauge theory, ge	ies as reac- es include neral relativi·
	mended. Furthermore, basic	-			,
Intende	d learning outcomes				
	dent gains insight into moderr advanced techniques in this				ics. He/She
Courses	(type, number of weekly cont	act hours, language –	- if other than Germa	ın)	
V (4) + Ü Module) (2) taught in: German and/or Eng	lish			
	of assessment (type, scope, l		an German, examina	tion offered — if not	every seme-
ster, info	ormation on whether module	can be chosen to earn	a bonus)		
b) oral e c) oral e Languag	en examination (approx. 90 to examination of one candidate xamination in groups (groups ge of assessment: German or l ple for bonus	each (approx. 20 min of 2, 15 minutes per c	utes) or		
Allocati	on of places				
Additior	nal information				
Workloa	nd				
300 h					
Teachin	g cvcle				
Referred	to in LPO I (examination reg	ulations for teaching-	degree programmes)		
Module	appears in				
	s degree (1 major) Mathematic	cs (2016)			
	s degree (1 major) Mathematic				
	s teaching degree Gymnasium		ion PLUS, Elite Netw	ork Bavaria (ENB) (2	016)
	•		Network Bavaria (EN	B) (2016)	
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016) Master's degree (1 major) Mathematics (2019)					
Master's	s teaching degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	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) 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)

Algebra	e title			Abbreviation	
-	a and Dynamics of Quantum Sy	stems		10-M=MP2-161-mo	1
Module	coordinator		Module offered by		
	f Studies Mathematik (Mathem	atics)	Institute of Mathem	atics	
ECTS	Method of grading	Only after succ. com		alles	
10	numerical grade				
Duratio		Other prerequisites			
1 semes					
Conten					
braic qu Recomr	n algebraic methods for dynam uantum field theory, spectral th mended previous knowledge: nowledge from the modules "F	neory, symmetries and	representation theo	pry.	
	alysis" is recommended. Basic				
Intende	ed learning outcomes				
The stu	dent gains insight into modern s advanced techniques in this f				ics. He/She
Course	s (type, number of weekly cont	act hours, language —	if other than Germa	n)	
V (4) + I Module	Ü (2) e taught in: German and/or Eng	lish			
	d of assessment (type, scope, l formation on whether module o			tion offered — if not	every seme-
c) oral e Langua	examination of one candidate examination in groups (groups ge of assessment: German or E ble for bonus	of 2, 15 minutes per c	-		
Allocat	ion of places				
Additio	onal information				
Worklo	ad	_			
300 h					
-	ng cycle				
Teachin					
 Referre	d to in LPOI (examination reg	ulations for teaching-c	legree programmes)		
	ed to in LPO I (examination reg	ulations for teaching-c	legree programmes)		
 Module			legree programmes)		
 Module Master' Master'	e appears in 's degree (1 major) Mathematic 's degree (1 major) Mathematic	s (2016) al Physics (2016)			
 Module Master' Master' Master'	e appears in 's degree (1 major) Mathematic 's degree (1 major) Mathematic 's teaching degree Gymnasium	s (2016) al Physics (2016) MINT Teacher Educati	on PLUS, Elite Netwo		016)
 Module Master ¹ Master ¹ Supple	e appears in 's degree (1 major) Mathematic 's degree (1 major) Mathematic 's teaching degree Gymnasium mentary course MINT Teacher B	s (2016) al Physics (2016) MINT Teacher Educati Education PLUS, Elite I	on PLUS, Elite Netwo		016)
 Module Master' Master' Supple Master'	e appears in 's degree (1 major) Mathematic 's degree (1 major) Mathematic 's teaching degree Gymnasium mentary course MINT Teacher E 's degree (1 major) Mathematic	s (2016) al Physics (2016) MINT Teacher Educati Education PLUS, Elite I s (2019)	on PLUS, Elite Netwo Network Bavaria (EN	3) (2016)	
 Module Master' Master' Supple Master' Supple	e appears in 's degree (1 major) Mathematic 's degree (1 major) Mathematic 's teaching degree Gymnasium mentary course MINT Teacher E 's degree (1 major) Mathematic 's teaching degree Gymnasium mentary course MINT Teacher E	s (2016) al Physics (2016) MINT Teacher Educati Education PLUS, Elite I s (2019) MINT Teacher Educati Education PLUS, Elite I	on PLUS, Elite Netwo Network Bavaria (EN on PLUS, Elite Netwo	3) (2016) ork Bavaria (ENB) (24	
 Module Master' Master' Supple Master' Supple	e appears in 's degree (1 major) Mathematic 's degree (1 major) Mathematic 's teaching degree Gymnasium mentary course MINT Teacher E 's degree (1 major) Mathematic 's teaching degree Gymnasium	s (2016) al Physics (2016) MINT Teacher Educati Education PLUS, Elite I s (2019) MINT Teacher Educati Education PLUS, Elite I	on PLUS, Elite Netwo Network Bavaria (EN on PLUS, Elite Netwo	3) (2016) ork Bavaria (ENB) (24	

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)

Module	Module title				
Semina	ar in Applied Differential Geom	etry		10-M=SADG-161-m	01
Module	e coordinator		Module offered by	<u> </u>	
Dean o	f Studies Mathematik (Mathem	atics)	Institute of Mathem	atics	
ECTS	Method of grading	Only after succ. con			
5	numerical grade				
Duratio	on Module level	Other prerequisites			
1 seme	· i				
Conten	ts				
A mode	ern topic in applied differential	geometry.			
Recommended previous knowledge: Advanced knowledge of differential geometry is required, such as can be acquired in the module "Differential					
Geometry". Knowledge of the contents of the modules "Applied Differential Geometry", "Geometric Mechanics",					
	lo-Riemannian and Riemannian				, incentantes
	ed learning outcomes		,		
-	Ident is able to elaborate a cont	temporary research to	ppic. This includes co	mprehending and s	tructuring of
	ic and the available literature,				
Course	s (type, number of weekly cont	act hours, language –	- if other than Germa	n)	
S (2)					
	e taught in: German and/or Eng				
	d of assessment (type, scope, la formation on whether module o			tion offered — if not	every seme-
talk (60	o to 120 minutes)				
Langua	age of assessment: German or E				
Assess	ment offered: In the semester i	n which the course is	offered and in the su	ubsequent semester	
Allocat	ion of places	_			
Additio	onal information				
Worklo	ad				
150 h					
Teachi	ng cycle				
	_ ~ •	_			
Referre	ed to in LPO I (examination regi	ulations for teaching-	degree programmes)		
Module	e appears in				
Master	's degree (1 major) Mathematic	s (2016)			
Master	's degree (1 major) Mathematic	al Physics (2016)			
Master	's teaching degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	016)
Supple	ementary course MINT Teacher E	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
	's degree (1 major) Mathematic	-			
	's teaching degree Gymnasium				020)
	mentary course MINT Teacher E		Network Bavaria (EN	B) (2020)	
	's degree (1 major) Mathematic	•	`		
	's degree (1 major) Computation		22)		
Master	's degree (1 major) Mathematic	S (2022)			
Master's w	ith 1 major Mathematical Physics (2022)	-	• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 93 / 276

Module title Abbreviation						
Semina	ar in Alg	rebra			10-M=SALG-161-mc)1
Module	e coordi	nator		Module offered by		
Dean o	f Studie	es Mathematik (Mathem	atics)	Institute of Mathem	natics	
ECTS	Metho	d of grading	Only after succ. con	npl. of module(s)		
5	numer	ical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts		_			
A mode	ern topi	c in algebra.				
Recommended previous knowledge: Basic knowledge of algebra is assumed, such as can be acquired in the modules "Introduction to Algebra" and "Applied Algebra".						
Intende	ed learr	ing outcomes				
		able to elaborate a con he available literature,				
		number of weekly cont				
S (2)	- (-)				,	
	e taught	in: German and/or Eng	lish			
		essment (type, scope, l on on whether module o			tion offered — if not	every seme-
Langua	ige of a	minutes) ssessment: German or E ffered: In the semester i		offered and in the su	ihsequent semester	
	ion of p			oncrea and in the st	ibsequent semester	
		duces	_			
Additio	nal info	ormation				
Worklo	ad		_			
150 h	au					
Teacini	ng cycle	2				
 Doforma	d to in	IDOL (examination reg	ulations for tooshing			
Referre		LPOI (examination reg		legree programmes)		
		vo in				
	e appea		c (cost ()			
	-	ee (1 major) Mathematic ee (1 major) Mathematic				
	-	ing degree Gymnasium	, , ,	ion PLUS, Flite Netwo	ork Bavaria (FNB) (2	016)
		y course MINT Teacher I				010)
		ee (1 major) Mathematic			_, ()	
	-	ing degree Gymnasium	-	ion PLUS, Elite Netwo	ork Bavaria (ENB) (2	020)
		y course MINT Teacher I				
	-	ee (1 major) Mathematic	•			
	-	ee (1 major) Computatio		2)		
	-	ee (1 major) Mathematic				
Master	's degre	ee (1 major) Mathematic	al Physics (2022)			
Master's wi	ith 1 major	Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 95 / 276

Module title				Abbreviation				
Seminar Applied Mathematics 10-M=SAMA-192-mo1								
Module coordinator				Module offered by				
Dean of Studies Mathematik (Mathema		natics)	Institute of Mathematics					
ECTS	1	od of grading	Only after succ. compl. of module(s)					
5 numerical grade								
Durati	on	Module level	Other prerequisites	her prerequisites				
1 seme	ester	graduate						
Conter	nts							
A mod	ern topi	c in applied mathemat	cs.					
Docom	mondo	d provious knowledge.						
		d previous knowledge: the content, basic and	advanced knowledge	from different areas	of applied mathema	tics is requi-		
		doubt, it is recommend			or applied mathema	illes is requi		
Intend	ed learı	ning outcomes						
		able to elaborate a con						
· · · ·		the available literature,	<u> </u>			cussion.		
	es (type	, number of weekly con	tact hours, language –	- if other than Germa	n)			
S (2) Modul	o taugh	t in: German and/or En	alich					
		essment (type, scope,		an Carman, avamina	tion offered if not	01/01/ 60100		
		on on whether module			tion onered — If not	every seme-		
		minutes)						
		ssessment: German or						
	tion of p	ffered: in the semester	in which the course is	onered and in the st	ibsequent semester			
Alloca		naces						
Additio	onal inf	ormation						
Worklo								
150 h								
	ng cycl	2						
	ing cycl							
Referre	ed to in	LPOI (examination reg	ulations for teaching.	degree programmes)				
 Module appears in								
		ee (1 major) Computatio	nal Mathematics (201	0)				
	-			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's degree (1 major) Mathematics (2022)								
Master's degree (1 major) Mathematical Physics (2022)								
Master	r's degre	ee (1 major) Economath	ematics (2022)					
exchar	exchange program Mathematics (2023)							
Master's w	vith 1 major	Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa	-	page 97 / 276		
			ta record Master	(120 ECTS) Mathematische P	TIYSIK - 2022			

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-mo1								
Module coordinator				Module offered by				
Dean of Studies Mathematik (Mathematics)			atics)	Institute of Mathematics				
ECTS	1	od of grading	Only after succ. compl. of module(s)					
5		rical grade						
Duratio	<u> </u>	Module level	Other prerequisites					
1 seme		graduate		prerequisites				
Conter	I							
A mod	ern topi	c in complex analysis.						
	F	· · · · · · · · · · · · · · · · · · ·						
		d previous knowledge:						
		ge of the contents of the	e modules "Introducti	on to Complex Analy	sis" and " Complex A	Analysis" is		
	mended		-					
		ning outcomes			1 1 1			
		able to elaborate a cont he available literature, p	, ,	•		-		
		number of weekly conta						
S (2)		number of weekly conte		in other than defina	,			
	e taugh	t in: German and/or Engl	ish					
		essment (type, scope, la		an German, examina	tion offered — if not	every seme-		
ster, in	formati	on on whether module c	an be chosen to earn	a bonus)				
		minutes)						
		ssessment: German or E						
		ffered: In the semester ir	n which the course is	offered and in the su	ibsequent semester			
Allocat	tion of p	laces	-					
Additio	onal info	ormation						
Worklo	bad							
150 h								
Teachi	ng cycl	9						
Referre	ed to in	LPOI (examination regu	llations for teaching-	degree programmes)				
Modul	e appea	rs in						
	-	ee (1 major) Mathematics						
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) Mathematics (2022)								
	-	ee (1 major) Mathematics						
Master's w	ith 1 major	Mathematical Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 99 / 276		

Module title				Abbreviation		
Seminar in Dynamical Systems and Control 10-M=SDSC-161-m01						
Module coordinator				Module offered by		
Dean of Studies Mathematik (Mathemat		atics)	Institute of Mathem	atics		
ECTS	Metho	Aethod of grading Only after succ. compl. of module(s)				
5	numei	ical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its					
A mode	ern topi	c in dynamical systems	and control.			
		d previous knowledge: the contents of the mod	ule "Mathematical Co	ntrol Theory" or "Cor	ntrol Theory" is requi	ired
		ing outcomes				
				nia Thiainaludaa aa		
		able to elaborate a cont he available literature, p				
Course	s (type,	number of weekly conta	act hours, language –	- if other than Germa	n)	
S (2) Module	e taughi	t in: German and/or Eng	lish			
		essment (type, scope, la		an German, examina	tion offered — if not	everv seme-
		on on whether module c				
talk (60	0 to 120	minutes)				
		ssessment: German or E	nglish			
Assess	ment o	ffered: In the semester in	n which the course is	offered and in the su	ıbsequent semester	
Allocat	ion of p	laces				
Additio	onal info	ormation				
			-			
Worklo	ad					
150 h						
Teachi	ng cycl	9				
	<u> </u>					
Referre	ad to in	LPOI (examination regu	lations for teaching.	legree programmes)		
Kelene						
		!				
	e appea					
	-	ee (1 major) Mathematic				
	-	ee (1 major) Economathe				
	-	ee (1 major) Mathematic		ion DUUS Elito Notw	ork Boyoria (ENB) (a	016)
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) Economathematics (2021)						
	-	ee (1 major) Computation		2)		
Master	Master's degree (1 major) Mathematics (2022)					
Master's w	ith 1 major	Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 101 / 276



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

Module	e title				Abbreviation	
Giovanni Prodi Seminar (Master)				10-M=SGPCin-152-r	n01	
Module coordinator						
				Module offered by		
Dean of Studies Mathematik (Mathema		1	Institute of Mathem	natics		
ECTSMethod of grading5numerical grade			Only after succ. compl. of module(s)			
5	r – L	_				
Duratio		Module level graduate	Other prerequisites			
1 seme		glauuale				
Conten						
		c in the research experti	ise of the current hold	er of the Giovanni Pr	rodi Chair.	
Intende	ed learr	ning outcomes				
		able to elaborate a con				
		he available literature,				cussion.
	s (type,	number of weekly cont	act hours, language —	if other than Germa	in)	
S (2)						
		t in: English		_		
		essment (type, scope, la on on whether module o			tion offered — if not	every seme-
•		minutes)				
		ssessment: English	1 • 1 - 1			
		ffered: In the semester i	n which the course is	offered and in the si	ibsequent semester	
Allocat	ion of p	laces				
			_			
Additio	nal info	ormation	_			
Worklo	ad					
150 h						
Teachi	ng cycle	9				
Referre	d to in	LPOI (examination reg	lations for teaching.	legree programmes)		
Referre						
Madula		ra in				
	e appea		c International (acto)			
	-	ee (1 major) Mathematic ee (1 major) Mathematic				
	-	ee (1 major) Economathe				
	-	ee (1 major) Mathematic				
		ee (1 major) Computatio		6)		
	-	ee (1 major) Computatio				
Master	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 (1 major) Mathematical Physics (2022)						
Master's degree (1 major) Mathematics International (2022)						
Master's degree (1 major) Economathematics (2022)						
	_	Mathematical Physics (2022)		generated 19-Apr-2025 • exa	am. reg. da-	page 103 / 276
	.,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		(120 ECTS) Mathematische P	-	

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)

Module title				Abbreviation		
Seminar in Geometry and Topology 10-M=SGTO-161-m01						
Module coordinator				Module offered by		
Dean of Studies Mathematik (Mathemati			atics)	Institute of Mathem	atics	
ECTS	—	od of grading	Only after succ. compl. of module(s)			
5	· · · · · · · · · · · · · · · · · · ·	rical grade				
Duratio	<u> </u>	Module level	Other prerequisites			
1 seme		graduate				
Conter	its					
A mod	ern topi	c in geometry and topol	ogy.			
		d previous knowledge:				
		lge of the contents of the	e modules "Introducti	on to Differential Geo	ometry" and "Introdu	uction to To-
		ommended. hing outcomes				
		able to elaborate a cont	omporant recearch to	nic. This includes as	mprobanding and a	tructuring of
		the available literature, p				
		number of weekly conta				
S (2)		,				
	e taugh	t in: German and/or Eng	lish			
		essment (type, scope, la			tion offered — if not	every seme-
		on on whether module c	an be chosen to earn	a bonus)		
		minutes)	u aliah			
		ssessment: German or E ffered: In the semester i		offered and in the su	ıbsequent semester	
	ion of p		-		I	
Additio	onal info	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	9				
Referre	ed to in	LPOI (examination regu	ulations for teaching-	degree programmes)		
Module appears in						
Master	's degre	ee (1 major) Mathematic	s (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 degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022)						
	-					
Master's degree (1 major) Mathematical Physics (2022)						
Master's w	ith 1 major	Mathematical Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P		page 105 / 276

Module title				Abbreviation		
Interdisciplinary Seminar 10-M=SIDC-161-m01						
Module coordinator				Module offered by		
Dean of Studies Mathematik (Mathema			atics)	Institute of Mathematics		
ECTS	Metho	hod of grading Only after succ. compl. of module(s)				
5	î	rical grade				
Duratio	· · · · · ·	Module level	Other prerequisites			
1 seme		graduate				
Conten		5.000010	1			
A mode	ern topi	c in mathematics with ir	terdisciplinary aspec	ts.		
	· · · ·	ning outcomes				
		able to elaborate a cont the available literature, p				
Course	s (type,	number of weekly conta	act hours, language –	- if other than Germa	n)	
S (2)					-	
	e taugh	t in: German and/or Eng	lish			
		essment (type, scope, la on on whether module c			tion offered — if not	every seme-
talk (60	o to 120	minutes)				
		ssessment: German or E				
Assess	ment o	ffered: In the semester in	n which the course is	offered and in the su	ubsequent semester	
Allocat	ion of p	olaces				
Additio	nal info	ormation				
Worklo	ad		_			
150 h						
Teachi	ng cvcl	9				
	0 . 7	-				
Deferre	d to in	IDOI (avamination rag	lations for tooshing			
Referre		LPOI (examination regu		legree programmes)		
Module	e appea	rs in				
	-	ee (1 major) Mathematic				
	-	ee (1 major) Economathe				
	-	ee (1 major) Mathematic	•			
		ee (1 major) Computation				
		ning degree Gymnasium				016)
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)						
	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 w	ith 1 major	Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 107 / 276

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)

Modul	e title				Abbreviation	
Semin	ar Math	ematics in the Sciences			10-M=SMSC-161-m	01
Modul	e coord	inator		Module offered by	<u> </u>	
		es Mathematik (Mathem	atics)	Institute of Mathem	atics	
ECTS	1	od of grading	Only after succ. con			
5	1	rical grade				
Duratio	<u> </u>	Module level	Other prerequisites			
1 seme		graduate				
Conter	nts	-				
A mod	ern topi	c in mathematics in the	sciences.			
		d previous knowledge:				· · · ·
		lge from the modules "O recommended, as well a			duction to Partial Dif	ferential
		ning outcomes	s basic knowledge of	Tunctional analysis.		
		able to elaborate a cont	emporany research to	nic This includes co	mprehending and s	tructuring of
		the available literature, j		•	, .	-
Course	es (type,	number of weekly conta	act hours, language –	- if other than Germa	n)	
S (2)						
Modul	e taugh	t in: German and/or Eng	lish			
		essment (type, scope, la on on whether module c			tion offered — if not	every seme-
talk (6	o to 120	minutes)				
		ssessment: German or E				
		ffered: In the semester in	n which the course is	offered and in the su	ibsequent semester	
Alloca	tion of p	olaces				
Additio	onal info	ormation				
Worklo	pad					
150 h						
Teachi	ng cycl	9	_			
Referre	ed to in	LPOI (examination regu	ulations for teaching-	degree programmes)		
Modul	e appea	rs in				
		ee (1 major) Mathematic				
	-	ee (1 major) Economathe				
	-	ee (1 major) Mathematic				
		ee (1 major) Computation				
		ning degree Gymnasium				016)
		y course MINT Teacher E			B) (2016)	
		ee (1 major) Computation		9)		
	-	ee (1 major) Mathematic	-	ion DILLS Elite Notes	ork Powerie (END) (-	020)
		ning degree Gymnasium				020)
		y course MINT Teacher E ee (1 major) Mathematic		Network Bavaria (EN	D) (2020)	
master	i s uegli		at i Hysics (2020)			
Master's w	/ith 1 major	Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 109 / 276

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)

Modul	e title				Abbreviation	
Seminar in Non-linear Analysis 10-M=SNLA-161-m01)1
Modul	e coord	inator		Module offered by		
1		es Mathematik (Mathem	atics)	Institute of Mathem	atics	
ECTS	1	od of grading	Only after succ. con		latics	
5	· · · · · · · · · · · · · · · · · · ·	rical grade				
Duratio	· · · · ·	Module level	Other prerequisites			
1 seme		graduate				
Conter		3	1			
A mod	ern topi	c in non-linear analysis.				
		,				
		d previous knowledge:				
		the content, basic and a		from different areas	of analysis is require	ed. In case of
-		ommended to consult th	he lecturer.			
		ning outcomes				
		able to elaborate a cont he available literature, j				
		number of weekly conta				cu35i0ii.
	s (type		act nours, language –		11)	
S (2) Modul	e taugh	t in: German and/or Eng	lish			
-		essment (type, scope, la		an German, examina	tion offered — if not	every seme-
		on on whether module c				,
talk (6	o to 120	minutes)				
		ssessment: German or E				
		ffered: In the semester i	n which the course is	offered and in the su	ibsequent semester	
Alloca	tion of p	olaces				
Additio	onal info	ormation				
Worklo	bad					
150 h						
Teachi	ng cycl	9				
Referre	ed to in	LPOI (examination regu	ulations for teaching-	degree programmes)		
Modul	e appea	rs in				
Master	r's degre	ee (1 major) Mathematic	s (2016)			
Master	r's degre	ee (1 major) Economathe	ematics (2016)			
		ee (1 major) Mathematic				
		ning degree Gymnasium				016)
		y course MINT Teacher E		Network Bavaria (EN	B) (2016)	
	-	ee (1 major) Mathematic	-			,
		ning degree Gymnasium				020)
		y course MINT Teacher E		Network Bavaria (EN	B) (2020)	
	-	ee (1 major) Mathematic				
	-	ee (1 major) Economathe		2)		
master	s aegre	ee (1 major) Computation	nai Mathematics (202	2)		I
Master's w	vith 1 major	Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 111 / 276

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	e title				Abbreviation	
Semina	ar in Nu	merical Mathematics an	nd Applied Analysis		10-M=SNMA-161-m	01
Modul	e coord	inator		Module offered by		
		es Mathematik (Mathem	atias)	Institute of Mathem	ation	
ECTS		```	Only after succ. com		Idlics	
_	1	od of grading rical grade	Only after succ. con			
5						
Duration		Module level graduate	Other prerequisites			
		glauuale]			
Conten						
Recom Depend	mende ding on	c in numerical mathema d previous knowledge: the content, basic and a equired. In case of doub	advanced knowledge	from different areas		umerical ma-
Intend	ed lear	ning outcomes				
the top	oic and	able to elaborate a cont the available literature, j	preparing a talk and th	ne ability to participa	ate in a scientific dis	
	es (type	, number of weekly conta	act hours, language —	· if other than Germa	n)	
S (2) Module	e taugh	t in: German and/or Eng	lish			
		e ssment (type, scope, la on on whether module c			tion offered — if not	every seme-
Langua Assess	age of a	o minutes) ssessment: German or E ffered: In the semester in places		offered and in the su	ıbsequent semester	
Additic	onal inf	ormation				
Worklo	bad					
150 h						
-	ng cycl	a				
reaction	<u>15 cyc</u>	-	_			
Referre	ed to in	LPO I (examination regu	ulations for teaching-c	legree programmes)		
	e appea	in and a second s				
Module						
	r's degr	ee (1 major) Mathematic	s (2016)			
Master	-	ee (1 major) Mathematic ee (1 major) Economathe				
Master Master	's degr		ematics (2016)			
Master Master Master Master	r's degr r's degr r's degr	ee (1 major) Economathe ee (1 major) Mathematic ee (1 major) Computation	ematics (2016) al Physics (2016) nal Mathematics (2010			
Master Master Master Master Master	r's degro r's degro r's degro r's teacl	ee (1 major) Economathe ee (1 major) Mathematic ee (1 major) Computation ning degree Gymnasium	ematics (2016) al Physics (2016) nal Mathematics (2014 MINT Teacher Educati	ion PLUS, Elite Netwo		016)
Master Master Master Master Master Supple	r's degro r's degro r's degro r's teach ementai	ee (1 major) Economathe ee (1 major) Mathematic ee (1 major) Computation ning degree Gymnasium y course MINT Teacher E	ematics (2016) al Physics (2016) nal Mathematics (2010 MINT Teacher Educati Education PLUS, Elite I	ion PLUS, Elite Netwo Network Bavaria (EN		016)
Master Master Master Master Master Supple Master	r's degru r's degru r's degru r's teacl ementai r's degru	ee (1 major) Economathe ee (1 major) Mathematic ee (1 major) Computation ning degree Gymnasium y course MINT Teacher E ee (1 major) Computation	ematics (2016) al Physics (2016) nal Mathematics (2014 MINT Teacher Educati ducation PLUS, Elite M nal Mathematics (2014	ion PLUS, Elite Netwo Network Bavaria (EN		016)
Master Master Master Master Supple Master Master	r's degru r's degru r's teach ementai r's degru r's degru	ee (1 major) Economathe ee (1 major) Mathematic ee (1 major) Computation ning degree Gymnasium y course MINT Teacher E ee (1 major) Computation ee (1 major) Mathematic	ematics (2016) al Physics (2016) nal Mathematics (2014 MINT Teacher Educati Education PLUS, Elite I nal Mathematics (2019) s (2019)	ion PLUS, Elite Netwo Network Bavaria (EN 9)	B) (2016)	
Master Master Master Master Supple Master Master Supple	r's degre r's degre r's teach ementai r's degre r's degre r's degre r's teach ementai	ee (1 major) Economathe ee (1 major) Mathematic ee (1 major) Computation ning degree Gymnasium y course MINT Teacher E ee (1 major) Computation	ematics (2016) al Physics (2016) nal Mathematics (2014 MINT Teacher Educati ducation PLUS, Elite M nal Mathematics (2014 s (2019) MINT Teacher Educati ducation PLUS, Elite M	ion PLUS, Elite Netwo Network Bavaria (EN 9) ion PLUS, Elite Netwo	B) (2016) ork Bavaria (ENB) (20	

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	e title	,			Abbreviation	
Semina	ar in Op	timization			10-M=SOPT-161-mc	01
Modul	e coord	inator		Module offered by		
Dean o	f Studie	es Mathematik (Mathema	atics)	Institute of Mathem	atics	
ECTS		od of grading	Only after succ. con			
5	·	rical grade				
Duratio	L	Module level	Other prerequisites			
1 seme		graduate				
Conten	its	0	<u> </u>			
A mode	ern topi	c in optimisation.				
		ning outcomes				
		able to elaborate a conte	omporany rosparch to	nic. This includos co	mprohonding and s	tructuring of
		the available literature, p				
Course	s (type,	number of weekly conta	ct hours, language –	- if other than Germa	n)	
S (2)	a taugh	tin. Cormon and for Engli	ich			
		t in: German and/or Engl				
		essment (type, scope, la on on whether module ca			tion offered — if not	every seme-
talk (60	o to 120	minutes)				
-	-	ssessment: German or Er	-			
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					
150 h						
Teachi	ng cycle	9				
Referre	d to in	LPOI (examination regu	lations for teaching.	legree programmes)		
Kelent						
		!				
	e appea		(224)			
	-	ee (1 major) Mathematics				
	-	ee (1 major) Economathe ee (1 major) Mathematica				
	-	ee (1 major) Kathematica	-	6)		
	-	ning degree Gymnasium I			ork Boyaria (ENB) (a	016)
		y course MINT Teacher E				010)
		ee (1 major) Computation			D) (2010)	
		ee (1 major) Mathematics		9)		
	-	ning degree Gymnasium I	-	ion PLUS Elite Netwo	ork Bavaria (FNB) (2	020)
		y course MINT Teacher Ed				020)
		ee (1 major) Mathematica		(_, (,	
	-	ee (1 major) Economathe	-			
	-	ee (1 major) Computation		2)		
		ee (1 major) Mathematics				
	-	ee (1 major) Mathematica				
Master's w	ith 1 major	Mathematical Physics (2022)		generated 19-Apr-2025 • exa		page 115 / 276

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	
Semina	ar in Sta	atistics			10-M=SSTA-161-mc)1
Modul	e coord	inator		Module offered by	<u> </u>	
1		es Mathematik (Mathema	atice)	Institute of Mathem	atics	
ECTS	1	od of grading	Only after succ. con		latics	
5	1	rical grade				
Duratio	I	Module level	Other prorequisites			
1 seme		graduate	Other prerequisites			
Conter		5.44446				
	-	c in statistics.				
		d previous knowledge:				
		lge of stochastics is requ				
		of the module "Stochastion ge may also be helpful; o				course, other
					iucu.	
		ning outcomes				
		able to elaborate a cont the available literature, p				
			- · -			cussion.
	s (type	, number of weekly conta	act hours, language –	- if other than Germa	n)	
S (2) Moduli	o tough	t in. Cormon and lor Engl	ich			
		t in: German and/or Engl				
		sessment (type, scope, la on on whether module c			tion offered — if not	every seme-
talk (6	o to 120	o minutes)				
		ssessment: German or E				
Assess	ment o	ffered: In the semester in	h which the course is	offered and in the su	ubsequent semester	
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad		-			
150 h						
	ng cycl	٥				
Teacin	ing cycl	5				
Referre	ed to in	LPOI (examination regu	ilations for teaching-	degree programmes)		
	e appea					
		ee (1 major) Mathematics				
	-	ee (1 major) Economathe				
	-	ee (1 major) Mathematica				
		ning degree Gymnasium				016)
		y course MINT Teacher E		Network Bavaria (EN	B) (2016)	
	-	ee (1 major) Mathematics ning degree Gymnasium	-	ion DILIC Elito Notice	ork Rovaria (END) (a	020)
		y course MINT Teacher E				020)
		ee (1 major) Mathematica		ivelwork Davalla (EN	D) (2020)	
	-	ee (1 major) Economathe	-			
	Jucgi					
Master's w	ith 1 majo	Mathematical Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P		page 117 / 276

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)

ECTS Method of grading Only after succ. compl. of models 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents The module builds on the topics covered in module 10-M=ADGM and of tial geometry, e. g. at the interface of control theory and mechanics (su timisation on manifolds or applications in physics. Recommended previous knowledge: Advanced knowledge of differential geometry is required, such as can	of Mathematics Jule(s) discusses selected applications of differen- ubriemannian geometry), in the smooth op- be acquired in the module "Differential ential Geometry", "Geometric Mechanics",
Dean of Studies Mathematik (Mathematics) Institute of ECTS Method of grading Only after succ. compl. of mode 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents The module builds on the topics covered in module 10-M=ADGM and of tial geometry, e. g. at the interface of control theory and mechanics (su timisation on manifolds or applications in physics. Recommended previous knowledge: Advanced knowledge of differential geometry is required, such as can	of Mathematics Jule(s) discusses selected applications of differen- ubriemannian geometry), in the smooth op- be acquired in the module "Differential ential Geometry", "Geometric Mechanics",
ECTS Method of grading Only after succ. compl. of models 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents The module builds on the topics covered in module 10-M=ADGM and or tial geometry, e. g. at the interface of control theory and mechanics (su timisation on manifolds or applications in physics. Recommended previous knowledge: Advanced knowledge of differential geometry is required, such as can	discusses selected applications of differen ubriemannian geometry), in the smooth op be acquired in the module "Differential ential Geometry", "Geometric Mechanics",
ECTS Method of grading Only after succ. compl. of models 10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents Other prerequisites The module builds on the topics covered in module 10-M=ADGM and or tial geometry, e. g. at the interface of control theory and mechanics (su timisation on manifolds or applications in physics. Recommended previous knowledge: Advanced knowledge of differential geometry is required, such as can	discusses selected applications of differen ubriemannian geometry), in the smooth op be acquired in the module "Differential ential Geometry", "Geometric Mechanics",
10 numerical grade Duration Module level Other prerequisites 1 semester graduate Contents The module builds on the topics covered in module 10-M=ADGM and or tial geometry, e. g. at the interface of control theory and mechanics (su timisation on manifolds or applications in physics. Recommended previous knowledge: Advanced knowledge of differential geometry is required, such as can	discusses selected applications of differen ubriemannian geometry), in the smooth op be acquired in the module "Differential ential Geometry", "Geometric Mechanics",
Duration Module level Other prerequisites 1 semester graduate Contents The module builds on the topics covered in module 10-M=ADGM and or tial geometry, e. g. at the interface of control theory and mechanics (su timisation on manifolds or applications in physics. Recommended previous knowledge: Advanced knowledge of differential geometry is required, such as can	ubriemannian geometry), in the smooth op be acquired in the module "Differential ential Geometry", "Geometric Mechanics",
1 semester graduate Contents	ubriemannian geometry), in the smooth op be acquired in the module "Differential ential Geometry", "Geometric Mechanics",
The module builds on the topics covered in module 10-M=ADGM and o tial geometry, e.g. at the interface of control theory and mechanics (su timisation on manifolds or applications in physics. Recommended previous knowledge: Advanced knowledge of differential geometry is required, such as can	ubriemannian geometry), in the smooth op be acquired in the module "Differential ential Geometry", "Geometric Mechanics",
The module builds on the topics covered in module 10-M=ADGM and o tial geometry, e. g. at the interface of control theory and mechanics (su timisation on manifolds or applications in physics. Recommended previous knowledge: Advanced knowledge of differential geometry is required, such as can	ubriemannian geometry), in the smooth op be acquired in the module "Differential ential Geometry", "Geometric Mechanics",
Geometry". Knowledge of the contents of the modules "Applied Differe "Pseudo-Riemannian and Riemannian Geometry" and "Lie Theory" is a	
Intended learning outcomes	
The student is acquainted with selected advanced applications of different blish a connection between his/her acquired skills and other branches sics.	
Courses (type, number of weekly contact hours, language — if other th	an German)
V (4) + Ü (2) Module taught in: German and/or English	
Method of assessment (type, scope, language — if other than German ster, information on whether module can be chosen to earn a bonus)	, examination 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 creditable for bonus 	
Allocation of places	
Additional information	
Workload	
300 h	
Teaching cycle	
Poterrad to in LDO L (avamination regulations for teaching destroy are	arammac
Referred to in LPO I (examination regulations for teaching-degree prog	grannies
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, F	- lite Network Bayaria (FNR) (2016)
Supplementary course MINT Teacher Education PLUS, Elite Network Ba	
Master's with 1 major Mathematical Physics (2022) JMU Würzburg • generated 19-A	
ta record Master (120 ECTS) Mat	

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)

Selecte	e title				Abbreviation	
	ed Topi	cs in Complex Analysis			10-M=VAFT-222-mo	1
Module	e coord	inator		Module offered by	<u>I</u>	
Dean o	of Studie	es Mathematik (Mathem	atics)	Institute of Mathem	natics	
ECTS	1	od of grading	Only after succ. con	npl. of module(s)		
5		rical grade		,		
Duratio	· · · · · ·	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its	-				
analysi sis, app Recom Basic k	is or op proxima mendeo (nowlec	hods and results of comerator theory as well as ation theory, the theory of previous knowledge: ge of the contents of the mplex Analysis" is recom	exemplary application of partial differential e e modules "Introducti	ns of this, e.g. in fun equations or mathen	ctional analysis, harn natical physics.	nonic analy-
Intend	ed learr	ing outcomes				
lar has	a famil	familiar with the basic of iarity with the properties athematics and applica	s of holomorphic func			
Course	s (type	number of weekly cont	act hours, language –	- if other than Germa	in)	
V (3) +						
Module	e taugh	t in: German and/or Eng	lish			
		essment (type, scope, l on on whether module o			tion offered — if not	every seme-
		ation of one candidate	each (approx, 15 min)	. +)		
Langua Assess	age of a	ssessment: German or E ffered: In the semester i	of 2, approx. 10 minu English	tes per candidate)	ubsequent semester	
Langua Assess credita	age of a ment o	ssessment: German or E ffered: In the semester i bonus	of 2, approx. 10 minu English	tes per candidate)	ubsequent semester	
Langua Assess credita	age of a ment o ble for	ssessment: German or E ffered: In the semester i bonus	of 2, approx. 10 minu English	tes per candidate)	ubsequent semester	
Langua Assess credita Allocat	age of a ment o ble for ion of p	ssessment: German or E ffered: In the semester i bonus Jlaces	of 2, approx. 10 minu English	tes per candidate)	ubsequent semester	
Langua Assess credita Allocat	age of a ment o ble for ion of p	ssessment: German or E ffered: In the semester i bonus	of 2, approx. 10 minu English	tes per candidate)	ubsequent semester	
Langua Assess credita Allocat Additio	age of a ment o ble for ion of p onal infe	ssessment: German or E ffered: In the semester i bonus Jlaces	of 2, approx. 10 minu English	tes per candidate)	ubsequent semester	
Langua Assess credita Allocat Additio Worklo	age of a ment o ble for ion of p onal infe	ssessment: German or E ffered: In the semester i bonus Jlaces	of 2, approx. 10 minu English	tes per candidate)	ubsequent semester	
Langua Assess credita Allocat Additio Worklo 150 h	age of a ment o ble for ion of p onal info	ssessment: German or E ffered: In the semester i bonus places ormation	of 2, approx. 10 minu English	tes per candidate)	ubsequent semester	
Langua Assess credita Allocat Additio Worklo 150 h	age of a ment o ble for ion of p onal infe	ssessment: German or E ffered: In the semester i bonus places ormation	of 2, approx. 10 minu English	tes per candidate)	ubsequent semester	
Langua Assess credita Allocat Additio Worklo 150 h Teachin 	age of a ment o ble for ion of p onal info pad	ssessment: German or E ffered: In the semester i bonus places prmation	of 2, approx. 10 minu inglish n which the course is	tes per candidate) offered and in the si		
Langua Assess credita Allocat Additio Worklo 150 h Teachin 	age of a ment o ble for ion of p onal info pad	ssessment: German or E ffered: In the semester i bonus places ormation	of 2, approx. 10 minu inglish n which the course is	tes per candidate) offered and in the si		
Langua Assess credita Allocat Additio Worklo 150 h Teachin 	age of a ment o ble for ion of p onal info pad	ssessment: German or E ffered: In the semester i bonus places prmation	of 2, approx. 10 minu inglish n which the course is	tes per candidate) offered and in the si		
Langua Assess credita Allocat Additio 150 h Teachin Referre Module	age of a ment o ble for ion of p onal info pad ad ag cyclo ed to in	ssessment: German or E ffered: In the semester i bonus blaces ormation e LPO I (examination regions rs in	of 2, approx. 10 minu inglish n which the course is ulations for teaching-	tes per candidate) offered and in the si degree programmes)		
Langua Assess credita Allocat Additio Worklo 150 h Teachin Referre Module Master Master Master exchan	age of a ment o ble for ion of p onal info pad ad ad ad ad ad ad ad ad ad ad ad ad a	ssessment: German or E ffered: In the semester i bonus blaces ormation e LPO I (examination regu rs in ee (1 major) Computatio ee (1 major) Mathematic gram Mathematics (2023	of 2, approx. 10 minu inglish n which the course is ulations for teaching- nal Mathematics (202 s (2022) al Physics (2022) 3)	tes per candidate) offered and in the su degree programmes) 22)		
Langua Assess credita Allocat Additio Worklo 150 h Teachin Referre Module Master Master exchan Master	age of a ment o ble for ion of p onal info oad ad ad ad ad ad ad ad ad ad ad ad ad a	ssessment: German or E ffered: In the semester i bonus blaces brmation comma	of 2, approx. 10 minu inglish n which the course is ulations for teaching- nal Mathematics (202 s (2022) al Physics (2022) 3) nal Mathematics (202	tes per candidate) offered and in the su degree programmes) 22)		
Langua Assess credita Allocat Additio 150 h Teachin Referre Module Master Master Master Master Master Master Master Master	age of a ment o ble for tion of p onal info onal info info onal info onal info onal info onal info onal info onal info onal info info onal info info info onal info onal info onal info info info info info info info info	ssessment: German or E ffered: In the semester i bonus blaces ormation e LPO I (examination regu rs in ee (1 major) Computatio ee (1 major) Mathematic gram Mathematics (2023	of 2, approx. 10 minu inglish n which the course is ulations for teaching- nal Mathematics (202 s (2022) al Physics (2022) 3) nal Mathematics (202 s (2024)	tes per candidate) offered and in the su degree programmes) 22)		page 121 / 276



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 ti	tle			Abbreviation	
	Geometry			10-M=VAGE-192-m	01
Madulaa	oordinator		Madula offered by		
		··	Module offered by		
	tudies Mathematik (Mathema	-	Institute of Mathem	latics	
	lethod of grading umerical grade	Only after succ. com	ipl. of module(s)		
Duration	Module level	Other prerequisites			
1 semeste	er graduate				
Contents					
sors and I Bezout's f Recomme	d projective space, affine and Riemann-Roch theorem for cu theorem; Grassmann and flag ended previous knowledge: wledge of algebra is assumed Algebra".	rves; genus, singular varieties; 27 lines in	ities and Plücker for a cubic surface.	mula; dual curve, du	ual surface;
Intended	learning outcomes				
The stude classify th	nt is acquainted with fundam nese results within more gene ds of mathematics.				
Courses (type, number of weekly conta	ct hours, language —	if other than Germa	n)	
V (4) + Ü (Module ta	(2) aught in: German and/or Engli	ish			
Method o	f assessment (type, scope, la	nguage — if other tha	an German, examina	tion offered — if not	everv seme-
	mation on whether module ca				,
c) oral exa Language Assessme	amination of one candidate e amination in groups (groups of of assessment: German or Er ent offered: In the semester in e for bonus	of 2, 15 minutes per conglish	andidate)	ıbsequent semester	
Allocation	n of places				
Additiona	l information				
 Workload					
300 h					
Teaching	cycle				
	.,				
	to in IDO L (overside the second	lations for tooship -			
Reieffed	to in LPO I (examination regu	tations for teaching-0	iegree programmes)		
Module a					
	degree (1 major) Computation		9)		
	degree (1 major) Mathematics	-	ON DILLS Flits Notes	ork Dovaria (CND) (-	aaa)
	eaching degree Gymnasium <i>l</i> entary course MINT Teacher Eo				020)
• •	degree (1 major) Mathematica			u, (2020)	
	degree (1 major) Mathematica	•	2)		
	major Mathematical Physics (2022)		generated 19-Apr-2025 • exa	am. reg. da-	page 123 / 276
			(120 ECTS) Mathematische P	-	

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	e title				Abbreviation	
Selecte	ed Topi	cs in Analysis			10-M=VANA-161-mc	01
Module	e coord	inator		Module offered by		
		es Mathematik (Mathema	atics)	Institute of Mathem	atics	
ECTS	-	od of grading	Only after succ. con			
10	1	rical grade				
Duratio	L	Module level	Other prerequisites			
1 seme		graduate				
Conten	its	0	I			
		ission of a specialised to the the total to the total concepts.	pic in analysis taking	g into account recent	developments and i	interrelations
Depend	ding on	d previous knowledge: the content, basic and a commended to consult th		from different areas	of analysis is require	ed. In case of
Intende	ed lear	ning outcomes				
The stu comple		acquainted with advanc lems.	ed results in a select	ed topic in analysis,	and is able to apply	these to
Course	s (type	, number of weekly conta		- if other than Germa	n)	
V (4) +	Ü (2)					
Module	e taugh	t in: German and/or Engl	ish			
		essment (type, scope, la on on whether module ca			tion offered — if not	every seme-
		nination (approx. 90 to 1				
		ation of one candidate e		-		
		ation in groups (groups o ssessment: German or Ei		andidate)		
		ffered: In the semester in		offered and in the su	ıbsequent semester	
credita	ble for	bonus			-	
Allocat	ion of p	olaces				
Additio	onal inf	ormation	·			
Worklo	ad					
300 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)		
Module	e appea	irs in				
		ee (1 major) Mathematics	5 (2016)			
	-	ee (1 major) Mathematica				
Master	's degr	ee (1 major) Computation	al Mathematics (201	6)		
		ning degree Gymnasium I				o16)
		y course MINT Teacher E			B) (2016)	
	-	ee (1 major) Computation		9)		
	-	ee (1 major) Mathematics ning degree Gymnasium I	-	ion PLUS Flite Netwo	ork Bavaria (FNR) (or	020)
		Mathematical Physics (2022)	JMU Würzburg •	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	ım. reg. da-	page 125 / 276

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)

Modul	e title				Abbreviation
Algebi	Algebraic Topology 10-M=VATP-161-m01 Module coordinator Module offered by				
Modul	e coord	inator		Module offered by	
Dean o	of Studi	es Mathematik (Mathema	atics)	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		
1 seme	ester	graduate			
Conte	nts				
spaces	5.		sequences, cohomo	logy, application to	the topology of Euclidean
		d previous knowledge: Ige of topology is assume	ed, such as can be ac	quired in the modul	e "Introduction to Topology".
Intend	ed lear	ning outcomes			
The st	udent is	acquainted with advanc	ed results in algebrai	ic topology.	
Course	es (type	, number of weekly conta	ct hours, language –	- if other than Germa	in)
V (4) + Modul		t in: German and/or Engli	ish		
		sessment (type, scope, la ion on whether module ca			tion offered — if not every seme-
b) oral c) oral Langua Assess	examir examin age of a sment o	mination (approx. 90 to 1 nation of one candidate e nation in groups (groups c ssessment: German or Er ffered: In the semester in	ach (approx. 20 minu of 2, 15 minutes per c nglish	utes) or andidate)	ıbsequent semester
	able for tion of j				
Additi	onal inf	ormation			
Workle	oad				
300 h					
Teachi	ing cycl	e			
Referr	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)	
Modul	e appea	ars in			
		ee (1 major) Mathematics			
Maste Supple Maste	r's teacl ementai r's degr	ee (1 major) Mathematica hing degree Gymnasium I ry course MINT Teacher Ec ee (1 major) Mathematics	MINT Teacher Educat ducation PLUS, Elite I (2019)	Network Bavaria (EN	B) (2016)
Supple Maste	ementaı r's degr	hing degree Gymnasium <i>I</i> ry course MINT Teacher Ec ee (1 major) Mathematica ee (1 major) Computation	ducation PLUS, Elite I Il Physics (2020)	Network Bavaria (EN	
Imasie	Jucgi		at mathematics (202	<i>2</i>)	

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 title	Abbreviation
Algorithmic Number Theory	10-M=VAZT-192-m01
Module coordinator	Module offered by
Dean of Studies Mathematik (Mathematics)	Institute of Mathematics
ECTS Method of grading Only after succ. com	pl. of module(s)
10 numerical grade	
Duration Module level Other prerequisites	
1 semester graduate	
Contents	
Binary numbers, computation of the greatest common diviso roots. Primality tests for Fermat and Mersenne numbers, fact tic curve method, quadratic sieve method), discrete logarith Recommended previous knowledge: Basic knowledge of algebra and number theory is assumed, on to Algebra", "Introduction to Number Theory" and "Applie	orisation methods (Pollard-Rho, (p-1)-method, ellip m. such as can be acquired in the modules "Introducti
Intended learning outcomes	0
The student knows about the theoretical foundations and the rithmic number theory.	e possible applications of several methods in algo-
Courses (type, number of weekly contact hours, language —	if other than German)
V (4) + Ü (2) Module taught in: German and/or English	· · · · · · · · · · · · · · · · · · ·
Method of assessment (type, scope, language — if other tha ster, information on whether module can be chosen to earn a a) written examination (approx. 90 to 120 minutes, usually c	a bonus)
b) oral examination of one candidate each (approx. 20 minut c) oral examination in groups (groups of 2, 15 minutes per ca Language of assessment: German or English Assessment offered: In the semester in which the course is c creditable for bonus	ndidate)
Allocation of places	
Additional information	
Workload	
300 h	
Teaching cycle	
Referred to in LPO I (examination regulations for teaching-d	egree 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 Educatio Supplementary course MINT Teacher Education PLUS, Elite N	
Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Computational Mathematics (2022	2)
Macter's degree (1 major) Mathematics (2022)	
Master's degree (1 major) Mathematics (2022) Master's with 1 major Mathematical Physics (2022) JMU Würzburg • g	generated 19-Apr-2025 • exam. reg. da- page 129 / 276

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)

Compu	e title			Abbreviation	
1	iter Algebra			10-M=VCAL-192-m	01
				10 11 10 12 192 11	
Module	e coordinator		Module offered by		
Dean o	f Studies Mathematik (Mathem	atics)	Institute of Mathem	atics	
ECTS	Method of grading	Only after succ. con	npl. of module(s)		
10	numerical grade				
Duratio	on Module level	Other prerequisites			
1 seme	ster graduate				
Conten	its				
lynomi als, syr als, Grö Recom Basic k	ultiplication of numbers, polync als over finite fields; lattices, la mbolic integration of rational fu öbner basis, Buchberger's algor mended previous knowledge: knowledge of algebra is assume ed Algebra".	ttice basis reduction nctions; exact arithm ithm, algorithms for p	and LLL-algorithm; fa etic with algebraic nu permutation groups.	ctorisation of ration Imbers; multivariat	nal polynomi- e polynomi-
	ed learning outcomes				
The stu	udent knows about the theoretic Ilgebra.	al foundations and th	ne possible applicati	ons of several meth	ods in com-
Course	s (type, number of weekly conta	act hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taught in: German and/or Eng	lish			
	d of assessment (type, scope, la		an Corman ovamina	tion offered if not	tovorycomo
	formation on whether module c				t every senie-
b) oral c) oral	en examination (approx. 90 to a examination of one candidate examination of one candidate examination in groups (groups	each (approx. 20 mini	utes) or		
Assess	age of assessment: German or E sment offered: In the semester in ble for bonus	nglish		bsequent semeste	r
Assess credita	ment offered: In the semester i	nglish		bsequent semester	r
Assess credita	ment offered: In the semester in ble for bonus	nglish		bsequent semester	r
Assess credita Allocat	ment offered: In the semester in ble for bonus	nglish		bsequent semeste	r
Assess credita Allocat Additio	ment offered: In the semester in ble for bonus tion of places onal information	nglish		bsequent semester	r
Assess credita Allocat Additio Worklo	ment offered: In the semester in ble for bonus tion of places onal information	nglish		bsequent semester	r
Assess credita Allocat Additio Worklo 300 h	ment offered: In the semester in ble for bonus tion of places onal information	nglish		bsequent semester	r
Assess credita Allocat Additio Worklo 300 h	ment offered: In the semester in ble for bonus tion of places onal information	nglish		bsequent semester	r
Assess credita Allocat Additio Worklo 300 h	ment offered: In the semester in ble for bonus tion of places onal information	nglish		bsequent semester	r
Assess credita Allocat Additio 300 h Teachin 	ment offered: In the semester in ble for bonus tion of places onal information	nglish n which the course is	offered and in the su	bsequent semester	r
Assess credita Allocat Additio 300 h Teachin 	ment offered: In the semester in ble for bonus tion of places onal information oad	nglish n which the course is	offered and in the su	bsequent semester	r
Assess credita Allocat Additio 300 h Teachin Referre	ment offered: In the semester in ble for bonus tion of places onal information oad	nglish n which the course is	offered and in the su	bsequent semester	r
Assess credita Allocat Additio 300 h Teachin Referre Module	ment offered: In the semester in ble for bonus tion of places onal information oad ng cycle ed to in LPO I (examination regu	nglish n which the course is	offered and in the su	bsequent semester	r
Assess credita Allocat Additio 300 h Teachin Referre Module	ment offered: In the semester in ble for bonus tion of places onal information oad ng cycle ed to in LPO I (examination regu	nglish n which the course is ulations for teaching-o	offered and in the su	bsequent semester	r
Assess credita Allocat Additio 300 h Teachin Referre Module Master Master Master	ment offered: In the semester in ble for bonus tion of places onal information oad ed to in LPO I (examination regu e appears in "'s degree (1 major) Computation "'s teaching degree Gymnasium	nglish n which the course is ulations for teaching-o nal Mathematics (201 s (2019) MINT Teacher Educat	offered and in the su degree programmes) 9)	ork Bavaria (ENB) (2	
Assess credita Allocat Additio 300 h Teachin Referre Master Master Master Supple	ment offered: In the semester in ble for bonus tion of places onal information oad ng cycle ed to in LPO I (examination regu e appears in r's degree (1 major) Computation r's teaching degree Gymnasium ementary course MINT Teacher E	nglish n which the course is ulations for teaching- nal Mathematics (201 s (2019) MINT Teacher Educat ducation PLUS, Elite	offered and in the su degree programmes) 9)	ork Bavaria (ENB) (2	
Assess credita Allocat Additio Worklo 300 h Teachin Referre Master Master Master Supple Master	ment offered: In the semester in ible for bonus tion of places onal information oad ad ed to in LPO I (examination regu e appears in d's degree (1 major) Computation d's degree (1 major) Mathematic d's teaching degree Gymnasium ementary course MINT Teacher E d's degree (1 major) Mathematic	nglish n which the course is ulations for teaching-one nal Mathematics (201 s (2019) MINT Teacher Educat ducation PLUS, Elite al Physics (2020)	offered and in the su degree programmes) 9) ion PLUS, Elite Network Bavaria (ENI	ork Bavaria (ENB) (2	
Assess credita Allocat Additio 300 h Teachin Referre Master Master Master Supple Master Master	ment offered: In the semester in ble for bonus tion of places onal information oad ng cycle ed to in LPO I (examination regu e appears in r's degree (1 major) Computation r's teaching degree Gymnasium ementary course MINT Teacher E	nglish n which the course is ulations for teaching- nal Mathematics (201 s (2019) MINT Teacher Educat ducation PLUS, Elite al Physics (2020) nal Mathematics (202	offered and in the su degree programmes) 9) ion PLUS, Elite Network Bavaria (ENI	ork Bavaria (ENB) (2 3) (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) 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		
Discrete Mathematics 10-M=VDIM-161-m01						
Module coordinator			Module offered by			
Dean of Studie	s Mathematik (Mathema	atics)	Institute of Mathem	atics		
ECTS Method of grading Only after succ. compl. of module(s)						
	Module level	Other prerequisites				
	graduate					
Contents	0	<u> </u>				
graph theory or	nods and results in a sel r combinatorics) previous knowledge:	ected field of discret	e mathematics (e. g.	coding theory, cryptography,		
	ge of the contents of the	module "Introductio	n to Discrete Mather	natics" is required.		
Intended learn	ing outcomes					
The student is	acquainted with advanc	ed results in a select	ed topic in discrete r	nathematics.		
Courses (type,	number of weekly conta	ct hours, language –	· if other than Germa	n)		
V (3) + Ü (1) Module taught	in: German and/or Engli	ish				
	essment (type, scope, la on on whether module ca			tion offered — if not every seme-		
b) oral examina c) oral examina Language of as	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					
Allocation of p	laces					
Additional info	rmation					
Workload						
150 h						
Teaching cycle						
Referred to in L	.POI (examination regu	lations for teaching-o	legree 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) 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 degree (1 major) Nanostructure Technology (2020)						

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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)

Module title					Abbreviation		
Dynam	Dynamical Systems 10-M=VDSY-161-m01						
Module	e coord	inator		Module offered by	lodule offered by		
Dean of Studies Mathematik (Mathematics)			natics)	Institute of Mathem	natics		
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					
Conten	nts						
Fundar	mentals	of dynamical systems	, e. g. stability theory, e	ergodic theory, Hami	ltonian systems.		
Pecom	mondo	d previous knowledge:					
		lge of the contents of th	he module "Ordinary D	ifferential Equations	" is useful.		
		ning outcomes					
		asters the mathematic	al methods in the theo	ory of dynamic system	ns, and is able to an	alyse their	
quality							
Course	s (type	, number of weekly con	tact hours, language –	- if other than Germa	an)		
V (3) + Module		t in: German and/or En	glish				
		sessment (type, scope,		an German, examina	ation offered — if not	every seme-	
		on on whether module				,	
		mination (approx. 60 to					
		ation of one candidate					
		ation in groups (groups ssessment: German or		tes per canuldate)			
Assess	ment o	ffered: In the semester		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 reg	gulations for teaching-	degree programmes)			
Module	Module appears 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 degree (1 major) Computational 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	Master's degree (1 major) Computational Mathematics (2019)						
	-	ee (1 major) Mathemati	-			`	
Master	Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2020)						
Master's w	vith 1 majo	r Mathematical Physics (2022)		• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 135 / 276	

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) Mathematical Physics (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) Computational Mathematics (2024)

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

UNIVERSITÄT

WÜRZBURG

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	
Groups	and their Representations			10-M=VGDS-161-m	01
Module	coordinator		Module offered by		
		(atian)		ation	
Dean of Studies Mathematik (Mathematics)			Institute of Mathem	Idlics	
ECTS 10	Method of grading numerical grade	Only after succ. con			
Duratio		Other prerequisites			
1 seme					
Conten					
	ermutation groups and charac ngs of Schur.	ter theory of finite gro	ups, interrelations a	nd special technique	es such as
Basic k	mended previous knowledge: nowledge of algebra is assume d Algebra".	ed, such as can be acc	juired in the module	s "Introduction to Al	gebra" and
	ed learning outcomes				
The stu	dent masters advanced algebr search questions in group theo				
Course	s (type, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (4) + Module	Ü (2) e taught in: German and/or Eng	lish			
	d of assessment (type, scope, l formation on whether module			tion offered — if not	every seme-
b) oral c) oral Langua Assess	en examination (approx. 90 to examination of one candidate examination in groups (groups ge of assessment: German or I ment offered: In the semester i ble for bonus	each (approx. 20 minu of 2, 15 minutes per c English	ıtes) or andidate)	ıbsequent semester	
Allocat	ion of places				
Additio	nal information				
Worklo	ad				
	44				
300 h					
reachi	ng cycle				
 Referre	d to in LPO I (examination reg	ulations for teaching-o	degree programmes)		
	、 ····································				
Module	e appears in				
	's degree (1 major) Mathematic	rs (2016)			
	's degree (1 major) Physics (20				
	's degree (1 major) Mathematic				
	's degree (1 major) Computatio	•	6)		
	's teaching degree Gymnasium			ork Bavaria (ENB) (2	016)
Supple	mentary course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2016)	
	's degree (1 major) Computatio	nal Mathematics (201	9)		
Aaster's w	th 1 major Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa	-	page 137 / 276
		ta record Master	(120 ECTS) Mathematische P	IIYSIK - 2022	

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)

Module	e title				Abbreviation		
Geome	etrical Mechanics				10-M=VGEM-161-m	01	
Module coordinator				Modulo offered by			
			··	Module offered by			
	Dean of Studies Mathematik (Mathematics) Institute of Mathematics						
ECTS Method of grading Only after succ. compl. of module(s)							
10	numerical grade	1					
Duratio		vel	Other prerequisites				
	1 semester graduate						
Conten							
tic geo phase Recom Advance	metry, cotangent b space reduction, n mended previous I ced knowledge of c	undles and o ormal forms, knowledge: lifferential ge	red in module 10-M=A other examples of sym introduction to Poiss cometry is required, su of the module "Introd	iplectic manifolds, s on geometry. uch as can be acquir	ymmetries and Noet ed in the module "D	her theorem, ifferential	
ge of th	neoretical mechani	cs can also b	e useful.				
Intend	ed learning outcon	nes					
He/She		sh a connecti	ed advanced applicati on between his/her a				
Course	s (type, number of	weekly cont	act hours, language –	- if other than Germa	n)		
V (4) +	Ü (2)						
	e taught in: Germai	n and/or Eng	lish				
			anguage — if other tha an be chosen to earn		tion offered — if not	every seme-	
b) oral c) oral Langua Assess	examination of on examination in gro age of assessment:	e candidate o oups (groups : German or E	120 minutes, usually each (approx. 20 minu of 2, 15 minutes per c inglish n which the course is	utes) or andidate)	ibsequent semester		
Allocat	tion of places						
Additio	onal information						
Worklo	bad						
300 h							
Teachi	ng cycle						
Referre	ed to in LPO I (exa	mination reg	ulations for teaching-o	degree programmes)			
				<u> </u>			
Modula	e appears in						
Master Master Master Master	r's degree (1 major) r's degree (1 major) r's degree (1 major) r's teaching degree	Physics (20: Mathematic Gymnasium	16) al Physics (2016) MINT Teacher Educat			016)	
	-		ducation PLUS, Elite			ı .	
Master's w	ith 1 major Mathematical P	Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P		page 139 / 276	
				,			

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)

Module title				Abbreviation			
Aspects of Geometry					10-M=VGEO-161-m	01	
Module coordinator				Module offered by	red by		
Dean of Studies Mathematik (Mathematics)			matics)	Institute of Mathem	natics		
ECTS							
5	nume	rical grade					
Duratio		Module level	Other prerequisites	i			
1 seme		graduate					
Conten	-						
			e of geometry taking int e.g. topological geome			rrelations	
		d previous knowledge: lge from the modules "	Differential Geometry"	and "Introduction to	Topology" is recom	mended.	
		ning outcomes					
The stu	udent is	acquainted with adva	nced results in a select	ed field of geometry	and can apply his/h	er skills to	
· ·	ex prob			if a the suith sur Course			
V(3) +		, number of weekly cor	itact hours, language -	- If other than Germa	in)		
	• •	t in: German and/or En	glish				
			language — if other th can be chosen to earr		tion offered — if not	every seme-	
a) writt	en exa	mination (approx. 60 to	o 90 minutes, usually c	hosen) or			
			e each (approx. 15 mini				
		ation in groups (group ssessment: German or	s of 2, approx. 10 minu	tes per candidate)			
			in which the course is	offered and in the su	ubsequent semester		
	ble for						
Allocat	tion of p	olaces					
Additio	onal inf	ormation					
Worklo	ad						
150 h							
Teachi	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) 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)							
			Education PLUS, Elite	Network Bavaria (EN	B) (2020)		
Master	Master's degree (1 major) Mathematical Physics (2020)						
Master's w	ith 1 majo	r Mathematical Physics (2022)	-	• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 141 / 276	

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)

Module	title			Abbreviation		
Geome	tric Complex Analysis	10-M=VGFT-192-mc	01			
Module	coordinator		Module offered by			
		-+;)				
	an of Studies Mathematik (Mathematics) Institute of Mathematics					
ECTS Method of grading Only after succ. compl. of module(s)						
10	numerical grade					
Duratio	· · · · · · · · · · · · · · · · · · ·	Other prerequisites				
	1 semester graduate					
Conten						
trics, q	ed methods and results in geo uasiconformal maps, harmonic mended previous knowledge:			aps, conformal Rier	nannian me-	
	nowledge of the contents of the	e module "Introductio	on to Complex Analys	is" is recommended	l.	
	ed learning outcomes					
able cla	dent is acquainted with fundar assify these results within more s with other fields of mathemat	e general theories and				
Course	s (type, number of weekly conta	act hours, language –	- if other than Germa	n)		
V (4) +		1:-1				
	e taught in: German and/or Eng					
	d of assessment (type, scope, la formation on whether module c			tion offered — if not	every seme-	
a) writt	en examination (approx. 90 to :	120 minutes, usually	chosen) or			
	examination of one candidate e					
	examination in groups (groups		andidate)			
	ge of assessment: German or E		offered and in the set			
	ment offered: In the semester in ble for bonus	n which the course is	offered and in the si	ibsequent semester		
Allocal	ion of places	_				
Additio	nal information					
Worklo	ad					
300 h						
Teachi	ng cycle					
Referre	ed to in LPO I (examination regu	ulations for teaching-	degree programmes)			
	、		<u> </u>			
	e appears in					
	's degree (1 major) Computation		.9)			
	's degree (1 major) Mathematic	÷				
	's teaching degree Gymnasium				020)	
	mentary course MINT Teacher E		Network Bavaria (EN	В) (2020)		
	's degree (1 major) Mathematic	•				
	's degree (1 major) Computation		22)			
	's degree (1 major) Mathematic 's degree (1 major) Mathematic					
	ith 1 major Mathematical Physics (2022)	•	• generated 19-Apr-2025 • exa	am. reg. da-	page 143 / 276	
			(120 ECTS) Mathematische P			

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)

	le title				Abbreviation	
Giova	nni Proc	li Lecture Advanced	Topics (Master)		10-M=VGPAin-152-m01	
Modul	le coord	inator		Module offered by	,	
		es Mathematik (Mat	homatics)	Institute of Mathematics		
ECTS		od of grading	Only after succ. co		ilatics	
10		rical grade				
Durati		Module level	Other prerequisite			
1 sem		graduate		5		
		giaduate				
Conte						
			in mathematics by an in	ternational expert.		
Intend	ded lear	ning outcomes				
thema thema	atics. He	/She is able to estable applications in othe	blish a connection betwe er subjects.	en his/her acquired	ntemporary research topic ir skills and other branches of	
Cours	es (type	, number of weekly o	contact hours, language -	 if other than Germ 	an)	
V (4) +						
		t in: English				
			be, language — if other th ule can be chosen to ear		ation offered — if not every s	sem
c) oral Langu Asses	l examir Iage of a	nation in groups (gro issessment: English iffered: In the semes	ate each (approx. 20 min ups of 2, 15 minutes per ter in which the course is	candidate)	ubsequent semester	
Alloca	ation of	places				
∆dditi	ional inf	ormation				
riaarci		ormation				
 \\\\\\						
Workl						
300 h						
Teach	ing cycl	е				
Referr	red to in	LPOI (examination	regulations for teaching	degree programmes)	
Modu	le appea	ars in				
			atics International (2015)		
	-	ee (1 major) Mathem				
	-		atical Physics (2016)			
	-	-	ational Mathematics (20	16)		
Maste	er's degr	ee (1 major) Comput	ational Mathematics (20	19)		
	-	ee (1 major) Mathem	-			
	-		atical Physics (2020)			
	-		atics International (2021			
	-		ational Mathematics (20	22)		
		ee (1 major) Mathem ee (1 major) Mathem	atics (2022) atical Physics (2022)			
Naster's v	with 1 majo	r Mathematical Physics (2022		• generated 19-Apr-2025 • ex		5 / 2
asters	with 1 majo	i mathematical Physics (2022		• generated 19-Apr-2025 • e: r (120 ECTS) Mathematische		5/

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)

	le title				Abbreviation	
Giova	nni Proc	li Lecture Modern Top	oics (Master)		10-M=VGPMin-152-m01	
Modu	le coord	inator		Module offered by		
		es Mathematik (Math	ematics)	Institute of Mathematics		
ECTS		od of grading	Only after succ. co			
10		rical grade				
Durati	_	Module level	Other prerequisite	c		
1 sem		graduate		.5		
Conte		Sidduite				
			• ,1 ,• 1 •			
		· · · ·	in mathematics by an ir	iternational expert.		
		ning outcomes				
thema thema	atics. He atics and	/She is able to estab applications in othe	lish a connection betwe r subjects.	en his/her acquired	ntemporary research topic in skills and other branches of i	
Cours	ses (type	, number of weekly co	ontact hours, language	— if other than Germ	an)	
	+ Ü (2)					
Modu	ile taugh	t in: English	· · · · · · · · · · · · · · · · · · ·			
			e, language — if other t le can be chosen to ear		ation offered — if not every se	eme
b) ora c) ora Langu Asses	al examin I examin Jage of a	nation of one candida nation in groups (grou ssessment: English offered: In the semest	to 120 minutes, usually te each (approx. 20 mir ps of 2, 15 minutes per er in which the course i	nutes) or candidate)	subsequent semester	
	ation of					
۸dditi	ional inf	ormation				
Auuiti						
Workl						
300 h	l					
Teach	ning cycl	e				
Referi	red to in	LPOI (examination	regulations for teaching	-degree programmes	5)	
Modu	le appe	ars in				
			atics International (2015	;)		_
	-	ee (1 major) Mathema		"		
	-	ee (1 major) Mathema				
	-	-	tional Mathematics (20	16)		
	-		tional Mathematics (20			
Maste	er's degr	ee (1 major) Mathema	atics (2019)			
	-	ee (1 major) Mathema	•			
	-		atics International (202			
	-		tional Mathematics (20	22)		
	-	ee (1 major) Mathema				
waste	er s degr	ee (1 major) Mathema	atical Physics (2022)			
laster's	with 1 majo	r Mathematical Physics (2022)		• generated 19-Apr-2025 • e		/ 2
			ta record Mast	er (120 ECTS) Mathematische	Physik - 2022	

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)

Module	e title				Abbreviation	
Giovan	ni Prod	Lecture Selected Topics	s (Master)		10-M=VGPSin-152-r	m01
Module	e coordi	nator		Module offered by		
Dean o	f Studie	s Mathematik (Mathema	atics)			
ECTS	1	d of grading	Only after succ. com	pl. of module(s)		
10	numer	ical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	Its					
Introdu	Introduction to a specialised topic in mathematics by an international expert.					
Intende	ed learn	ing outcomes	· · · · · ·	· · · · ·		
themat	ics. He	acquainted with the fun 'She is able to establish applications in other su	a connection betwee			
Course	s (type,	number of weekly conta	ect hours, language —	if other than Germa	n)	
V (4) + Module		in: English				
		essment (type, scope, la on on whether module c			tion offered — if not	every seme-
Assess credita			n which the course is	offered and in the su	ubsequent semester	
Additio	onal info	ormation				
Worklo	ad					
300 h						
Teachi	ng cycle	9				
Referre	ed to in	LPOI (examination regu	lations for teaching-c	legree programmes)		
Module	e appea	rs in				
		e (1 major) Mathematics	s International (2015)			
	-	e (1 major) Mathematics				
	-	e (1 major) Mathematica				
	-	e (1 major) Computation				
	-	e (1 major) Computation		9)		
	-	ee (1 major) Mathematics ee (1 major) Mathematica	-			
	-		-			
	Master's degree (1 major) Mathematics International (2021) Master's degree (1 major) Computational Mathematics (2022)					
	Master's degree (1 major) Mathematics (2022)					
Master	's degre	e (1 major) Mathematica	al Physics (2022)			
Master's wi	ith 1 major	Mathematical Physics (2022)	_	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 149 / 276

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)

Modul	Module title Abbreviation					
Inverse	e Proble	ems 2			10-M=VIP2-222-mo	1
Modul	e coord	inator		Module offered by		
			atias)	Institute of Mathematics		
ECTS		es Mathematik (Mathem			Idlics	
	1	od of grading rical grade	Only after succ. con	npt. of module(s)		
5						
Duration 1 seme		Module level undergraduate	Other prerequisites			
Conter		undergraduate				
				1:		
variati	Variational regularisation methods, source conditions, non-linear operator equations.					
Recom	mende	d previous knowledge:				
		lge of functional analysi	s, such as that taught	in the module "Fund	ctional Analysis", is r	recommen-
ded, as	s well a	s the contents of the mo	dule "Inverse Problen	ns 1" if applicable.		
Intend	ed lear	ning outcomes				
		understand the particula				
		ability to apply variation			e them with respect	to stability
		nce. They gain deeper kr		•		
		, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (3) +						
	-	t in: German and/or Eng				
		sessment (type, scope, l on on whether module o			tion offered — if not	every seme-
a) writt	ten exa	mination (approx. 60 to	90 minutes, usually c	hosen) or		
		ation of one candidate				
		ation in groups (groups		tes per candidate)		
		ssessment: German or E ffered: In the semester i		offered and in the cu	beaquant competer	
	ble for		II which the course is	onereu anu în the st	insequent semester	
	tion of J					
Alloca		Jaces				
Additio		ormation				
Worklo	bad					
150 h						
Teachi	ng cycl	е				
Referre	ed to in	LPO I (examination reg	ulations for teaching-	degree programmes)		
		we in				
	e appea					
	-	ee (1 major) Computatio ee (1 major) Mathematic		2)		
1	-	ee (1 major) Mathematic				
1	-	-	•			
	Master's degree (1 major) Economathematics (2022) exchange program Mathematics (2023)					
1		ee (1 major) Computatio		24)		
1	-	ee (1 major) Mathematic				
Master	's degr	ee (1 major) Economathe	· · ·			
Master's w	vith 1 majo	r Mathematical Physics (2022)	_	9 generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 151 / 276

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	Module title Abbreviation					
Invers	e Proble	ems 1			10-M=VIPR-222-mo	1
Modul	e coord	inator		Module offered by		
			-+:)	-		
ECTS	1	es Mathematik (Mathema	<u>í í í í í í í í í í í í í í í í í í í </u>	Institute of Mathem	latics	
	1	od of grading rical grade	Only after succ. con	npl. of module(s)		
5						
Duration 1 seme		Module level graduate	Other prerequisites	i		
Conter		graduate				
				with a serie Tileban serie		u a va svilavi
Linear operator equations, ill-posed problems, regularisation theory, Tikhonov regularisation, iterative regulari- sation methods, examples of ill-posed problems.						
		d previous knowledge:				
Basic I ded.	knowled	lge of functional analysis	s, such as that taught	in the module "Fund	tional Analysis", is i	recommen-
	ed lear	ning outcomes				
	-	an judge whether a given	problem is well pose	ed or ill posed. He/S	he can apply regular	isation me-
		mine them regarding sta	• •	•	,	
Course	es (type	, number of weekly conta	ict hours, language –	- if other than Germa	n)	
V (3) +						
	-	t in: German and/or Engl	,			
		sessment (type, scope, la on on whether module c			tion offered — if not	every seme-
a) writt	ten exai	mination (approx. 60 to g	o minutes, usually c	hosen) or		
b) oral	examir	ation of one candidate e	ach (approx. 15 minu	ites) or		
		ation in groups (groups of		tes per candidate)		
		ssessment: German or E ffered: In the semester ir		offered and in the su	ihsequent semester	
	ble for			offered and in the st	ibsequent semester	
Alloca	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	bad					
150 h						
	ng cycl	e				
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)		
Modul	e appea	ars in				
		ee (1 major) Computation	al Mathematics (202	2)		
Master	r's degr	ee (1 major) Mathematics	5 (2022)			
	-	ee (1 major) Mathematica				
	-	ee (1 major) Economathe				
		gram Mathematics (2023		、 、		
	-	ee (1 major) Computation		:4)		
1	-	ee (1 major) Mathematics				
	-	ee (1 major) Economathe		generated 19-Apr-2025 • exa	am reg da-	page 153 / 276
musici s w	inaju		-	(120 ECTS) Mathematische P	-	P450 100 / 2/0

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	Module title Abbreviation					
Indust	rial Sta	tistics 2			10-M=VIST-161-mo:	1
Modul	e coord	inator		Module offered by	<u> </u>	
Dean	of Studie	es Mathematik (Mathem	atics)	Institute of Mathem	natics	
ECTS		od of grading	Only after succ. con			
10		rical grade				
Durati		Module level	Other prerequisites			
1 seme		graduate				
Conter	nts					
ling, b	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				
		asters advanced statist	ical methods for indu	strial applications.		
Course	es (type	, number of weekly cont	act hours, language –	- if other than Germa	ın)	
V (4) + Modul		t in: German and/or Eng	lish			
		essment (type, scope, l on on whether module o			tion offered — if not	every seme-
b) oral c) oral Langua	 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 					
	tion of p		-			
Additi	onal inf	ormation	_			
Worklo	oad					
300 h						
-	ing cycl	e				
		-				
Referr	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)		
			0			
Modul	e appea	ars in				
		ee (1 major) Mathematic	s (2016)			
		ee (1 major) Economathe				
Maste	r's degre	ee (1 major) Mathematic	al Physics (2016)			
Maste	r's degro	ee (1 major) Computatio	nal Mathematics (201	6)		
Master	r's teacł	ning degree Gymnasium	MINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
		y course MINT Teacher E			B) (2016)	
		ee (1 major) Computatio		9)		
	-	ee (1 major) Mathematic	-			
		ning degree Gymnasium				020)
		y course MINT Teacher E		Network Bavaria (EN	В) (2020)	
mastel	i s uegli	ee (1 major) Mathematic	ai f 11ysils (2020)			
Master's w	vith 1 majoı	Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 155 / 276

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)

Modul	Module title Abbreviation						
Field A	rithmet	tics			10-M=VKAR-161-mo	1	
Modul	e coord	inator		Module offered by			
1		es Mathematik (Mathema	otics)	Institute of Mathematics			
ECTS		od of grading	-	succ. compl. of module(s)			
10	1	rical grade	Unity after Succ. com				
Duration 1 seme		Module level graduate	Other prerequisites				
Conter		Siddute					
ber the ture) a Recom	Combination of Galois theory, group theory and the theory of function fields with the aim of application in num- ber theory, e. g. topics around Hilbert's irreducibility theorem, permutation polynomials (e. g. Calitz-Wan-conjec- ture) and the inverse problem in Galois theory. Recommended previous knowledge: Basic knowledge of algebra is assumed, such as can be acquired in the modules "Introduction to Algebra" and						
		ning outcomes					
		asters advanced algebra	ic concepts and met	hods. He/She gains t	the ability to work or	i contempo-	
		questions in algebra and				reontempo	
		, number of weekly conta	ct hours, language –	- if other than Germa	n)		
V (4) + Modul		t in: German and/or Engl	ish				
		sessment (type, scope, la		an German, evamina	tion offered — if not	ovory como-	
		on on whether module ca				every senie-	
b) oral c) oral Langua Assess	examir examin age of a	mination (approx. 90 to 1 nation of one candidate e ation in groups (groups c ssessment: German or Er ffered: In the semester in bonus	ach (approx. 20 minu of 2, 15 minutes per c nglish	utes) or andidate)	ıbsequent semester		
Alloca	tion of p	olaces					
Additio	onal inf	ormation					
Worklo	ad						
300 h							
Teachi	ng cycl	e					
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)			
Modul	e appea	ars in					
Master	r's degr	ee (1 major) Mathematics	(2016)				
Master	r's degr	ee (1 major) Mathematica	ll Physics (2016)				
		ning degree Gymnasium I				016)	
		ry course MINT Teacher E		Network Bavaria (EN	B) (2016)		
	-	ee (1 major) Mathematics	-				
		ning degree Gymnasium I				020)	
		y course MINT Teacher E					
Master's w	ith 1 majo	r Mathematical Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	•	page 157 / 276	

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)

Module	Module title Abbreviation					
Comple	ex Geor	netry			10-M=VKGE-161-mo	1
Module	e coord	inator		Module offered by		
Dean o	f Studie	es Mathematik (Mathema	atics)	Institute of Mathematics		
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)		
10		rical grade		•		
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	its					
calculu Kähler) Recom Basic k	The module builds on the topics covered in module 10-M=ADGM and discusses these in more detail: Wirtinger calculus, complex structures and complex manifolds, metrics on complex manifolds (e. g. conformal, hermitian, Kähler), differential operators on complex manifolds, classification of complex manifolds. Recommended previous knowledge: Basic knowledge of the contents of the modules "Introduction to Complex Analysis" and " Complex Analysis" or "Geometric Complex Analysis" is recommended.					
		ning outcomes				
		nows and masters advan	ced methods and not	tions in complex diff	erential geometry. H	e is familiar
with th	e centra	al concepts in this fied ar	nd is able to apply the	e fundamental proof	methods independe	
		number of weekly conta	ct hours, language —	- if other than Germa	n)	
V (4) + Module		t in: German and/or Engl	ish			
		essment (type, scope, la		an German, examina	tion offered — if not	everv seme-
		on on whether module ca				every serie
b) oral c) oral Langua Assess	examin examin age of a	nination (approx. 90 to 1 ation of one candidate e ation in groups (groups c ssessment: German or Er ffered: In the semester in bonus	ach (approx. 20 minu of 2, 15 minutes per c nglish	utes) or andidate)	ıbsequent semester	
	ion of p					
Allocal		haces				
	1. 6					
Additio	onal Info	ormation				
 Worklo	ad					
300 h	uu					
-	ng cycl	2	-			
	ing cycl	-				
Referre	ed to in	LPO I (examination regu	lations for teaching of	legree programmes)		
				203.00 p.03.000)		
Module	e appea	rs in				
Master	's degre	ee (1 major) Mathematics	(2016)			
	-	ee (1 major) Mathematica				
Master	's degre	ee (1 major) Computation	al Mathematics (201	6)		
Master	's teacł	ning degree Gymnasium I	WINT Teacher Educat	ion PLUS, Elite Netwo	ork Bavaria (ENB) (20	016)
Supple	mentar	y course MINT Teacher E	ducation PLUS, Elite I	Network Bavaria (ENI	B) (2016)	
	Master's degree (1 major) Computational Mathematics (2019)					
		ee (1 major) Mathematics				
Master's w	ith 1 major	Mathematical Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P		page 159 / 276

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)

Module	Module title Abbreviation					
Mathe	matical	Continuum Mechanics	5		10-M=VKOM-161-m	01
Module	e coord	inator		Module offered by	<u> </u>	
		es Mathematik (Mathe	matics)	Institute of Mathematics		
ECTS	1	od of grading	Only after succ. cor			
5	1	rical grade		<u> </u>		
Duratio		Module level	Other prerequisites	i		
1 seme	ester	graduate				
Conten	nts					
Partial differential equations and/or variational methods in the context of continuum mechanics.						
		·				
		d previous knowledge:				
		lge from the modules " recommended, as well				terential
		ning outcomes		runctional analysis.		
	-	asters the mathematic	al mothods in mathem	atical continuum mo	chanics and knows	about thoir
		application.	at methous in mathem			about then
		, number of weekly cor	ntact hours, language –	– if other than Germa	in)	
V (3) +		,,,,,,,				
		t in: German and/or En	glish			
Metho	d of ass	sessment (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	ı a bonus)		
		mination (approx. 60 to				
		ation of one candidate ation in groups (group				
		ssessment: German or		ites per canuldate)		
Assess	ment o	ffered: In the semester		offered and in the su	ubsequent semester	
credita	ble for	bonus				
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	oad					
150 h						
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
		-	<u> </u>			
Module	e appea	ars in				
		ee (1 major) Mathemati	ics (2016)			
	-	ee (1 major) Mathemati				
Master	's degr	ee (1 major) Computati	onal Mathematics (201			
		ning degree Gymnasiur				016)
		y course MINT Teacher			B) (2016)	
	-	ee (1 major) Computati		19)		
1	-	ee (1 major) Mathemati ning degree Gymnasiur	-	ion PILIS Flite Netw	ork Bayaria (FNR) (a	020)
	Jicuci	ing active dynnasia		EUS, Eute Netw		020)
Master's w	ith 1 majo	Mathematical Physics (2022)	-	• generated 19-Apr-2025 • exa r (120 ECTS) Mathematische P	-	page 161 / 276

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)

Modul	Module title Abbreviation					
Crypto	graphy	/Coding Theory			10-M=VKRY-192-m	01
Modul	e coord	inator		Module offered by		
Dean c	of Studi	es Mathematik (Mathem	atics)	Institute of Mathem	atics	
ECTS	1	od of grading	Only after succ. con			
10	1	rical grade				
Duratio		Module level	Other prorequisites			
1 seme		graduate	Other prerequisites			
Conter		glaudate]			
Error detection and error correction, linear codes, channel coding theorems of Shannon, classical and contempo- rary codes, bounds, network codes, connections to cryptography.						
	ucs, bo			lupity.		
Basic k		d previous knowledge: lge of algebra is assume bra"	d, such as can be acc	quired in the module	s "Introduction to Al	gebra" and
			_			
		ning outcomes				
is able	to clas	acquainted with fundar sify these results within phy with other fields of r	more general theories			
		, number of weekly conta		- if other than Germa	n)	
V (4) +				n other than defina	")	
		t in: German and/or Eng	lish			
		essment (type, scope, la on on whether module o			tion offered — if not	every seme-
-		mination (approx. 90 to		•		
		ation of one candidate e				
		ation in groups (groups				
		ssessment: German or E				
	ment o ble for	ffered: In the semester i	n which the course is	offered and in the su	ıbsequent semester	
	tion of p					
		haces	_			
Additid	nal inf	ormation				
Addition						
			-			
Worklo	bad					
300 h			_			
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination regu	ulations for teaching-	degree programmes)		
Modul	e appea	irs in				
	Master's degree (1 major) Computational Mathematics (2019)					
	-	ee (1 major) Mathematic	-			
		ning degree Gymnasium				020)
		y course MINT Teacher E		Network Bavaria (ENI	B) (2020)	
	Master's degree (1 major) Mathematical Physics (2020)					
	Master's degree (1 major) Computational Mathematics (2022)					
		ee (1 major) Mathematic				
Master's w	uth 1 majo	Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 163 / 276

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					
Mathematica	Imaging			10-M=VMBV-161-mc	01
Module coord	inator		Module offered by		
	es Mathematik (Mathema	atics)	Institute of Mathematics		
	od of grading	Only after succ. con			
	rical grade				
Duration	Module level	Other proreculaites			
1 semester	graduate	Other prerequisites			
Contents	giaduate	<u> </u>			
Mathematical fundamentals of image processing and computer vision such as elementary projective geometry, camera models and camera calibration, rigid and non-rigid registration, reconstruction of 3D objects from came- ra pictures; algorithms; module might also include an introduction to geometric methods and tomography. Recommended previous knowledge: Basic knowledge of functional analysis, such as that taught in the module "Functional Analysis", is recommen-					
ded.	•				
	ning outcomes				
The student n fields of appli	nasters the mathematical cation.	methods in the theo	ry of image processir	ng and knows about	their main
Courses (type	, number of weekly conta	ict hours, language –	- if other than Germa	n)	
V (3) + Ü (1) Module taugh	t in: German and/or Engl	ish			
	sessment (type, scope, la		an German, examinat	tion offered — if not	everv seme-
	ion on whether module c				, ,
b) oral examin c) oral examin Language of a	mination (approx. 60 to 9 nation of one candidate e nation in groups (groups o Issessment: German or E Iffered: In the semester ir bonus	ach (approx. 15 minu of 2, approx. 10 minu nglish	tes) or tes per candidate)	ibsequent semester	
Allocation of	places				
Additional inf	ormation				
Workload					
150 h					
Teaching cycl	e				
	-				
Referred to in	LPOI (examination regu	lations for teaching-	degree programmes)		
Module appea	ars in				
Master's degr	ee (1 major) Mathematics	6 (2016)			
Master's degr	ee (1 major) Mathematica	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)					
-	ee (1 major) Mathematics				
Master's with 1 majo	r Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische Ph	-	page 165 / 276

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) 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)

Modul	e title			Abbreviation	
Select	ed Topics in Mathematical Phys	ics		10-M=VMPH-161-m	01
Modul	e coordinator		Module offered by	<u> </u>	
	of Studies Mathematik (Mathem	atics)	· · · · · · · · · · · · · · · · · · ·		
ECTS	Method of grading	Only after succ. com			
10	numerical grade				
Duratio		Other prerequisites			
1 seme					
Conter					
		es for overale conti	uum machanias flu	id dunamica matha	maticalma
	ed topics in mathematical physi cciences, geometric field theory,			nu uynannes, maine	IIIdlical IIIa-
Recom	mended previous knowledge:				
	ding on the content, basic and a		from different areas	of analysis is requir	ed. In case of
	it is recommended to consult the	ne lecturer.			
Intend	ed learning outcomes				
	udent is acquainted with an adv ction between his/her acquired				
Course	es (type, number of weekly conta	act hours, language —	if other than Germa	n)	
V (4) +					
10	e taught in: German and/or Engl	lish			
Metho	d of assessment (type, scope, la	anguage — if other tha	an German, examina	tion offered — if not	every seme-
	formation on whether module c				,
a) writt	ten examination (approx. 90 to 1	120 minutes, usually o	chosen) or		
	examination of one candidate e				
	examination in groups (groups		andidate)		
-	age of assessment: German or E sment offered: In the semester in	-	offered and in the c	beaquant competer	
	ible for bonus	i which the course is	offered and in the St	ibsequent semester	
	tion of places	-			
Allocal					
Additio	onal information				
		-			
Worklo	pad				
300 h					
Teachi	ng cycle				
Referre	ed to in LPO I (examination regu	lations for teaching-	legree programmes)		
			<u></u>		
	e appears in				
	r's degree (1 major) Mathematic				
	's degree (1 major) Physics (201				
	r's degree (1 major) Mathematica	•			
	r's degree (1 major) Computation			ork Dougris (END) (-	or()
	's teaching degree Gymnasium				010)
	ementary course MINT Teacher E start (1 major) Computatior			0) (2010)	
	r's degree (1 major) Computation		<i>YI</i>		
	vith 1 major Mathematical Physics (2022)		generated 19-Apr-2025 • exa	am. reg. da-	page 167 / 276
			(120 ECTS) Mathematische P		

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) 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)

Module title				Abbreviation			
Module Theory 10-M=VMTH-161-m01						01	
Module coordinator Module offered by							
Dean of Studies Mathematik (Mathemat			vticc)				
ECTS			natics) Institute of Mathematics Only after succ. compl. of module(s)				
		od of grading rical grade	Only after succ. con	ipt. of module(s)			
5	·						
Duration		Module level graduate	Other prerequisites				
Conter		graduate					
semi-s rems. Recom Basic I	imple a mende (nowled	ule theory: modules and nd complex modules, mo d previous knowledge: lge of algebra is assumed	odule trees and their	defibrations, distors	ion theorems, reduc	tion theo-	
	ed Algel						
		ning outcomes					
		asters mathematical met		•			
Course	es (type	, number of weekly conta	ct hours, language —	- if other than Germa	n)		
V (3) + Modul		t in: German and/or Engli	ish				
Metho	d of ass	s essment (type, scope, la	nguage — if other tha	an German, examina	tion offered — if not	every seme-	
ster, in	Iformati	on on whether module ca	an be chosen to earn	a bonus)		·	
b) oral c) oral Langua Assess credita	 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 						
Additio	onal info	ormation					
Worklo	bad						
150 h							
Teachi	ng cycl	e					
Referre	ed to in	LPOI (examination regu	lations for teaching-o	degree programmes)			
Modul	e appea	irs in					
Master	r's degr	ee (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 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) Aaster's with 1 major Mathematical Physics (2022) JMU Würzburg • generated 19-Apr-2025 • exam. reg. da- ta record Master (120 ECTS) Mathematics Physic - 2022						

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)

Modul	e title				Abbreviation	
Selected Topics in Numerical and Applied Mathematics					10-M=VNAM-192-m	01
Module coordinator				Module offered by		
		es Mathematik (Mathem	atics)	Institute of Mathem	atics	
ECTS		d of grading	Only after succ. com		latics	
10		ical grade				
Duratio	r	Module level	Other prerequisites			
1 seme		graduate				
	I	graduate				
Conter				11 1 11 11		
		ssion of a specialised to interrelations with othe			taking into account	recent deve-
		previous knowledge:				
•	•	the content, basic and a			of applied mathema	tics is requi-
		doubt, it is recommend	ed to consult the lectl	irer.		
		ing outcomes	-			
		acquainted with advand hese to complex proble		ed topic in numerica	l or applied mathem	atics, and is
Course	es (type,	number of weekly conta	act hours, language —	if other than Germa	n)	
V (4) +	Ü (2)					
Modul	e taught	in: German and/or Eng	lish			
		essment (type, scope, la on on whether module c			tion offered — if not	every seme-
a) writt	ten exar	nination (approx. 90 to		chosen) or		
		ation of one candidate e				
		ation in groups (groups		andidate)		
		ssessment: German or E		affanad and in the av		
	able for l	ffered: In the semester i	n which the course is	offered and in the st	ibsequent semester	
	tion of p		_			
		laces				
Additio	onal info	ormation				
			_			
Worklo	oad					
300 h						
Teachi	ing cycle	9				
Referre	ed to in	LPO I (examination reg	- ulations for teaching-c	legree programmes)		
Modul	e appea	rs in				
Master	r's degre	ee (1 major) Computation	nal Mathematics (201	9)		
Master	r's degre	ee (1 major) Mathematic	s (2019)			
		ing degree Gymnasium				020)
		y course MINT Teacher E		Network Bavaria (EN	B) (2020)	
	-	ee (1 major) Mathematic				
	-	ee (1 major) Economathe				
Mactor	r's degre	e (1 major) Computation	nal Mathematics (202	2)		
	با با ما س			2)		
Master		ee (1 major) Mathematic Mathematical Physics (2022)	s (2022)	generated 19-Apr-2025 • exa	am reg da.	page 171 / 276

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			
Non-liı	Non-linear Analysis 10-M=VNAN-161-m01						
Module coordinator				Module offered by			
Dean of Studies Mathematik (Mathematics)			matics)	Institute of Mathematics			
ECTS	Metho	Nethod of grading Only after succ. compl. of module(s)					
5	nume	rical grade					
Duratio	on	Module level	Other prerequisites	uisites			
1 seme		graduate					
Conter							
Metho	ds in no	onlinear analysis (e. g. t	opological methods, n	nonotony and variati	onal methods) with	applications.	
Pecom	mondo	d previous knowledge:					
		id basic knowledge of f	unctional analysis and	l partial differential e	quations, such as ca	an be acqui-	
		dules "Introduction to F				•	
Intend	ed lear	ning outcomes					
		acquainted with the co ical problems.	oncepts of non-linear a	nalysis, can compar	e them and assess t	heir applica-	
		, number of weekly con	tact hours, language –	- if other than Germa	ın)		
V (3) +	Ü (1)						
Modul	e taugh	t in: German and/or En	glish				
		essment (type, scope, on on whether module			tion offered — if not	every seme-	
a) writt	ten exai	mination (approx. 60 to	90 minutes, usually c	hosen) or			
		ation of one candidate		-			
		ation in groups (groups ssessment: German or		tes per candidate)			
		ffered: In the semester		offered and in the su	ubsequent semester	i	
	ble for				I		
Allocat	tion of p	olaces					
Additio	onal inf	ormation					
Worklo	ad						
150 h							
Teachi	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) 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 w	ith 1 majo	r Mathematical Physics (2022)	-	• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 173 / 276	



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					Abbreviation	
Numer	ric of Par	tial Differential Equati	ons		10-M=VNPE-161-m	
Madul	o coordi			Module offered by		
Module coordinator						
	-	s Mathematik (Mathem		Institute of Mathem	latics	
ECTS		d of grading	Only after succ. con	ipl. of module(s)		
10	r	ical grade				
Duratio		Module level	Other prerequisites			
1 seme		graduate				
Conten	nts					
(numer discon Recom We rec	rical men ntinuous nmendec commen	l differential equations thods for elliptic, paral Gelerkin finite elemen I previous knowledge: d basic knowledge of fu ules "Introduction to Fi	polic and hyperbolic pa ts method, finite differ unctional analysis and	artial differential equ ences and finite volu partial differential e	ations; finite eleme ime methods). quations, such as ca	nts method,
		ing outcomes			•	
		0	and mothods for dias	oticing partial differen	ntial oquations	
		acquainted with advar		• •	•	
	_	number of weekly con	tact hours, language –	- if other than Germa	n)	
V (4) +	• •					
		in: German and/or Eng				
		essment (type, scope, on on whether module			tion offered — if not	every seme-
		nination (approx. 90 to				
		ation of one candidate		-		
		ation in groups (groups ssessment: German or		andidate)		
-	-	fered: In the semester	-	offered and in the su	ibsequent semester	
	able for b			oncrea and in the se	issequent semester	
Allocat	tion of p	laces				
Additic	onal info	rmation				
Auunn						
	•					
Worklo	oad					
300 h						
Teachi	ing cycle					
Referre	ed to in l	LPOI (examination reg	gulations for teaching-o	degree programmes)		
Module	e appea	rs in				
Master	r's degre	e (1 major) Mathemati	cs (2016)			
	-	e (1 major) Physics (20				
Master	r's degre	e (1 major) Economath	ematics (2016)			
Master	r's degre	e (1 major) Mathemati	cal Physics (2016)			
	-	e (1 major) Computatio				
		ing degree Gymnasium				016)
	omontan	course MINT Teacher	Education DILLS Elital	Vature de Davrada (CN		
					B) (2016)	
Master	r's degre	e (1 major) Computatio	onal Mathematics (201			page 175 / 276

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		
Selected Topics in Optimization 10-M=VOPT-161-m01)1
Module coordinator Module offered by						
		es Mathematik (Mathem	<u> </u>	Institute of Mathem	latics	
ECTS	1	od of grading rical grade	Only after succ. con	ipi. of module(s)		
10						
Durati		Module level graduate	Other prerequisites			
Conte		glauuale				
		c in ontimization of a		amidafinita program	a non smooth onti	mization as
		cs in optimization, e.g. i timization with different		sennuennite program	is, non-sinootii optii	ilizatioli, ga-
Intend	ed lear	ning outcomes				
		acquainted with advan research questions in c			He gains the ability t	o work on
		, number of weekly cont			un)	
V (4) +		, number of weekly cont			(11)	
	• •	t in: German and/or Eng	lish			
		sessment (type, scope, l		an German, examina	tion offered — if not	every seme-
		ion on whether module of				every serie
a) writ	ten exa	mination (approx. 90 to	120 minutes, usually	chosen) or		
b) oral	examir	nation of one candidate	each (approx. 20 mini	utes) or		
		ation in groups (groups		andidate)		
		ssessment: German or E				
	sment o able for	ffered: In the semester i	n which the course is	offered and in the st	ibsequent semester	
	tion of _l					
Additi	onal inf	ormation	_			
Workl	oad					
300 h						
-	ing cycl	e				
		•	_			
Referr	ed to in	LPOI (examination reg	ulations for teaching.	degree programmes)		
Modul	e appea	ars in				
		ee (1 major) Mathematic	s (2016)			
	-					
Master's degree (1 major) Economathematics (2016) Master's degree (1 major) Mathematical Physics (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 (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)					
1	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 v	vith 1 majo	r Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 177 / 276

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		
Optimal Control 10-M=VOST-161-m01)1
Module coordinator Module offered by						
Dean of Studies Mathematik (Mathematics)			atics)	Institute of Mathematics		
ECTS		od of grading	Only after succ. con			
5	1	rical grade				
Duratio		Module level	Other prerequisites			
1 seme		graduate				
Conter						
		mal control of ordinary ar ethods for numerical solu		equations, theory of	optimal control, cor	nditions for
We rec quired the cor	ommen in the r ntents c	d previous knowledge: Id basic knowledge of fur nodules "Introduction to If the module "Basics in (Functional Analysis"	and "Ordinary Differ		
Intend	ed lear	ning outcomes				
		acquainted with advanc questions in continuous		al control. He gains t	the ability to work or	n contempo-
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)	
V (3) + Module		t in: German and/or Engl	ish			
Metho	d of ass	sessment (type, scope, la	inguage — 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)		
b) oral c) oral Langua	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					
	tion of p					
Allocal						
Additid	nalinf	ormation				
Auunn						
Worklo	ad					
150 h						
	ng cycl	e				
	iis cyce					
Referred to in LPO I (examination regulations for teaching-degree programmes)						
			0			
Modul	e appea	urs in				
		ee (1 major) Mathematics	5 (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)						
	-	ee (1 major) Computation		9) generated 19-Apr-2025 • exa	am reg da-	page 179 / 276
muster 5 W	i majo			(120 FCTS) Mathematische P		puse 1/9/2/0

UNIVERSITÄT WÜRZBURG

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)

Partial	e title				Abbreviation	
Partial Differential Equations of Mathematical Physics					10-M=VPDP-161-m01	
Modul	e coordin	ator		Module offered by		
Dean of Studies Mathematik (Mathematics)			atics)	Institute of Mathematics		
ECTS	-	of grading	Only after succ. con		latics	
10		cal grade				
Duratio	on A	Aodule level	Other prerequisites			
	1 semester graduate					
Conten	nts					
examp ons an Recom Basic k	oles; initia nd genera nmended knowledg	Il and boundary value lisations; Hilbert space previous knowledge:	problems; well-posed e methods; Sobolev s Ordinary Differential Ec	and ill-posed proble paces and Fourier tra quations" and "Intro	duction to Partial Differe	; extensi-
Intend	led learni	ng outcomes	_			
equation	ons, as w		les from mathematica	al physics. He/She is	the theory of partial dif able to establish a cor ons in physics.	
Course	es (type, r	number of weekly cont	act hours, language –	- if other than Germa	ın)	
V (4) + Module		n: German and/or Eng	lish			
		ssment (type, scope, l n on whether module o			tion offered — if not ev	ery seme-
b) oral c) oral Langua Assess	examina examinat age of ass	ination (approx. 90 to tion of one candidate tion in groups (groups sessment: German or E ered: In the semester i onus	each (approx. 20 minu of 2, 15 minutes per c English	utes) or andidate)	ubsequent semester	
Allocat	tion of pla	aces				
 Additio	onal infor	mation				
 Additic	onal infor	mation				
 Additic Worklo		mation				
		mation				
 Worklo 300 h	oad	mation				
 Worklo 300 h		mation				
 Worklo 300 h Teachi	oad ing cycle	mation POI (examination reg	ulations for teaching-o	degree programmes)		
 Worklo 300 h Teachi	oad ing cycle		ulations for teaching-	degree programmes)		
 Worklo 300 h Teachi Referre	oad ing cycle	POI (examination reg	ulations for teaching-	degree programmes)		
 Worklo 300 h Teachi Referre Modulo Master Master Master Master Master	oad ing cycle ed to in Ll e appears r's degree r's degree r's degree r's degree	POI (examination reg s in e (1 major) Mathematic e (1 major) Physics (201 e (1 major) Mathematic e (1 major) Computatio	s (2016) 16) al Physics (2016) nal Mathematics (201 MINT Teacher Educat	6) ion PLUS, Elite Netw	ork 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)

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

Deoudo	e title		-	Abbreviation					
Pseudo Riemannian and Riemannian Geometry				10-M=VPRG-161-mc	01				
Module	e coordinator		Module offered by						
	f Studies Mathematik (Mathe	matics)	Institute of Mathem	atics					
ECTS	Method of grading	Only after succ. con							
10	numerical grade								
Duratio	on Module level	Other prerequisites							
1 seme	ster graduate								
Conten	ts								
nian an map, Ja Laplace theory. Recomm Advance	dule builds on the topics cov nd pseudo-Riemannian manifo acobi fields, comparison theo e operators, causal structure o mended previous knowledge: ced knowledge of differential try". Knowledge of the conten	olds, Levi-Civita connec rems in Riemannian ge of Lorenz manifolds, Eir geometry is required, se	tion and curvature, g ometry, submanifolo nstein equations and uch as can be acquir	geodesics and the ex s, integration, d'Ale applications in gen ed in the module "D	kponential mbert and eral relativity ifferential				
"Lie The	eory" is also recommended.								
	ed learning outcomes								
manifo	Ident is acquainted with adva lds. He/She is able to establi ics and questions in physics.								
Course	s (type, number of weekly cor	itact hours, language –	- if other than Germa	n)					
V (4) +									
	e taught in: German and/or Er								
	d of assessment (type, scope, formation on whether module			tion offered — if not	every seme-				
b) oral c) oral e	en examination (approx. 90 to examination of one candidate examination in groups (group age of assessment: German or	e each (approx. 20 minu s of 2, 15 minutes per c	utes) or						
	ment offered: In the semester ble for bonus	in which the course is	offered and in the su	ubsequent semester	Language of assessment: German or English Assessment offered: In the semester in which the course is offered and in the subsequent semester				
	ion of places								
	ion of places								
Allocat 	ion of places nal information								
Allocat 									
Allocat 	onal information								
Allocat Additio 	onal information								
Allocat Additio Worklo 300 h	onal information								
Allocat Additio Worklo 300 h Teachin	onal information ad	gulations for teaching-(degree programmes)						
Allocat Additio Worklo 300 h Teachin Referre	nal information ad ng cycle ed to in LPO I (examination re	gulations for teaching-(degree programmes)						
Allocati Additio 300 h Teachin Referre Module	anal information ad ng cycle ed to in LPO I (examination re e appears in		degree programmes)						
Allocat Additio Worklo 300 h Teachin Referre Master Master	nal information ad ng cycle ed to in LPO I (examination re	ics (2016) 016)	degree programmes)						

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)

Module	title			Abbreviation	
Mather	natical Statistics			10-M=VSTA-212-m	01
Module coordinator			Module offered by		
Dean of	f Studies Mathematik (Mathema	, ,	Institute of Mathem	atics	
ECTS	Method of grading	Only after succ. com	pl. of module(s)		
10	numerical grade				
Duratio		Other prerequisites			
1 seme	ster graduate				
Conten	ts				
crimina	gency tables, categorical regress Int function analysis, cluster and				nalysis, dis-
Basic k	mended previous knowledge: nowledge of stochastics is requ tents of the module "Stochastic			astics 1" module. Kn	owledge of
	ed learning outcomes				
	dent is acquainted with the fund	damental mothods in	statistical analysis	and can apply them	to practical
problen	-	uamentat methous II	i statistical allalysis	and can apply them	i to practical
	s (type, number of weekly conta	ct hours language	if other than Germa	n)	
V (4) +		ier nours, language –	n other than defilla	11)	
1.12	u (2) e taught in: German and/or Engli	ish			
			an Corman, ovamina	tion offered if not	tovonicomo
	d of assessment (type, scope, la formation on whether module ca			tion offered — if not	t every seme-
	en examination (approx. 90 to 1				
	examination of one candidate e				
	examination in groups (groups oge of assessment: German or Er		andidate)		
•	ment offered: In the semester in	-	offered and in the su	ihsequent semester	r
	ble for bonus	i willen the course is	onered and in the st	ibsequent semester	I
	ion of places				
Allocal					
Additio	nal information				
Worklo	ad				
300 h					
Teachir	ng cycle				
Referre	d to in LPO I (examination regu	lations for teaching-c	legree programmes)		
	e appears in				
	's degree (1 major) Economathe				
	s degree (1 major) Computation		2)		
	's degree (1 major) Mathematics				
	's degree (1 major) Mathematica				
	's degree (1 major) Economathe				
	ge program Mathematics (2023)		0		
	's degree (1 major) Computation		4)		
	s degree (1 major) Mathematics		generated 19-Apr-2025 • exa	am, reg. da-	page 185 / 276
nuster 5 WI			(120 ECTS) Mathematische P	-	puge 105 / 2/0

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		Abbreviation			
Selecte	d Topics in Control Theory			10-M=VTRT-161-mc	01
Module coordinator			Module offered by		
Dean of Studies Mathematik (Mathematics)			Institute of Mathem	natics	
ECTS Method of grading Only after succ. compl. of module(s)					
10	numerical grade				
Duratio	n Module level	Other prerequisit	es		
1 seme	ster graduate				
Conten	ts				
bilinea	d topics in linear and non- r systems. nended previous knowleds		g. networked linear co	ntrol systems, contr	ollability of
	dge of the contents of the	-	Control Theory" or "Co	ntrol Theory" is requ	ired.
Intende	ed learning outcomes				
	dent gains insight into con ues in this field and can a			y. He/She masters a	dvanced
Course	s (type, number of weekly o	contact hours, language	— if other than Germa	in)	
V (4) + Module	Ü (2) e taught in: German and/or	English			
	l of assessment (type, scop formation on whether mod			tion offered — if not	every seme-
Langua Assess	examination in groups (gro ge of assessment: German ment offered: In the semes ble for bonus	or English		ubsequent semester	
Allocat	ion of places				
Additio	nal information				
Worklo	ad				
300 h					
	ng cycle				
Referre	d to in LPO I (examination	regulations for teaching	g-degree programmes)		
Module	appears in				
Master Master Master Master Supple Master	s degree (1 major) Mathem s degree (1 major) Econom s degree (1 major) Mathem s degree (1 major) Comput s teaching degree Gymnas mentary course MINT Teach s degree (1 major) Comput s degree (1 major) Mathem	athematics (2016) natical Physics (2016) ational Mathematics (20 ium MINT Teacher Educ ner Education PLUS, Elit ational Mathematics (20	ation PLUS, Elite Netw e Network Bavaria (EN		016)
	th 1 major Mathematical Physics (202:		g • generated 19-Apr-2025 • ex.	am. reg. da-	page 187 / 276

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

Module title Abbreviation						
Networ	ked Sy	stems			10-M=VVSY-161-m)1
Module	e coord	inator		Module offered by	<u> </u>	
Dean o	f Studie	es Mathematik (Mathe	matics)	Institute of Mathematics		
ECTS		od of grading	Only after succ. cor			
5	î	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
			near and non-linear dy ical aspects (controllal			homogenous
		d previous knowledge:	he module "Ordinary D	ifferential Equations	" is useful	
		ning outcomes			15 050101.	
		-	nced methods in the fi	ald of notworked sys	tome. He gains the a	bility to work
			in networked systems		tems. He gams the a	
Course	s (type	, number of weekly cor	ntact hours, language –	- if other than Germa	in)	
V (3) + Module		t in: German and/or En	ølish			
			language — if other th	an German examina	tion offered — if not	every seme-
			can be chosen to earn			every serie
			o 90 minutes, usually c			
			e each (approx. 15 minu s of 2, approx. 10 minu			
		ssessment: German or		tes per candidate)		
Assess	ment o	ffered: In the semester	in which the course is	offered and in the su	ubsequent semester	
credita						
Allocat	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
150 h						
Teachi	ng cycl	e				
Referre	d to in	LPOI (examination re	gulations for teaching-	degree programmes)		
Module	e appea	irs in				
	-	ee (1 major) Mathemat				
	-	ee (1 major) Mathemat	-			
1	-		onal Mathematics (201		ork Dovoria (END) (-	016)
			n MINT Teacher Educat Education PLUS, Elite			010)
		•	onal Mathematics (201		0, (2010)	
1	-	ee (1 major) Mathemat		<i>,</i> ,		
	-	-	n MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2	020)
Master's wi	ith 1 majoı	Mathematical Physics (2022)	-	• generated 19-Apr-2025 • ex (120 ECTS) Mathematische P	-	page 189 / 276

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)

Module	e title				Abbreviation
Study (Group I	lopf Algebras			11-AG-HAL-161-m01
Module	e coord	inator		Module offered by	<u> </u>
chairpe	erson o	f examination committee		Faculty of Physics a	ind Astronomy
ECTS		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				
		o current questions of Ho undamental topics in a se		aration for a Master's	s thesis in this area. Summary of
Intend	ed lear	ning outcomes			
		have advanced knowledg to summarise their know			nts into current research topics.
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	ın)
Metho	d of as	t in: German or English sessment (type, scope, la ion on whether module ca			tion offered — if not every seme-
Langua	ige of a	o minutes) ssessment: German and, ffered: In the semester in		offered and in the su	ubsequent semester
Allocat	ion of	places			
Additio	nal inf	ormation			
Worklo	ad				
300 h					
Teachi	ng cycl	e			
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)	
	1				
Module	e appea	ars in			
		ee (1 major) Mathematica	Il Physics (2016)		
	-	ee (1 major) Mathematica	•		
Master	's degr	ee (1 major) Mathematica	ll Physics (2022)		

Module	e title				Abbreviation
Study	Group (Conformal Field Theory			11-AG-KFT-161-m01
Modul	e coord	inator		Module offered by	<u> </u>
chairpe	erson o	f examination committee		Faculty of Physics a	and Astronomy
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)	
10	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	Its				
		o current questions of con ne required fundamental	-		a Master's thesis in this area.
Intend	ed lear	ning outcomes			
		have advanced knowledg re able to summarise the			ned insights into current research
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	in)
Metho ster, in talk (60	d of ass formation	t in: German or English cessment (type, scope, la ion on whether module ca o minutes) ssessment: German and	an be chosen to earn		tion offered — if not every seme-
		ffered: In the semester in		offered and in the su	ubsequent semester
Allocat	ion of _l	olaces			
Additio	onal inf	ormation			
Worklo	ad				
300 h					
Teachi	ng cycl	e			
Referre	ed to in	LPOI (examination regu	lations for teaching-o	degree programmes)	
Module	e appea	urs in			
Master	's degr	ee (1 major) Mathematica	ll Physics (2016)		
	Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Mathematical Physics (2022)				

Modul	e title				Abbreviation
Study	Group I	Modern Differential Geom	ietry		11-AG-MDG-161-m01
Modul	e coord	inator		Module offered by	
				Faculty of Physics a	and Astronomy
ECTS	1	od of grading	Only after succ. con	· · ·	,
10	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ester	graduate			
Conter	nts				
		o current questions of mo y of the required fundam			on for a Master's thesis in this
Intend	ed lear	ning outcomes			
		have advanced knowledg s. They are able to summ			ave gained insights into current ation.
Course	es (type	, number of weekly conta	ct hours, language –	- if other than Germa	an)
		t in: German or English Sessment (type, scope, la	nguage — if other that	an German, examina	tion offered — if not every seme-
		ion on whether module ca			
Langua	age of a	o minutes) ssessment: German and/ ffered: In the semester in		offered and in the su	ubsequent semester
	tion of p				
Additio	onal inf	ormation			
Worklo	ad				
300 h					
-	ng cycl	e			
			-		
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)	
				· - ·	
Modul	e appea	ars in			
		ee (1 major) Mathematica	Il Physics (2016)		
	-	ee (1 major) Mathematica	, , ,		
Master	's degr	ee (1 major) Mathematica	ll Physics (2022)		

Modul	e title				Abbreviation
Study	Group I	Mathematical Physics			11-AG-MPH-161-m01
Modul	e coord	inator		Module offered by	l
chairp	erson o	f examination committee		Faculty of Physics a	and Astronomy
ECTS	Meth	od of grading	Only after succ. con		-
10	nume	rical grade			
Durati	on	Module level	Other prerequisites		
1 seme	ester	graduate			
Conte	nts				
		o current questions of Ma ne required fundamental			a Master's thesis in this area.
Intend	ed lear	ning outcomes			
The st	udents				ned insights into current research
•		, number of weekly conta		•	n)
Metho ster, ir talk (6 Langua Assess	od of ass nformat o to 120 age of a	ion on whether module ca o minutes) ssessment: German and, ffered: In the semester in	an be chosen to earn /or English	a bonus)	ution offered — if not every seme-
AllULa		Jaces			
 Additi	onalinf	ormation			
Audith					
Workle	oad				
300 h					
-	ing cycl	e			
Referr	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)	
Modul	e appea	ars in			
		ee (1 major) Mathematica	Il Physics (2016)		
Maste	r's degr	ee (1 major) Mathematica	ll Physics (2020)		
Maste	r's degr	ee (1 major) Mathematica	ll Physics (2022)		

					Abbreviation
Study	Group (Operator Algebras and Re	presentation Theory		11-AG-OAD-161-m01
Modul	e coord	inator		Module offered by	
chairp	erson o	f examination committee		Faculty of Physics a	and Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
10	nume	rical grade			
Durati	on	Module level	Other prerequisites		
1 seme	ester	graduate			
Conter	nts				
		o current questions of op d fundamental topics in a			ter's thesis in this area. Summary
Intend	ed lear	ning outcomes			
		have advanced knowledg able to summarise their			sights into current research to-
Course	es (type	, number of weekly conta	ct hours, language –	- if other than Germa	an)
S (4) Modul	e taugh	t in: German or English			
		sessment (type, scope, la ion on whether module ca			tion offered — if not every seme-
Langua	age of a	o minutes) ssessment: German and/ ffered: In the semester in		offered and in the su	ubsequent semester
	tion of j				•
Additio	onal inf	ormation			
Worklo	bad				
300 h					
-	ng cycl	e			
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)	
	_				
Modul	e appea	ars in			
		ee (1 major) Mathematica	l Physics (2016)		
	-	ee (1 major) Mathematica	•		
Master	r's degr	ee (1 major) Mathematica	l Physics (2022)		

Modul	e title				Abbreviation
Study	Group (Quantum Field Theory			11-AG-QFT-161-m01
Modul	e coord	inator		Module offered by	1
chairp	erson o	f examination committee		Faculty of Physics a	and Astronomy
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	
10	nume	rical grade			
Durati	on	Module level	Other prerequisites		
1 seme	ester	graduate			
Conte	nts				
		o current questions of qu quired fundamental topic			Master's thesis in this area. Sum
Intend	ed lear	ning outcomes			
			e of quantum field th	neory and have gain	ed insights into current research
topics	. They a	re able to summarise the	ir knowledge in an or	al presentation.	
Course	es (type	, number of weekly conta	ct hours, language –	- if other than Germa	an)
S (4)					
Modul	e taugh	t in: German or English			
		sessment (type, scope, la ion on whether module ca			ation offered — if not every seme-
talk (6	o to 120	o minutes)			
		ssessment: German and,			
		ffered: In the semester in	which the course is	offered and in the s	ubsequent semester
Alloca	tion of _l	olaces			
Additi	onal inf	ormation			
Workle	oad				
300 h					
Teachi	ing cycl	e			
Referr	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)	
Modul	e appea	ars in			
		ee (1 major) Mathematica	Il Physics (2016)		
	-	ee (1 major) Mathematica			
Maste	r's degr	ee (1 major) Mathematica	ll Physics (2022)		

Modul	e title				Abbreviation
Study	Group I	Riemannian Geometry			11-AG-RGE-161-m01
Modul	e coord	inator		Module offered by	1
chairp	erson o	f examination committee		Faculty of Physics a	and Astronomy
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)	-
10	nume	rical grade			
Durati	on	Module level	Other prerequisites		
1 seme	ester	graduate			
Conte	nts				
		o current questions of Rie ne required fundamental			a Master's thesis in this area.
Intend	ed lear	ning outcomes			
The st	udents				ned insights into current research
		, number of weekly conta		•	an)
	s (type	, number of weekly collid	- invuis, language –		11 <i>1</i>
S (4) Modul	e taugh	t in: German or English			
		sessment (type, scope, la ion on whether module ca			ation offered — if not every seme-
talk (6	o to 120	o minutes)			
		ssessment: German and,			
		ffered: In the semester in	which the course is	offered and in the s	ubsequent semester
Alloca	tion of _l	olaces			
Additi	onal inf	ormation			
Workle	oad				
300 h					
Teachi	ing cycl	e			
Referr	ed to in	LPO I (examination regu	lations for teaching-	degree programmes)	
Modul	e appea	ars in			
		ee (1 major) Mathematica	ll Physics (2016)		
	-	ee (1 major) Mathematica			
Maste	r's degr	ee (1 major) Mathematica	ll Physics (2022)		

Module title Abbreviation						
Study	Study Group Symplectic and Poisson Geometry 11-AG-SPG-161-m01					
Module coordinator Module offered by						
chairp	erson o	f examination committee		Faculty of Physics a	and Astronomy	
ECTS	Meth	od of grading	Only after succ. con	· · · ·		
10	nume	rical grade				
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conte	nts					
		o current questions of syr area. Summary of the req			as a preparation for a Master's esentation.	
Intend	led lear	ning outcomes				
		have advanced knowledg topics. They are able to s			nd have gained insights into cur- sentation.	
Course	es (type	, number of weekly conta	ct hours, language –	- if other than Germa	in)	
Metho	d of ass				tion offered — if not every seme-	
talk (6	o to 120	ion on whether module ca				
-	•	ssessment: German and, ffered: In the semester in	-	offered and in the su	ubsequent semester	
	tion of					
Additi	onal inf	ormation				
Workl	oad					
300 h						
-	ing cycl	e				
Referr	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)		
Modu	e appea	ars in				
Maste	r's degr	ee (1 major) Mathematica	l Physics (2016)			
	-	ee (1 major) Mathematica				
Maste	r's degr	ee (1 major) Mathematica	ll Physics (2022)			

Module title					Abbreviation	
Study Group Statistical Mechanics					11-AG-STM-161-m01	
Modul	e coord	inator		Module offered by	1	
chairp	erson o	f examination committee		Faculty of Physics a	and Astronomy	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
10	nume	rical grade				
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conte	nts					
		o current questions of sta ne required fundamental			Master's thesis in this area.	
Intend	ed lear	ning outcomes				
		have advanced knowledg re able to summarise the			ed insights into current research	
Course	es (type	, number of weekly conta	ct hours, language –	- if other than Germa	an)	
Metho ster, ir talk (6 Langua	d of ass format o to 120 age of a	t in: German or English sessment (type, scope, la ion on whether module ca o minutes) sssessment: German and, ffered: In the semester in	an be chosen to earn /or English	a bonus)	ntion offered — if not every seme-	
Alloca	tion of _l	places				
Additi	onal inf	ormation				
Workle	oad					
300 h						
Teachi	ing cycl	e				
Referr	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)		
Modul	e appea	ars in				
Maste	r's degr	ee (1 major) Mathematica	ll Physics (2016)			
	-	ee (1 major) Mathematica	· · ·			
Maste	r's degr	ee (1 major) Mathematica	ll Physics (2022)			

Module title			Abbreviation				
Cosmology					11-AKM-161-m01		
Module	coord	inator		Module offered by			
Managir and Astr	-	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	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 semes	ster	graduate					
Content	S						
matter,	primo	ace-time, Friedmannian rdial nucleosynthesis, c actic medium, cosmolo	osmic microwave bacl				
Intende	d learı	ning outcomes					
	ate the	nave basic knowledge c em to observations. The stions.	C , ,				
Courses	(type	, number of weekly con	tact hours, language –	- if other than Germa	n)		
V (3) + R Module		t in: German or English					
		s essment (type, scope, on on whether module			tion offered — if not	every seme-	
b) oral e c) oral e d) proje e) prese lf a writt stead ta of asses nation d Languag	 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	on of p	olaces					
Addition	nal inf	ormation					
Workloa	ad						
180 h							
Teachin	g cvcl	9					
	<u> </u>						
Referred to in LPO I (examination regulations for teaching-degree programmes)							
Keleffet							
Module	annea	urs in					
		ee (1 major) Mathemati	(2016)				
	-	ee (1 major) Physics (20					
	-	ee (1 major) Mathemati					
	-	ee (1 major) Computatio	-	6)			
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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) 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		
Selecte	Selected Topics of Theoretical Solid State Physics 11-AKTF-201-m01						
Module	e coord	inator		Module offered by	ļ		
Manag and As		ector of the Institute of Th sics	neoretical Physics	Faculty of Physics a	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	i			
1 seme	ster	graduate					
Conten	-						
ments	to bring				ntend to present new develop- ects are many-body localization		
Intende	ed lear	ning outcomes					
theoret a smoo	tical po oth cros		s on the basis of anal to the next step of be	ytical and numerical coming a researcher			
V (3) +		, number of weekly conta		in other than define			
		t in: German or English					
		s essment (type, scope, la ion on whether module c			tion offered — if not every seme-		
c) oral d d) proje e) pres lf a writ 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 Assessment offered: In the semester in which the course is offered and in the subsequent semester 						
Allocat	ion of j	places					
Additio	onal inf	ormation					
Worklo	ad						
180 h							
Teachi	ng cycl	e					
	-						
Referre	ed to in	LPOI (examination regu	llations for teaching-	degree programmes)			
Module							
Master Master	's degr 's teac	ee (1 major) Nanostructu ee (1 major) Physics (202 hing degree Gymnasium ry course MINT Teacher E	20) MINT Teacher Educat	ion PLUS, Elite Netw	ork Bavaria (ENB) (2020) B) (2020)		
		r Mathematical Physics (2022)	JMU Würzburg	• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	am. reg. da- page 202 / 276		

Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Mathematical Physics (2022) 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	e title				Abbreviation			
High Energy Astrophysics 11-APL-161-m01								
Module coordinator Module offered by								
Managi and Ast	-	ector of the Institute of Th sics	neoretical Physics	Faculty of Physics a	nd Astronomy			
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)				
6	1	rical grade		-				
Duratio	on	Module level	Other prerequisites					
1 seme	ster	graduate						
Conten	ts		·					
		cesses, interaction of ligh production, astrophysica			sses, pair creation,	nuclear pro-		
		ning outcomes						
The stu	ident g	ains knowledge in funda adiative processes in ast		gy Astrophysics, suc	h as particle accele	ration and		
Course	s (type	, number of weekly conta	act hours, language –	- if other than Germa	n)			
V (3) + Module	• •	t in: German or English						
		sessment (type, scope, la ion on whether module c			tion offered — if no	t every seme-		
If a writ stead ta of asse nation Langua Assess Allocat	tten exa ake the essmen date at age of a ment o ion of j		s method of assessme tion of one candidate must inform student /or English	e each or an oral exames about this by four	mination in groups. weeks prior to the c	If the method original exami-		
Additio	onal inf	ormation						
Worklo	ad							
180 h								
Teachi	ng cycl	e						
Referre	ed to in	LPO I (examination regu	llations for teaching-	degree programmes)				
Module	e appea	ars in						
Master Master Master Master	's degr 's degr 's degr 's degr 's teacl	ee (1 major) Mathematics ee (1 major) Physics (201 ee (1 major) Mathematics ee (1 major) Computatior	6) al Physics (2016) nal Mathematics (201		ork Bayaria (ENB) (2			
	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)							
Supple		ry course MINT Teacher E r Mathematical Physics (2022)	ducation PLUS, Elite		B) (2016)	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			
Astrophysics					11-APM-242-m01		
Module	e coord	inator		Module offered by			
Manag and As	-	ector of the Institute of T sics	heoretical 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						
Telesco Mediur tive Ga	opes ar n, Mole lactic N	ronomy, Coordinates and nd Detectors, Stellar Stru ecular Clouds, Structure luclei, Large-Scale Struc	cture and Atmospher of the Milky Way, the	es, Stellar Evolution	and their End Stages	s, Interstellar	
Intende	ed lear	ning outcomes					
thods a	and ins	as achieved a deepened truments of astrophysica asses in the context of t	al research. He/She is	able to interpret ast			
Course	s (type	, number of weekly cont	act hours, language –	- if other than Germa	n)		
V (2) + Module		t in: German or English					
		sessment (type, scope, l ion on whether module o			tion offered — if not	every seme-	
 b) oral c) oral d) proje e) pres lf a write stead t of assen nation 	 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 j	olaces					
Additio	onal inf	ormation					
Approv	al from	examination committee	e required.				
Worklo							
180 h							
Teachi		0	_				
Teacini	ig cyci	e					
 D-(-						
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module	annea	ars in					
		ee (1 major) Physics (20:	16)				
	-	ee (1 major) Mathematic					
	-	ee (1 major) Physics (20:	•				
Master's w	ith 1 majo	r Mathematical Physics (2022)	JMU Würzburg •	generated 19-Apr-2025 • exa	am. reg. da-	page 206 / 276	
				(120 ECTS) Mathematische P			



Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Mathematical Physics (2022) exchange program Physics (2023)

Module title					Abbreviation		
Theore	tical A	strophysics		11-AST-161-m01			
Module coordinator				Module offered by			
		ector of the Institute of Th	poorotical Physics	Faculty of Physics a	und Astronomy		
and As	-		leoretical Filysics		ind Astronomy		
ECTS	<u> </u>	od of grading	Only after succ. cor	npl. of module(s)			
6		rical grade		• • • •			
Duratio	n	Module level	Other prerequisites	5			
1 seme	ster	graduate					
Conten	ts						
		retical astrophysics such jets, shock waves, radia			black holes, supernovae, pulsa		
		ning outcomes					
	-		thods of Theoretical	Astrophysics Ability	to formulate theoretical mode		
		, number of weekly conta					
		, number of weekly conta	ici nours, language -	- ir other than Germa	(II)		
V (2) + Module	• • •	t in: German or English					
		_	nguage - if other th	an German ovamina	tion offered — if not every sem		
ster. in	formati	ion on whether module c	an be chosen to earn	an German, examina i a bonus)	nion onered — It not every self		
		mination (approx. 90 to 1		······			
		nation of one candidate e		utes) or			
		ation in groups (groups (r		
		ort (approx. 8 to 10 pages					
		n/talk (approx. 30 minut					
				ent, this may be cha	nged and assessment may in-		
stead t	ake the	e form of an oral examina	tion of one candidate	e each or an oral exa	mination in groups. If the meth		
of asse	ssmen	t is changed, the lecturer	must inform studen	ts about this by four	weeks prior to the original exa		
		the latest.					
		ssessment: German and			1		
		ffered: In the semester in	which the course is	offered and in the su	ibsequent semester		
Allocat	ion of _l	places					
Additio	nal inf	ormation					
Worklo	ad						
180 h							
Teachi	ng cycl	e					
Referre	d to in	LPOI (examination regu	lations for teaching-	degree programmes)			
Module	e appea	ars in					
		ee (1 major) Mathematics	5 (2016)				
	-	ee (1 major) Physics (201					
	-	ee (1 major) Mathematica					
	-	ee (1 major) Computatior		16)			
	-	hing degree Gymnasium			ork Bavaria (ENB) (2016)		
		ry course MINT Teacher E					
		ee (1 major) Computatior					
	-	r Mathematical Physics (2022)	JMU Würzburg	• generated 19-Apr-2025 • exa			
	ta record Master (120 ECTS) Mathematische Physik - 2022						

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 Mathematical Physics (2022)

Module title					Abbreviation		
Atmospheric Physics 11-ATP-242-mo1							
Module	e coord	inator		Module offered by			
Managing Director of the Institute of Theoretical Physics Faculty of Physics and Astronomy							
and Astrophysics							
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)			
6		rical grade					
Duratio		Module level	Other prerequisites				
1 seme		graduate					
Conten	-						
mics. R and Ru	Radiativ Inaway.	atmospheres. Planetary a re transfer and radiative l Physics of clouds. Elect mic rays. Atmospheres c	balance. Fluid mecha ric and magnetic field	nics. Greenhouse eff	fect. Climate Models	: Equilibrium	
Intende	ed lear	ning outcomes					
		e knowledge of the physi			•		
		e. They are able to use th					
		lanets. They are able to r al warming.	nodet the physical m	echanisms of the ter	restriat climate and	interpret the	
		, number of weekly conta	act hours, language –	- if other than Germa	ın)		
V (2) +		,					
		t in: German or English					
		sessment (type, scope, la			tion offered — if not	every seme-	
-		ion on whether module c		a bonus)			
		mination (approx. 90 to 1		1toc) or			
		nation of one candidate e nation in groups (groups (r		
		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 lecture					
		the latest.					
		ssessment: German and					
Assess	ment o	ffered: In the semester in	which the course is	offered and in the su	ubsequent semester		
Allocat	ion of _l	olaces					
	-						
Additio	onal inf	ormation					
Worklo	ad						
180 h							
Teachi	ng cycl	e					
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)			
Module	e appea	ars in					
	-	ee (1 major) Physics (201 ee (1 major) Mathematica					
Master's w	ith 1 majo	r Mathematical Physics (2022)	-	9 generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 210 / 276	

Master's degree (1 major) Physics (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Mathematical Physics (2022) exchange program Physics (2023)

	e title			_	Abbreviation	
Selected Topics of Theoretical Elementary Particle Physics				i	11-ATTP-161-m01	
Module coordinator				Module offered by		
Manag	ing Dire	ector of the Institute of T	heoretical Physics	Faculty of Physics a	ind Astronomy	
and As	trophys	sics	·			
ECTS		od of grading	Only after succ. cor	npl. of module(s)		
6	I	rical grade				
Duration		Module level graduate	Other prerequisites	5		
Conten	-	gladuale				
A selec 1. Adva	tion of nced to nomeno s physi		calculations of scatte			
Intende	ed lear	ning outcomes				
neutrin test the	o phys ese ext	are familiar with the test ics. They are able to form ensions in low energy ex	nulate extensions of t periments, at high er	the standard model. hergy colliders and in	Furthermore, they kr cosmology.	
		, number of weekly cont	act hours, language -	– if other than Germa	in)	
V (3) + Module		t in: German or English				
Metho	d of as	sessment (type, scope, li ion on whether module of			tion offered — if not	every seme-
c) oral d d) proje e) pres If a writ stead t of asse nation Langua Assess	examin ect repo entatio tten exa ake the essmen date at age of a ment o	nation of one candidate of ation in groups (groups ort (approx. 8 to 10 page n/talk (approx. 30 minu amination was chosen a to form of an oral examina t is changed, the lecture the latest. ssessment: German and ffered: In the semester i	of 2, approx. 30 minus) or tes). s method of assessm ation of one candidat r must inform studen I/or English	utes per candidate) o ent, this may be cha e each or an oral exa ts about this by four	nged and assessme mination in groups. weeks prior to the o	If the method riginal exami
Allocat	ion of _l	olaces				
 Additio	onal inf	ormation				
 Additio 		ormation				
 Additio Worklo		ormation				
 Additio Worklo 180 h	ad					
 Additio 	ad					
 Additio Worklo 180 h Teachin 	ad ng cycl	e				
 Additio Worklo 180 h Teachin Referre	ad ng cycl		ulations for teaching-	degree programmes)		
 Additio 180 h Teachin Referre	ng cycl ed to in	e LPOI (examination reg	ulations for teaching-	degree programmes)		
 Additio 180 h Teachin Referre Module	ad ng cycl ed to in e appea	e LPOI (examination reg		degree programmes)		
 Additio 180 h Teachin Referre Module	ad ng cycl ed to in e appea 's degr	e LPOI (examination reg	s (2016)	degree programmes)		

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 title	Abbreviation					
Models Beyond the Standard Model o	11-BSM-161-m01					
Module coordinator		Module offered by				
Managing Director of the Institute of T and Astrophysics	neoretical Physics	Faculty of Physics a	and Astronomy			
ECTS Method of grading	Only after succ. cor	npl. of module(s)				
6 numerical grade						
Duration Module level	Other prerequisites	5				
1 semester graduate						
Contents						
 Principles of the standard model of Tests of the standard model in low e Neutrino physics Higgs physics. 			lliders			
 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 additional space-time dimensions 						
Intended learning outcomes						
The students are familiar with the test neutrino physics. They are able to forn test these extensions in low energy ex	nulate extensions of t	the standard model.	Furthermore, they know how to			
Courses (type, number of weekly conta						
V(3) + R(1)						
Module taught in: German or English						
			tion offered — if not every seme-			
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) 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	-					
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 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		
Bosonisation and Interactions in One Dimension					11-BWW-161-m01		
Module coordinator Module o							
Managi and Ast	-	ector of the Institute of Th lics	eoretical Physics	Faculty of Physics a	nd Astronomy		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)			
6	numei	rical grade					
Duratio	n	Module level	Other prerequisites				
1 semes	ster	graduate					
Conten	ts						
2.Abelia	an bos	Fermi systems in one dir onisation and Luttinger li up, and the sine-Gordon	quids (spinless ferm	ions, correlation fun	ctions, models with spin, renor-		
3.Intera 4.Bethe 5.Spin- 6.Disor 7.Non-a	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- lodchikov equation, applications of the WZW model)						
Intende	ed learr	ning outcomes					
					ctron systems and acquire the lisorder effects and transport in		
Courses	s (type,	, number of weekly conta	ct hours, language –	- if other than Germa	n)		
V (3) + I	R (1)	t in: German or English					
		e ssment (type, scope, la on on whether module ca			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 							
Allocati	ion of p	olaces					
Additio	nal info	ormation					
Worklo	ad						
180 h							
Teachir	ng cvclo	9					
	3 - 9 - 10	-					

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	
		Il Materials Science (DFI	D)		11-CMS-161-m01	
Module	e coord	inator		Module offered by		
Managi and Ast		ector of the Institute of T sics	heoretical Physics	Faculty of Physics and Astronomy		
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
8	nume	rical grade				
Duratio	n	Module level	Other prerequisites	;		
1 seme	ster	graduate				
Conten	Contents					
2. Wann 3. Num 4. Hartr 5. Many 6. Ande 7. Dyna 8. DFT	nier fur erical e ree-Foc y-body erson ir mical r + DMFT	ctional theory (DFT) nctions and localized ba evaluation of topological k and static mean-field t methods for solid state npurity model (AIM) and mean-field theory (DMFT) methods for realistic mo rrelated electrons	invariants heory physics Kondo physics)			
		ning outcomes	-			
pool. Th constru the soft serve b me qua (DMFT).	he part action o tware v order o antum I . These	e theoretical discussion icipants are introduced to f maximally localised W vannier90. Furthermore, cases such as the Kondo Monte Carlo are utilised steps are necessary to metal oxide such as SrV	to the use of DFT softwannier functions thro the students learn ho regime. Impurity solv to solve the self cons reach the peak of the	ware packages such ugh the projection of ow to construct many vers such as exact dia istency equations of	as VASP or Wien2k a f DFT results on atom -particle solutions o agonalisation or con dynamic molecular	and to the n orbitals with of AIM and ob- ntinuous-ti- field theory
		, number of weekly conta		- if other than Germa	ın)	
V (4) + Module		t in: German or English				
		essment (type, scope, la on on whether module o			ition offered — if not	every seme-
 b) oral e c) oral e d) proje e) prese lf a writ stead ta of asse nation e Langua 	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 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					
Allocat	ion of _l	olaces				
Additio	nal inf	ormation				
Worklo	ad					
240 h						
Master's wi	ith 1 majo	r Mathematical Physics (2022)	-	• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 218 / 276

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					Abbreviation
Renorn	nalizati	on Group and Critical Pl	ienomena		11-CRP-161-m01
Module	e coord	inator		Module offered by	<u> </u>
		ector of the Institute of T	heoretical Physics	Faculty of Physics a	and Astronomy
and As	•				
ECTS		od of grading	Only after succ. co	mpl. of module(s)	
6		rical grade			
Duratio		Module level	Other prerequisites	5	
1 seme		graduate]		
1. Phas 2. Mea 3. The c 4. Pertu 5. Low-	e trans n field t concep urbation dimens			grams and fixed poir	nts
Intende	ed lear	ning outcomes			
(RG) in statisti	Statist cal and	ical Physics. They under quantum field theory.	stand the concept of	RG flow with respect	and of the renormalisation group to effective field theories in both
		, number of weekly conta	act hours, language -	– if other than Germa	an)
V (3) + Module		t in: German or English			
		essment (type, scope, la on on whether module o			ation offered — if not every seme-
 b) oral c) oral of d) projection e) pression If a write stead to a stead to	examir examin ect repo entatio tten exa ake the ssmen date at ge of a	e form of an oral examina	each (approx. 30 min of 2, approx. 30 minu s) or tes). s method of assessm ation of one candidat r must inform studen I/or English	utes per candidate) o ent, this may be cha e each or an oral exa ts about this by four	nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
180 h					
Teachi	ng cycl	е			
Referre	d to in	LPOI (examination reg	ulations for teaching-	degree programmes)	
Module	e appea	urs in			
Master	's degr	ee (1 major) Mathematic	s (2016)		

UNIVERSITÄT WÜRZBURG

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	e title				Abbreviation	
Introdu	uction t	o Plasma Physics			11-EPP-161-m01	
Module	e coord	inator		Module offered by		
		ector of the Institute of Th	heoretical Physics	Faculty of Physics and Astronomy		
and As			neoretteat i nysies		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	;		
1 semester graduate						
Conten	ts					
transpo thin the	ort equa e solar	ations for energetic parti	cles, properties of ma on via shock waves a	agnetic turbulence, p nd via interaction wit	elds, magnetohydrodynamic propagation of solar particle th plasma turbulence, partic liation.	s wi-
Intend	ed lear	ning outcomes				
The stu	idents l	have knowledge of the b	asic processes of Pla	sma Astrophysics.		
Course	s (type	, number of weekly conta	act hours, language –	- if other than Germa	in)	
V (2) + Module	• • •	t in: German or English				
		sessment (type, scope, la on on whether module c			tion offered — if not every s	eme-
stead t of asse nation Langua	ake the essmen date at age of a	e form of an oral examina	ation of one candidate r must inform studen /or English	e each or an oral exa ts about this by four	nged and assessment may i mination in groups. If the m weeks prior to the original e ubsequent semester	ethod
Allocat	ion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
180 h	-					
Teachi	ng cycl	e				
Referre	ed to in	LPOI (examination regu	ulations for teaching-	degree programmes)		
Module	e appea	irs in				
Master Master	's degr 's teacl	ee (1 major) Physics (201 ee (1 major) Mathematic ning degree Gymnasium	al Physics (2016)	ion DILIS Elite Notw	ork Powaria (END) (2016)	
		y course MINT Teacher E ee (1 major) Physics (202	ducation PLUS, Elite			

Julius-Maximilians-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) Mathematical Physics (2020) Master's degree (1 major) Mathematical Physics (2022)

exchange program Physics (2023)

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	
Current Topics of Mathematical Physics			cs		11-EXMP5-161-m01	
Module	e coord	linator		Module offered by		
chairpe	chairperson of examination committee		e	Faculty of Physics and Astronomy		
ECTS	1	od of grading	Only after succ. con		, , , , , , , , , , , , , , , , , , ,	
5		rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate	Approval from exam	ination committee r	equired.	
Conten	nts	·				
Current study a			s. Credited academic	achievements, e.g. i	n case of change of university or	
Intend	ed lear	ning outcomes				
sics of unders texts a	the Ma stand th nd kno	ister's programme. They ne methods necessary to w the application areas.	have knowledge of a a acquire this knowled	current subdiscipling ge. They are able to	of a module of Mathematical Phy- e of Mathematical Physics and classify the subject-specific con-	
		, number of weekly cont	act nours, language –	- If other than Germa	in)	
V (2) +						
ster, in	format	sessment (type, scope, l ion on whether module of mination (approx. 90 to	can be chosen to earn		tion offered — if not every seme-	
d) proje e) pres If a writ stead t of asse nation	ect rep sentatic tten ex take the essmen date a	 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: German and			mination in groups. If the method	
Allocat	tion of				mination in groups. If the method	
Allocat	tion of				mination in groups. If the method	
					mination in groups. If the method	
		places			mination in groups. If the method	
	onal inf	places			mination in groups. If the method	
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 Additic Worklo 150 h	onal inf Dad	places Formation			mination in groups. If the method	
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 Additic 150 h Teachin Referre Module	onal inf oad ing cycl ed to in e appea	places Formation Re LPO I (examination reg	l/or English ulations for teaching-o al Physics (2016)	s about this by four	mination in groups. If the method weeks prior to the original exami-	

Curron	Module title				Abbreviation
Current Topics of Mathematical Physics			cs		11-EXMP6-161-m01
Module	e coord	linator		Module offered by	<u> </u>
	chairperson of examination committee		2	Faculty of Physics and Astronomy	
ECTS			Only after succ. con	•	
6		rical grade		1	
Duratio	on	Module level	Other prerequisites	i	
1 seme	ester	graduate		ination committee r	equired.
Conten	nts	•			
Current study a	•		s. Credited academic	achievements, e.g.	in case of change of university or
Intend	ed lear	ning outcomes			
sics of unders texts a	the Ma stand th nd kno	ster's programme. They ne methods necessary to w the application areas.	have knowledge of a a acquire this knowled	current subdisciplin ge. They are able to	of a module of Mathematical Phy- e of Mathematical Physics and classify the subject-specific con-
		, number of weekly conta	act nours, language –	- If other than Germa	an)
V (3) +					
ster, in	format	ion on whether module c	an be chosen to earn		ation offered — if not every seme-
		nation of one candidate e			
 c) oral d) projetion e) press lf a write stead to fassee nation 	examir ect rep sentatic tten ex take the essmen date at	nation of one candidate e nation in groups (groups ort (approx. 8 to 10 page on/talk (approx. 30 minut amination was chosen as e form of an oral examina	each (approx. 30 minu of 2, approx. 30 minu s) or tes) s method of assessmu ation of one candidate r must inform student	tes per candidate) o ent, this may be cha e each or an oral exa	nged and assessment may in- mination in groups. If the method
 c) oral d) projetion e) press lf a write stead to fassee nation 	examir ect rep sentatic tten ex take the essmen date at age of a	nation of one candidate en nation in groups (groups ort (approx. 8 to 10 page on/talk (approx. 30 minut amination was chosen as e form of an oral examina t is changed, the lecture t the latest. assessment: German and	each (approx. 30 minu of 2, approx. 30 minu s) or tes) s method of assessmu ation of one candidate r must inform student	tes per candidate) o ent, this may be cha e each or an oral exa	nged and assessment may in-
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c) oral d) proje e) pres If a writ stead t of asse nation Langua Allocat	examir ect rep sentatic tten ex take the essmen date at age of a tion of	nation of one candidate en nation in groups (groups ort (approx. 8 to 10 page on/talk (approx. 30 minut amination was chosen as e form of an oral examina t is changed, the lecture t the latest. assessment: German and	each (approx. 30 minu of 2, approx. 30 minu s) or tes) s method of assessmu ation of one candidate r must inform student	tes per candidate) o ent, this may be cha e each or an oral exa	nged and assessment may in- mination in groups. If the method
c) oral d) proje e) pres If a writ stead t of asse nation Langua Allocat	examir ect rep sentatic tten ex take the essmen date at age of a tion of	nation of one candidate en nation in groups (groups ort (approx. 8 to 10 page on/talk (approx. 30 minut amination was chosen as e form of an oral examina it is changed, the lecture t the latest. assessment: German and places	each (approx. 30 minu of 2, approx. 30 minu s) or tes) s method of assessmu ation of one candidate r must inform student	tes per candidate) o ent, this may be cha e each or an oral exa	nged and assessment may in- mination in groups. If the method
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c) oral d d) proje e) pres If a writ stead t of asse nation Langua Allocat Additio 180 h	examir ect rep sentatic tten ex take the essmen date a age of a tion of pnal inf	nation of one candidate enation in groups (groups ort (approx. 8 to 10 page on/talk (approx. 30 minut amination was chosen as e form of an oral examina t is changed, the lecture t the latest. Issessment: German and places	each (approx. 30 minu of 2, approx. 30 minu s) or tes) s method of assessmu ation of one candidate r must inform student	tes per candidate) o ent, this may be cha e each or an oral exa	nged and assessment may in- mination in groups. If the method
c) oral d d) proje e) pres lf a writ stead t of asse nation Langua Allocat Additio 180 h Teachin 	examir ect rep sentatic tten ex take the essmen date at age of a tion of onal inf	nation of one candidate enation in groups (groups ort (approx. 8 to 10 page on/talk (approx. 30 minut amination was chosen as e form of an oral examina it is changed, the lecture t the latest. issessment: German and places	each (approx. 30 minu of 2, approx. 30 minu s) or tes) s method of assessme ation of one candidate r must inform student //or English	tes per candidate) o ent, this may be cha e each or an oral exa ts about this by four	nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
c) oral d d) proje e) pres lf a writ stead t of asse nation Langua Allocat Additio 180 h Teachin 	examir ect rep sentatic tten ex take the essmen date at age of a tion of onal inf	nation of one candidate enation in groups (groups ort (approx. 8 to 10 page on/talk (approx. 30 minut amination was chosen as e form of an oral examina t is changed, the lecture t the latest. Issessment: German and places	each (approx. 30 minu of 2, approx. 30 minu s) or tes) s method of assessme ation of one candidate r must inform student //or English	tes per candidate) o ent, this may be cha e each or an oral exa ts about this by four	nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
c) oral d d) proje e) pres If a writi stead t of assen nation Langua Allocat Additio 180 h Teachin Referre 	examir ect rep sentatic tten ex take the essmen date at age of a tion of onal inf oad	hation of one candidate enation in groups (groups ort (approx. 8 to 10 page on/talk (approx. 30 minut amination was chosen as e form of an oral examina it is changed, the lecture it the latest. essessment: German and places	each (approx. 30 minu of 2, approx. 30 minu s) or tes) s method of assessme ation of one candidate r must inform student //or English	tes per candidate) o ent, this may be cha e each or an oral exa ts about this by four	nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
c) oral d d) proje e) pres If a writ stead t of asse nation Langua Allocat Morklo 180 h Teachin Referre Module	examir ect rep sentatic tten ex take the essmen date at age of a tion of onal inf onal inf oad ng cycl	ation of one candidate enation in groups (groups ort (approx. 8 to 10 page on/talk (approx. 30 minut amination was chosen as e form of an oral examina it is changed, the lecture it the latest. assessment: German and places formation	each (approx. 30 minu of 2, approx. 30 minu s) or tes) s method of assessme ation of one candidate r must inform student //or English	tes per candidate) o ent, this may be cha e each or an oral exa ts about this by four	nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
c) oral d d) proje e) pres If a writi stead t of asse nation Langua Allocat Additio 180 h Teachin Referre Master	examir ect rep sentatic tten ex take the essmen date at age of a tion of onal inf onal inf oad ed to in e appea	hation of one candidate enation in groups (groups ort (approx. 8 to 10 page on/talk (approx. 30 minut amination was chosen as e form of an oral examina it is changed, the lecture it the latest. assessment: German and places	each (approx. 30 minu of 2, approx. 30 minu s) or tes) s method of assessme ation of one candidate r must inform student //or English //or English	tes per candidate) o ent, this may be cha e each or an oral exa ts about this by four	nged and assessment may in- mination in groups. If the method weeks prior to the original exami-

Module title				Abbreviation	
Curren	Current Topics of Mathematical Physics				11-EXMP7-161-m01
Module	e coord	linator		Module offered by	
chairpe	chairperson of examination committee		2	Faculty of Physics and Astronomy	
ECTS		od of grading	Only after succ. con		,
7		rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ester	graduate	Approval from exam	ination committee r	equired.
Conten	nts				
Current study a	•		s. Credited academic	achievements, e.g. i	n case of change of university or
Intend	ed lear	ning outcomes			
sics of unders texts a	the Ma stand th nd kno	ster's programme. They ne methods necessary to w the application areas.	have knowledge of a c acquire this knowled	current subdiscipling ge. They are able to	of a module of Mathematical Phy- e of Mathematical Physics and classify the subject-specific con-
		, number of weekly cont	aci nours, language –	- II other than Germa	(11)
V (3) +	-				
ster, in	format	sessment (type, scope, la ion on whether module of mination (approx. 90 to	an be chosen to earn		ition offered — if not every seme-
d) proje e) pres If a writ stead t of asse nation	ect rep sentatic tten ex take the essmen date a	e form of an oral examina	s) or tes) s method of assessme ation of one candidate r must inform student	ent, this may be cha e each or an oral exa	r nged and assessment may in- mination in groups. If the method weeks prior to the original exami-
Allocat	tion of	places			
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Additio	onal inf	ormation			
 Additic	onal inf	ormation			
 Additio Worklo		ormation			
		ormation			
 Workla	oad				
 Worklo 210 h	oad				
 Worklo 210 h Teachi	oad ng cycl		Jlations for teaching-o	legree programmes)	
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 Worklo 210 h Teachin Referre	ng cycl ed to in	e LPOI (examination regu	ulations for teaching-o	legree programmes)	
 Worklo 210 h Teachin Referre Modulo	oad ng cycl ed to in e appe	e LPOI (examination regination re		degree programmes)	
 Workla 210 h Teachin Referre Modula	ng cycl ed to in e appea	e LPOI (examination regu	al Physics (2016)	degree programmes)	

Module title			Abbreviation		
Curren	t Topic	s of Mathematical Physic	:s		11-EXMP8-161-m01
Module	e coord	linator		Module offered by	<u> </u>
chairpe	chairperson of examination committee		!	Faculty of Physics a	and Astronomy
ECTS	1	od of grading	Only after succ. con		· · · · · · · · · · · · · · · · · · ·
8		rical grade		• • • •	
Duratio	on	Module level	Other prerequisites		
1 seme	ster	graduate	Approval from exam		equired.
Conten	nts				
Current or stud	•	-	S. Accredited academ	ic achievements, e.g	. in case of change of university
		ning outcomes			
sics of unders texts a	the Ma tand th nd kno	ister's programme. They have methods necessary to w the application areas.	nave knowledge of a acquire this knowled	current subdiscipling ge. They are able to	of a module of Mathematical Phy- e of Mathematical Physics and classify the subject-specific con-
		, number of weekly conta	ici nours, ianguage –	- ir other than Germa	(II)
V (4) +					
ster, in	format	ion on whether module c mination (approx. 90 to 1	an be chosen to earn		tion offered — if not every seme-
c) oral d) proje e) pres If a writ stead t of asse nation	examir ect rep eentatic tten ex cake the essmen date a	e form of an oral examina	of 2, approx. 30 minu s) or es) s method of assessme tion of one candidate must inform student	tes per candidate) o ent, this may be cha e each or an oral exa	r nged and assessment may in- mination in groups. If the methoo weeks prior to the original exami
Allocat	tion of	places			
Additio	onal inf	ormation			
Worklo	ad				
240 h					
Teachi	ng cvcl	e			
Referre	ed to in	LPOI (examination regu	lations for teaching-	legree programmes)	
Module	a 2000	ars in			
			Del Delveice (2016)		
	-	ree (1 major) Mathematica ree (1 major) Mathematica			
	-	ee (1 major) Mathematica			
master	Jucgi	ee (1 major) mathematice	(1) (2022)		

Module title					Abbreviation
Field Th	ieory ir	Solid State Physics			11-FFK-201-m01
Module	coordi	nator		Module offered by	
Managing Director of the Institute of Theoretical Physi and Astrophysics			eoretical Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
8	numer	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semes	ster	graduate			
Conten	ts				
Green's An outli 1. Singl 2. Revie 3. Diagn 4. Diagn 5. Land 6. Supe 7. One- Intende Working ties of F sential	Contents This will usually be a course on quantum many particle physics approached by the perturbative methods using Green's functions An outline could be: 1. Single-particle Green's function 2. Review of second quantization 3. Diagrammatic method using many particle Green's functions at temperature T=0 4. Diagrammatic method for finite T 5. Landau theory of Fermi liquids 6. Superconductivity 7. One-dimensional systems and bosonization Intended learning outcomes Working knowledge of the methods of quantum field theory in a non-relativistic context. Ability to study properties of Fermi liquids (and bosonic systems) beyond the one-particle picture. Acquisition of methods which are essential for the understanding the effects of interactions, including superconductivity and the Kondo effect.				
V (4) + I	R (2)				
		t in: German or English			
		essment (type, scope, la on on whether module ca			tion offered — if not every seme-
 b) oral e c) oral e d) proje e) prese lf a writ stead ta of asses nation e Langua 	 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. 				
Assessi	ment o	ffered: In the semester in	which the course is	offered and in the su	ibsequent semester
Allocati	ion of p	laces			
Additio	nal info	ormation			
Worklo	ad				
240 h					
Teachir	ig cycle	e			

Module appears in

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)

Module	e title				Abbreviation
Profess	sional	Specialization Mathemat	ical Physics		11-FS-MP-161-m01
Module	e coord	inator		Module offered by	
chairpe	erson o	f examination committee		Faculty of Physics a	and Astronomy
ECTS		od of grading	Only after succ. con		,
10	(not)	successfully completed			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	Its				
		o current questions of a s a. Summary of the require			a preparation for a Master's the- ntation.
Intend	ed lear	ning outcomes			
vance t	to the i		ter's thesis. They kno	•	ical Physics with a special rele- of research in this area and are
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	ın)
S (2) Module	e taugh	t in: German or English			
		sessment (type, scope, la ion on whether module ca			tion offered — if not every seme-
		o minutes) ssessment: German and,	or English		
Allocat	ion of _l	olaces			
Additio	onal inf	ormation			
Worklo	ad				
300 h					
Teachi	ng cycl	e			
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)	
Module	e appea	ars in			
		ee (1 major) Mathematica	Il Physics (2016)		
Master	's degr	ee (1 major) Mathematica	Il Physics (2020)		
Master	's degr	ee (1 major) Mathematica	ll Physics (2022)		

Module ti	tle			Abbreviation
Introducti	ion to Gauge/Gravity Duali	ty		11-GGD-161-m01
Madula	oordinator		Modulo offered by	
			Module offered by	
	Managing Director of the Institute of Theoretical Physics and Astrophysics		Faculty of Physics a	and Astronomy
ECTS M	thod of grading Only after succ. compl. of module(s)			
8 ni	umerical grade			
Duration	Module level	Other prerequisite	s	
1 semeste	er graduate			
Contents				
 Qua Inte Ren Gau Con Larg Sup 2. Elemen Max Blac 3. Elemen Ope Strifi Typ D-B 4. The AdS Stat Nea Fiele Test Hole 5. Extensi Hole 5. Extensi Hole 6. Applica Qua Blac Hole Trar 7. Applica Finiti Qua Hole Enta 8. Applica Grav 	ts of quantum field theory: antisation of the free field ractions ormalisation Group age Fields formal Symmetry ge N expansion bersymmetry ts of gravity hifolds, coordinate covariant mann curvature kimally symmetric spacetime ck holes ts of string theory en and closed strings ngs in background fields e IIB String Theory ranes 5/CFT correspondence tement of the correspondence to ographic principle ons to non-conformal theo ographic renormalisation g ographic C-Theorem tions I: Thermo- and hydro antum field theory at finite to ck holes ographic linear response for asport coefficients: Shear v tions II: Condensed matter te charge density and Reise antum critical behaviour ographic superconductors anglement entropy tions III: Particle physics vity dual of confinement vity dual of confinement vity dual of chiral symmetry ark-gluon plasma	nce s Correlation functions Conformal anomaly ries roup dynamics emperature rmalism iscosity and conductiv physics sner-Nordström black		

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

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Additional information

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Workload

240 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 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	
		ld Theory			11-KFT-161-m01	
Module	coord	inator		Module offered by		
Managir and Astr		ector of the Institute of sics	Theoretical Physics	Faculty of Physics and Astronomy		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6 numerical grade						
Duration	n	Module level	Other prerequisites			
1 semes	ster	graduate				
Content	s					
two-dim (Ising, tr scale inv variance two dim relevant on, quar edge in particula ons, for the first o. Introc point) 1. Confo ctions) 2. Confo tion and on, the fi 3. Centra sation, r	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 (lsing, 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: o. 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-					
Intende	d lear	ning outcomes				
complet also acc primaril	tion of quire b y addr ng acq	acquire practical and co "Quantum Mechanics asic knowledge of criti ressed to students of Th uainted with a sophist s.	II" (11-QM2) is the only cal phenomena, quant neoretical Physics and	prerequisite to take um field theory and f aims to increase the	part in this course, t functional integrals. ir general level of kn	he students The course is owledge by
Courses	s (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (3) + R Module		t in: German or English				
Method	of ass	sessment (type, scope, on on whether module	language — if other th		tion offered — if not	every seme-
a) writte b) oral e c) oral e d) proje e) prese	en exar examir examin ect repo entatio	mination (approx. 90 to nation of one candidate ation in groups (group ort (approx. 8 to 10 pag n/talk (approx. 30 min	9 120 minutes) or each (approx. 30 minu s of 2, approx. 30 minu es) or utes).	utes) or		page 234 / 276
			-	(120 ECTS) Mathematische P	-	

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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

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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)

Module title					Abbreviation	
		ld Theory 2			11-KFT2-161-m01	
Module	coord	inator		Module offered by		
Managing Director of the Institute of Theoretical Physics and Astrophysics			Theoretical Physics	Faculty of Physics and Astronomy		
ECTS		od of grading	Only after succ. con	npl. of module(s)		
6 numerical grade						
Duratio	n	Module level	Other prerequisites			
1 semes	ster	graduate				
Content	ts					
lid-on-s au-Ginz del, sup 6. Free 7. Free ons of V the toru 8. Free ral, S1/2 operato Intende The stur comple also acc	 5. Minimal models (critical statistical mechanics models (lsing, 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 I	Physics					
		, number of weekly con	lact nours, language –	- II other than Germa	in)	
	taugh	t in: German or English				
		sessment (type, scope, on on whether module			tion offered — if not	every seme-
b) oral e c) oral e d) proje e) prese If a writ stead ta of asses nation o Langua	 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	ion of p	olaces				
Additio	nal inf	ormation				
Worklo	ad					
180 h						
	th 1 majoı	r Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 236 / 276

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)

Modul					Abbreviation
Master	r Thesis	Mathematical Physics			11-MA-MP-161-m01
Module	Module coordinator			Module offered by	
chairpe	erson o	f examination committee		Faculty of Physics a	and Astronomy
ECTS	Meth	od of grading	Only after succ. con	pl. of module(s)	
30	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ester	graduate			l completion of certain modu- ppic a prerequisite for the assign-
Conten	nts				
		endent processing of a ta cientific aspects; writing		nematical Physics, e	specially according to known pro-
Intend	ed lear	ning outcomes			
		are able to independently ds and scientific aspects			ics, especially according to paper.
Course	s (type	, number of weekly conta	ict hours, language –	- if other than Germa	ın)
No cou	irses as	signed to module			
		sessment (type, scope, la ion on whether module ca			tion offered — if not every seme-
Registr	ration a	is (750 to 900 hours total nd assignment of topic ir ssessment: German and	n consultation with su	ıpervisor.	
Allocat	tion of _l	olaces			
Additio	onal inf	ormation			
Time to	o comp	ete: 6 months.			
Worklo	ad		·		
900 h					
Teachi	ng cycl	e			
Referre	ed to in	LPOI (examination regu	lations for teaching-o	degree programmes)	
Module	e appea	ars in			
Master	's degr	ee (1 major) Mathematica ee (1 major) Mathematica	· · ·		
		ee (1 major) Mathematica			

Modul	le title				Abbreviation
Scient	ific Met	hods and Project Manage	ement Mathematical	Physics	11-MP-MP-161-m01
Modul	le coord	inator		Module offer	ed by
chairp	chairperson of examination committee			Faculty of Phy	ysics and Astronomy
ECTS		od of grading	Only after succ. com	pl. of module	(s)
10	(not)	successfully completed			
Durati	on	Module level	Other prerequisites		
1 seme	ester	graduate			
Conte	nts				
					ds of project planning. Application to the planned Master's thesis.
Intend	led lear	ning outcomes			
ster's able to	thesis. o descri	They are able to draft a pr be their projects in oral p	oject plan for the Mas resentations.	ster's thesis a	evance to the intended topic of the Ma- nd to plan the required work. They are
	es (type	, number of weekly conta	ct hours, language —	if other than	German)
R (6) Modul	le taugh	t in: German or English			
		sessment (type, scope, la ion on whether module ca			amination offered — if not every seme-
•		o minutes) Issessment: German and,	/or English		
Alloca	tion of	places			
Additi	onal inf	ormation			
Workl	oad				
300 h					
-	ing cycl	e			
Referr	ed to in	LPOI (examination regu	lations for teaching-d	egree prograr	nmes)
Modul	le appea	ars in			
		ee (1 major) Mathematica	l Physics (2016)		
	-		· · ·		
maste		ee (1 major) Mathematica	al Physics (2020)		

Module title					Abbreviation		
Compu	Itationa	al Astrophysics	11-NMA-161-m01				
Modula	e coord	inator		Module offered by			
		ector of the Institute of Th	eoretical Physics	Faculty of Physics a	and Astronomy		
	trophys				and Astronomy		
ECTS		od of grading	Only after succ. con	npl. of module(s)			
6	nume	rical grade					
Duratio		Module level	Other prerequisites	i			
1 seme		graduate					
Conten	-						
rithms Lattice	(tree- a -Boltzm	ods used in astrophysica and polynomial codes). P nann). Hyperbolic conser Is of high-performance co	article-mesh method vation laws (fluid dyr	s (particle-in-cell me amics, finite differer	thods). Vlasow meth nce method, Rieman	nods (e.g., n solver,	
Intend	ed lear	ning outcomes					
sics wi	th the ł	are able to solve typical p nelp of numerical simulat problems and of validatin	tions. They are espec				
Course	s (type	, number of weekly conta	act hours, language –	- if other than Germa	ın)		
V (3) + Module		t in: German or English					
	_	sessment (type, scope, la	anguage — if other th	an German, examina	tion offered — if not	every seme-	
		ion on whether module c				-	
b) oral c) oral d) proje e) pres	examir examin ect rep entatio	mination (approx. 90 to 1 nation of one candidate e nation in groups (groups of ort (approx. 8 to 10 pages n/talk (approx. 30 minut amination was chosen as	each (approx. 30 minu of 2, approx. 30 minu s) or es)	tes per candidate) o		nt may in-	
of asse nation	essmen date at	e form of an oral examina t is changed, the lecture the latest.	r must inform student				
		ssessment: German and ffered: In the semester ir		offered and in the su	ibsequent semester		
	tion of				issequent semester		
			-				
Additio	nal inf	ormation					
Worklo	bad						
180 h	180 h						
Teachi	Teaching cycle						
Referre	ed to in	LPOI (examination regu	llations for teaching-	degree programmes)			
Module	e appea	ars in					
	-	ee (1 major) Physics (201 ee (1 major) Mathematica					
Master's w	ith 1 majo	r Mathematical Physics (2022)	-	• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 240 / 276	

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) 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) Mathematical Physics (2022)

exchange program Physics (2023)

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		
Open Quantum Systems					11-0QS-242-m01		
Module	e coord	inator		Module offered by			
Managi	ing Dire	ector of the Institute of Th	eoretical Physics	Faculty of Physics a	nd Astronomy		
and Ast							
ECTS	Metho	od of grading	Only after succ. compl. of module(s)				
6	nume	rical grade					
Duratio	n	Module level	Other prerequisites				
1 seme	ster	graduate					
Conten	Contents						
density cesses	density matrix theory, stochastic processes in Hilbert space, non-Markovian processes, relativistic quantum pro- cesses						
Intende	ed learr	ning outcomes					
		of a theoretical understa	nding of quantum sve	stem coupled to thei	r environment		
		, number of weekly conta					
V (3) +		, number of weekly collid	et nours, language –	n other than Genila			
	• •	t in: German or English					
		_	nguage — if other the	an German, examina	tion offered — if not every seme-		
		on on whether module ca			and shered in hot every selle		
stead ta of asse nation Langua	ake the ssment date at ge of a ment o	form of an oral examina t is changed, the lecturer the latest. ssessment: German and, ffered: In the semester in	tion of one candidate must inform student /or English	e each or an oral exa s about this by four	nged and assessment may in- mination in groups. If the method weeks prior to the original exami- ubsequent semester		
Additio	nal inf	ormation					
Worklo	ad						
180 h							
Teachir	ng cycl	e					
Referre	d to in	LPO I (examination regu	lations for teaching-	degree programmes)			
	Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module	e appea	irs in					
		ee (1 major) Physics (201	6)				
		ee (1 major) Mathematica					
	Master's degree (1 major) Physics (2020)						
	-	ee (1 major) Mathematica					
Master'	's degre	ee (1 major) Mathematica	ll Physics (2022)				
exchan	ge prog	gram Physics (2023)					

Module title					Abbreviation			
Physic	s of Co	mplex Systems			11-PKS-161-m01			
Module	e coord	inator		Module offered by				
Manag and As	-	ector of the Institute of Th	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	on	Module level	Other prerequisites					
1 seme	ster	graduate						
Conten	Contents							
2. Intro 3. Entro 4. Phas 5. Univ 6. Spin	 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 							
Intende	ed lear	ning outcomes						
derstar unders	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 conta	ct hours, language –	- if other than Germa	n)			
V (2) + Module		t in: German or English						
		sessment (type, scope, la ion on whether module ca			tion offered — if not every seme-			
 b) oral c) oral d) projetion e) pression If a write stead t of assemblication Languation 	 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 _l	olaces						
Additio	onal inf	ormation						
Worklo	ad							
180 h								
Teachi	ng cycl	0						
Teacini	ing cycl	C						
Deferme		IDOI (overningtion result	lations for to - abin					
Referre	α το ιη	LPOI (examination regu	iations for teaching-	uegree programmes)				
Master's w	ith 1 majo	r Mathematical Physics (2022)		generated 19-Apr-2025 • exa (120 ECTS) Mathematische P				

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		
		gy and Theory of Super		11-PTS-201-m01			
Module	e coord	inator		Module offered by			
	ing Dire	ector of the Institute of A ector of the Institute of T sics		Faculty of Physics a	and Astronomy		
ECTS	<u> </u>	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	Contents						
materia ventior superco grams a des, ph of the H	Basic Properties of Superconductors and their Applications, Development of technological platforms, Methods of material science for calculating temperature profiles in superconductors. Overview of the phenomenology of conventional and unconventional superconductivity. Review of BCS theory and its applicability for different types of superconductors. Extension of Ginzburg-Landau theory to a quantum field theory formalism using Feynman diagrams and functional integrals. Theoretical formalism of Ward identities and response functions. Goldstone modes, phase fluctuations, and coupling to the electromagnetic field. Interpretation of the Meissner effect in terms of the Higgs mechanism. Interplay of magnetism and conventional/unconventional superconductivity. Discussion of current research topics and perspective on room-temperature superconductivity.						
		ning outcomes	·	•			
derstar arch. K as well tors an	Acquisition of basic knowledge about superconductivity as a macroscopic quantum phenomenon. Profound un- derstanding of unconventional superconductivity and its interplay with magnetism in the context of current rese- arch. Knowledge of BCS mean-field theory, the quantum-field theory methods necessary to extend BCS theory, as well as the Meissner effect and the Higgs mechanism. Basic understanding of unconventional superconduc- tors and their fascinating connection with competing magnetic phases.						
		, number of weekly cont	- act nours, language -	- II other than Germa	(1)		
V (3) + Module		t in: German or English					
		sessment (type, scope, l ion on whether module o			ition offered — if not	t every seme-	
b) oral c) oral d d) proje e) pres If a writ stead t of asse nation Langua	 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 _l	olaces					
Additio	Additional information						
Worklo	Workload						
180 h							
Teachi	ng cycl	e					
Master's wi	ith 1 majo	r Mathematical Physics (2022)	-	• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 245 / 276	

Module appears in

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)

Module title					Abbreviation		
Quantu	m Field	d Theory I			11-QFT1-201-m01		
Module	e coord	inator		Module offered by	ed by		
Managi and Ast	-	ector of the Institute of Th sics	eoretical Physics	Faculty of Physics and Astronomy			
ECTS Method of grading Only after succ. compl. of module(s)							
8	nume	rical grade					
Duratio	n	Module level	Other prerequisites				
1 seme	ster	graduate	Approval from exam	ination committee re	equired.		
Conten	Contents						
 Lagra Field Asym Gaug Pertu Feyn Quar 	 Symmetries. Lagrange formalism for fields. Field quantisation. Asymptotic states, scattering theory and S-matrix Gauge principle and interaction. Perturbation theory. Feynman rules. Quantum elektrodynamical processees in Born approximation. Radiative corrections (optional) 						
		ning outcomes					
They kr process standin	now ho ses in t ng of ra	w to use perturbation the he framework of quantur diative corrections and re	ory and how to apply n electrodynamics in enormalisation.	/ Feynman rules. The leading order. More	ivistic quantum field theories. y are able to calculate basics over, they have a basic under-		
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)		
V (4) + Module		t in: German or English					
		essment (type, scope, la on on whether module ca			tion offered — if not every seme-		
b) oral e c) oral e d) proje e) prese If a writ stead ta of asse nation Langua	 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		ffered: In the semester in	which the course is	onered and in the st			
		/10/05					
Additio	nal inf	ormation					
Auultio	nat III						
 Worklo	be						
	au						
240 h Teachir		0					
reduill	ig tytt	c					

Module appears in

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)

Module title					Abbreviation		
Quantu	m Field	d Theory II			11-QFT2-161-m01		
Module	e coord	inator		Module offered by			
Managi and Ast		ector of the Institute of Th sics	eoretical Physics	Faculty of Physics and Astronomy			
ECTS		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					
Conten	ts						
2. Path 3. Reno 4. Reno 5. Gaug 6. Spor	Integra ormaliza ormaliza ge theo ntaneou	ation ation group					
· · · · · · · · · · · · · · · · · · ·		ning outcomes					
red the	princip		alisation and gauge	theories. They are al	um field theory. They have maste- ble to formulate and solve pro-		
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	in)		
V (4) + Module		t in: German or English					
		essment (type, scope, la on on whether module ca			tion offered — if not every seme-		
 b) oral e c) oral e d) proje e) prese If a writ stead ta of asse nation e Langua 	 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					
Worklo	Workload						
240 h							
Teachir	ng cvcl	9					
	0 - 9 - 0	-					
Referre	d to in	LPO I (examination regu	lations for teaching.	legree programmes)			
		(chainination regu					
Madula		arc in					
Module	e appea	IIS III					

UNIVERSITÄT WÜRZBURG

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	e title				Abbreviation			
Advanc	ed The	ory of Quantum Comput	ing and Quantum Info	ormation	11-QIC-201-m01			
Module	e coord	inator		Module offered by				
Managi	ing Dire	ector of the Institute of T	neoretical Physics	Faculty of Physics a	and Astronomy			
and Ast	-		,	, ,	,			
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)				
6	nume	rical grade						
Duratio	n	Module level	Other prerequisites	tes				
1 seme	ster	graduate						
Conten	ts							
2. Quar 3. Com 4. Enta 5. Quar 6. Quar	ntum th posite ngleme ntum oj ntum ga	ary of classical informati neory seen from the pers systems and the Schmid ent measures perations, POVMs, and t ates and quantum comp the theory of decoherer	pective of information t decomposition he theorems of Kraus uters					
<u>.</u>		ning outcomes						
Comprehensive understanding of quantum states and identity matrix beyond the usual textbook interpretation. Knowledge of handling tensor products and dealing with quantum effects in multipartite quantum systems. In- depth understanding of the phenomenon of entanglement. Knowledge of the fundamental mathematical con- cepts of quantum information theory. Ability to assess the limitations of quantum computing arising from deco- herence.								
Course	s (type	, number of weekly conta	act hours, language –	- if other than Germa	an)			
V (3) + Module		t in: German or English						
	_	sessment (type, scope, la	 anguage — if other th	an German examina	ntion offered — if not	overv come.		
		on on whether module of				. every serife		
b) oral c) oral c d) proje e) prese If a writ stead ta of asse nation Langua	examir examin ect repo entatio ten exa ake the ssmen date at ge of a	mination (approx. 90 to a ation of one candidate e 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	each (approx. 30 minu of 2, approx. 30 minu s) or tes). s method of assessm ation of one candidate r must inform student /or English	ites per candidate) o ent, this may be cha e each or an oral exa ts about this by four	nged and assessme mination in groups. weeks prior to the o	If the methoo riginal exami		
Allocat		-			•			
Additio	nal inf	ormation						
Additional information								
Workload								
	uu							
180 h Teaching cycle								
reachli	ig cycl	e						
 Defe			lations for to a bin					
Referre		LPO I (examination regu	itations for teaching-	uegree programmes)				
	th a main	Mathomatical Dhusica (assa)		concrated to Apr ages a	am rog da			
naster S WI	ui i majo	r Mathematical Physics (2022)	-	• generated 19-Apr-2025 • ex (120 ECTS) Mathematische F	-	page 251 / 276		

Module appears in

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)

Module title Abbreviation					Abbreviation		
Quantu	Quantum Mechanics II 11-QM2-161-m01						
Module	Module coordinator Module offered by						
Managi and Ast	-	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	numei	rical grade					
Duratio	n	Module level	Other prerequisites				
1 seme	ster	undergraduate					
Conten	ts						
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							
		ning outcomes					
most of	the th		courses in Astrophy		s knowledge is highly relevant to s and Condensed Matter Physics.		
Courses	s (type,	number of weekly conta	ct hours, language –	- if other than Germa	n)		
V (4) + I Module		t in: German or English					
					tion 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 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							
- :+: م	naline	rmation					
	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) 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)

Module title		Abbreviation					
Renormalizat	Renormalization Group Methods in Field Theory 11-RMFT-161-mo1						
Module coord	linator		Module offered by				
Managing Dir and Astrophy	ector of the Institute of T sics	heoretical Physics	Faculty of Physics a	and Astronomy			
	od of grading	Only after succ. con	npl. of module(s)				
8 nume	erical grade						
Duration	Module level	Other prerequisites					
1 semester	graduate						
Contents							
 This course is complementary to the discussion of Wilson's renormalisation group (RG) as covered in the course "Renormalisation Group and Critical Phenomena" (11-CRP). It focuses on the diagrammatic formulation of RG flow equations and its relation to diagrammatic perturbation expansions. This is of particular relevance for interacting fermion systems in the context of functional renormalisation groups. An outline of the course might be: 1. Wilson's RG 2. Path integrals of interacting fermions 3. Bethe-Salpeter equation 4. RG flow equations for the one-particle and two-particle vertex 5. Comparison of flow equations with diagrammatic resummation schemes (such as the random phase approxi- 							
mation)	·	-					
6. RG flow eq	uations for spin systems						
Intended lear	ning outcomes						
ledge serves spin density	become familiar with th as a theoretical basis fo waves, and nematic inst	r the examination of p abilities.	henomena such as s	uperconductivity, ch			
	e, number of weekly cont	act hours, language –	- if other than Germa	in)			
V (4) + R (2) Module taugi	nt in: German or English						
	sessment (type, scope, ion on whether module			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 in	formation						
Workload							
240 h							
Teaching cycle							
Master's with 1 majo	or Mathematical Physics (2022)	-	• generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 255 / 276		

Module appears in

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

exchange program Physics (2023)

Module title					Abbreviation				
	Theory of Relativity 11-RTT-161-m01								
Module	Module coordinator Module offered by								
Managi and Ast	•	ector of the Institute of Th sics	eoretical Physics	Faculty of Physics a	nd Astronomy				
ECTS		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	Contents								
2. Diffe 3. Brief 4. Elem 5. Elect 6. Field 7. Stell	 Mathematical Foundations Differential forms Brief Summary of the special relativity Elements of differential geometry Electrodynamics as an example of a relativistic gauge theory Field equations of the fundamental structure of general relativity Stellar equilibrium and other astrophysical applications Introduction to cosmology 								
			-						
The stu main to electro to simp	Intended learning outcomes The students become familiar with the principal physical and mathematical concepts of general relativity. The main topics include modern formulation on the basis of differential forms. Furthermore, the similarities between electrodynamics as a gauge theory and general relativity are emphasised. The students learn to apply the theory to simple models of stellar equilibrium and are introduced to basic elements of cosmology.								
		, number of weekly conta	ct hours, language –	- if other than Germa	n)				
V (3) + Module		t in: German or English							
		sessment (type, scope, la on on whether module ca			tion offered — if not ev	very 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 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									
Allocat	ion of _l	olaces							
Additio	nal inf	ormation							
Worklo	Workload								
180 h									
Teachi	ng cycl	e							
	3 59 50	-							
Poforro	d to in	LPOI (examination regu	lations for toaching	degree programmec)					
Referre				acgree programmes)					
 Master's wi	- JMU Würzburg • generated 19-Apr-2025 • exam. reg. da- ta record Master (120 ECTS) Mathematische Physik - 2022								

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					Abbreviation		
Black H	Black Holes 11-SLQ-232-mo1						
Module	Module coordinator Module offered by						
Managi and Ast	-	ector of the Institute of Th sics	eoretical 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						
 PART 1 - Classical solutions 1. Vacuum solutions of Einstein's equation - the Schwarzschild solution, Birkhoff's theorem, the Eddington-Finkelstein coordinates, Kruskal extension and eternal black holes, the Penrose diagram, conformal compactification and Carter-Penrose diagram 2. Gravitational collapse - the Oppenheimer-Snyder solution 3. Charged and rotating black holes - Cauchy horizons, ergosphere 4. ADM formalism - energy and angular momentum 5. Black hole thermodynamics PART 2 - Astrophysical observations of black holes 1. Spin and mass measurements of black holes 2. Black hole electromagnetism 3. Gravitational waves and their measurement PART 3 - Quantum aspects of black hole 1. Introduction to QFT on curved spacetime: Rindler spacetime, Unruh effect 2. Derivation of Hawking radiation 3. Hawking's original formulation of the information paradox 4. The "holography of information" - information paradox in AdS/CFT, the Page curve and Islands 5. Firewall, fuzzball, complementarity - possible resolutions of information paradox 							
		and the factorization puz	zzie				
		ning outcomes					
ons in t Througl connec	This course plays a bridging role joining the basics on GR learnt in the GR I course and the active research directions in the fields of Astronomy, Astrophysics, General Relativity, String Theory and Gauge/Gravity Duality. Through this course, the students will gain sufficient commands over the applications of general relativity in connection with research directions in this area. This in turn will motivate them to pursue careers as a researcher in the aforementioned directions and help them to successful begin their Master and PhD projects.						
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)		
V (3) + I Module		t in: German or English					
					tion offered — if not every seme-		
b) oral o c) oral o d) proje e) preso If a writ stead ta of asse	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 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.						

Assessment offered: In the semester in which the course is offered and in the subsequent semester

Allocation of places

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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) Physics (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) 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) 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								
_	String Theory 1 11-STRG1-171-m01							
Module	coord	inator		Module offered by				
Managi and Ast		ector of the Institute of Th lics	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						
Conten	ts							
action; dimens conforn	quanti ion; qu nal fielo	sation of the closed bosc antisation of the open bo	onic string and emerg osonic string, D-Bran	gent graviton; quantu es, Gauge Fields and	Nambu-Goto action and Polyakov um Lorentz invariance and critical d Yang-Mills theories; relativistic ns, effective actions and gravity.			
· · · · · · · · · · · · · · · · · · ·			1 1 1	6 1 11 1 11	· · · · · · · · · · · · · · · · · · ·			
cal acti bosonic have ca underst open st dent br tion and and the	The students are familiar with classical and quantum theory of relativistic bosonic strings. They know the classi- cal actions for relativistic bosonic strings, the Nambu-Goto action and Polyakov action, they have quantised the bosonic string and understand the emergence of the massless graviton in the spectrum of the closed string. They have calculated Lorentz anomaly on quantum level to deduce the critical dimension of the bosonic string. They understand the boundary conditions for the open string and its connection to D-branes. They have knowledge of open string quantisation and of the spectrum of massless gauge fields, as well as of Yang-Mills fields for coinci- dent branes. They are familiar with relativistic conformal field theory, the string path integral, its BRST quantisa- tion and the calculation of string interactions. They understand the low-energy effective actions in target space and the emergence of Einstein gravity.							
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)			
V (4) + I Module		t in: German or English						
					tion offered — if not every seme-			
 b) oral e c) oral e d) proje e) prese lf a writ stead ta of asse nation e Langua 	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 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							
Allocat								
Additio	nal inf	ormation						
AuultiO	11at 1111							
	Workload							
240 h								
Teachir	ng cycl	9						
	-							

Module appears in

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

exchange program Physics (2023)

Module title Abbreviation						
String Theory 2 11-STRG2-171-m01						
Module coordinator		Module offered by				
Managing Director of the Institute of and Astrophysics	Theoretical Physics	Faculty of Physics a	and Astronomy			
ECTS Method of grading	Only after succ. cor	npl. of module(s)				
6 numerical grade						
Duration Module level	Other prerequisites	;				
1 semester graduate						
Contents						
Superstring theories and M theory, in particular a short introduction to bosonic string theory, the theory of fer- mionic fields and representations of Clifford algebra in diverse dimensions, a review of supersymmetry in two and more dimensions, the classical and quantum version of the Ramond-Neveau-Schwarz superstring, type II A/B superstrings, the Gliozzi-Scherck-Olive projection and space-time supersymmetry in 10 dimensions, the ty- pe I superstring, heterotic string theories, anomaly cancellation and restrictions on gauge groups, dualities bet- ween the five superstring theories as well as their relation to M theory in 11D, D-Branes and supersymmetric gau-						
ge theories, supergravity and the Ad	S/CFI correspondence.	•				
Intended learning outcomes The students are familiar with supers						
of bosonic string theory and fermion sions. They have studied the aspects ry. They are acquainted with classica derstand the deduction of type IIA/B of Gliozzi-Scherk-Olive projection. Th the limiting effects of anomaly freed dualities between the five superstrin miliar with the properties of supersy supersymmetric gauge theories as w AdS/CFT correspondence.	s of supersymmetry in t and quantum theory string theories and the ney have gained insigh om on the permitted ga g theories and their co mmetric D-branes in ty rell as the supergravity	wo or more dimension of the Ramon-Neveau e ensuring of space-t ts into type I and het auge groups of these nnections to M theor pe I and II superstrin effects in 10 and 11 c	ons relevant to superstring theo- u-Schwarz superstring , they un- ime supersymmetry on the basis erotic superstring theory and into theories. They have studied the ry in 11 dimensions. They are fa- g theories and the corresponding dimensions and the connection to			
Courses (type, number of weekly cor	ntact hours, language –	– if other than Germa	an)			
V (3) + R (1) Module taught in: German or English						
Method of assessment (type, scope,	language — if other th	an German, examina	tion offered — if not every seme-			
ster, information on whether module						
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						
Additional information						

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) 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) 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) Mathematical Physics (2022)

exchange program Physics (2023)

					Abbreviation			
Topological Effects in Solid State Physics					11-TEFK-201-m01			
Modul	e coord	inator		Module offered by				
	ging Dire strophys	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						
Durati	on	Module level	Other prerequisites	i				
1 seme	ester	graduate						
Conter	nts							
2. Mat 3. Time 4. Hall 5. Bulk 6. Graj 7. Qua 8. Z2 i	 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 							
		ning outcomes						
In-dep stems.	th theo Ability	retical understanding of to connect their knowle Würzburg University.						
Course	es (type	, number of weekly cont	act hours, language –	- if other than Germa	ın)			
V (4) +	R (1)							
Modul	e taugh	t in: German or English						
		sessment (type, scope, l ion on whether module o			tion offered — if not	every seme-		
 b) oral c) oral d) proj e) pres lf a wri stead to f asse nation Langua 	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 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							
Alloca	tion of	places			· · · ·			
Additi	onal inf	ormation						
Workle	had		_					
240 h	Workload							
-								
reachi	ng cycl	e						
Referr	ed to in	LPOI (examination reg	ulations for teaching-	degree programmes)				
Master's w	ith 1 majo	r Mathematical Physics (2022)	-	e generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 265 / 276		

Module appears in

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)

Module title Abbreviation									
Theore	Theoretical Elementary Particle Physics 11-TEP-161-m01								
Module coordinator Module offered by									
	ing Dire	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)					
8	8 numerical grade								
Duratio	on	Module level	Other prerequisites	;					
1 seme	1 semester graduate								
Conten	nts								
 Fundamental particles and forces Symmetries and groups Quark model of hadrons Quark parton model and deep inelastic scattering Principles of quantum field theory Gauge theories Spontaneous symmetry breaking Electroweak standard model Quantum chrome dynamics 									
10. Ext	ensions	s of the standard mode	l						
Intend	ed lear	ning outcomes							
structu lation r re, they	ire of th method y know	e standard model base s for the processing of the tests and limits of	athematical methods o ed on symmetry princip simple problems and p the standard model an itact hours, language –	les and experimenta processes of Element d the basics of exten	ll observations. They tary Particle Physics ded theories.	/ know calcu-			
V (4) +	R (2)								
Module	e taugh	t in: German or English							
			language — if other th can be chosen to earn		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	tion of _l	olaces							
Additio	Additional information								
Workload									
240 h									
Teaching cycle									
Master's w	vith 1 majo	r Mathematical Physics (2022)	-	generated 19-Apr-2025 • exa (120 ECTS) Mathematische P	-	page 267 / 276			

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							
Theoretical Solid State Physics 11-TFK-161-m01								
Module coordinator	Module coordinator Module offered by							
Managing Director of t and Astrophysics	he Institute of Th	eoretical Physics	Faculty of Physics a	nd Astronomy				
ECTS Method of gra	ding	Only after succ. con	npl. of module(s)					
8 numerical grad	de							
Duration Module	e level	Other prerequisites						
1 semester graduat	te							
Contents								
The contents of this two-term course will depend on the choice of the lecturer, and may include parts of the sylla- bus which could alternatively be offered as "Quantum Many Body Physics" (11-QVTP). A possible syllabus may be: 1 Band structure (Sommerfeld theory of metals, Bloch theorem, k.p approach and effective Hamiltonians for to- pological insulators (TIs), bulk-surface correspondence, general properties of TIs) 2 Electron-electron interactions in solids (path integral method for weakly interacting fermions, mean field theo- ry, random phase approximation (RPA), density functional theory) 3 Application of mean field theory and the RPA to magnetism								
4 BCS theory of superc								
Intended learning outcomes During the two-semester lecture, the students acquire a basic understanding of many topics of Solid-State Physics, which are addressed in classical textbooks, and thereby advance their knowledge of the underlying concepts and the methods of description. The course builds upon the courses "Experimental Condensed Matter Physics" and "Quantum Mechanics". 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 in groups (groups of 2, approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes) or e) project report (approx. 8 to 10 pages) or e) project report (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: Ir	n the semester in	which the course is	offered and in the su	Ibsequent semester				
Allocation of places								
 Additional information	n							
 Workload								
240 h								
Teaching cycle								

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)

Module title					Abbreviation			
Theore	Theoretical Solid State Physics 2 11-TFK2-161-m01							
Module	e coord	inator		Module offered by				
Managi and Ast		ector of the Institute of Th sics	eoretical Physics	Faculty of Physics a	nd Astronomy			
ECTS	<u> </u>	od of grading	Only after succ. con	pl. of module(s)				
8		rical grade		• • • •				
Duratio	n	Module level	Other prerequisites					
1 seme	ster	graduate						
Conten	ts							
5. Adva Anders 6. Uncc 7. Gree	A continuation of the first semester (11-TFK) might be the following syllabus: 5. Advanced topics of the theory of superconductivity (Bogoliubov-de Gennes equations, effective field theory, Anderson-Higgs description of the Meissner effect) 6. Unconventional superconductors (e.G. copper-oxide high-Tc superconductors) 7. Green's function methods and Feynman diagrammatic technique 8. The Kondo Effect (Anderson's "poor mans scaling", renormalization group)							
		ning outcomes		0 17				
During sics, wi cepts a	the two nich are nd the	o-semester lecture, the st e addressed in classical t	extbooks, and there	by advance their kno	many topics of Solid-State Phy- wledge of the underlying con- erimental Condensed Matter Phy-			
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)			
V (4) + Module		t in: German or English						
		essment (type, scope, la on on whether module ca			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						
Worklo	 ad							
240 h								
Teachir		•						
reaciiii	יא נאנו	6						
	 Referred to in LPO I (examination regulations for teaching-degree programmes)							
Keferre	a to in	LPUT (examination regu	lations for teaching-	uegree programmes)				
Module	e appea	irs in						

UNIVERSITÄT WÜRZBURG

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	e title				Abbreviation			
Particle	e Physi	cs (Standard Model)			11-TPSM-211-m01			
Module	e coord	inator		Module offered by	Nodule offered by			
-	•	ectors of the Institute of f Theoretical Physics an		Faculty of Physics a	nd Astronomy			
ECTS		od of grading	Only after succ. con	nnl of module(s)				
8		rical grade						
Duratio	L	Module level	Other prerequisites					
1 semes		graduate		nination committee re	auired			
		gladdate			equirea.			
Conten								
Electrov parity V Bhabha Z-Line S Higgs p Experim ters								
		Higgs boson	_					
		v the theoretical fundar						
		ned and confirmed the s cal results in the framew						
		, number of weekly cont			-	i illintations.		
V (4) +					,			
		t in: German or English						
		sessment (type, scope,		an German, examina	tion offered — if not	every seme-		
		on on whether module				every serie		
a) writte	en exai	nination (approx. 90 to	120 minutes) or					
b) oral	examin	ation of one candidate	each (approx. 30 mini	utes) or				
		ation in groups (groups		ites per candidate) o	r			
		ort (approx. 8 to 10 page						
		n/talk (approx. 30 minu						
		amination was chosen a						
		e form of an oral examin t is changed, the lecture			e ,			
		the latest.		is about this by four	weeks phot to the o			
		ssessment: German and	d/or English					
		ffered: In the semester		offered and in the su	ubsequent semester			
Allocat	ion of p	olaces						
Additio	nal inf	ormation						
Worklo	ad							
240 h	240 h							
Teachir	ng cycl	e						
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)							
Master's wi	ith 1 major	Mathematical Physics (2022)	JMU Würzburg	• generated 19-Apr-2025 • exa	am. reg. da-	page 273 / 276		
				(120 ECTS) Mathematische P				

Module appears in

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

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

exchange program Physics (2023)

Module title					Abbreviation
Theoretical Quantum Optics					11-TQO-221-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. con	npl. of module(s)		
8 numerical grade					
Duration Module level		Other prerequisites			
1 semester graduate					
Contents					
 Semi-classical atom-field interactions Interaction of atoms with quantized light fields and dressed-atom model Master equation and open systems Coherence and interference effects Coherent light propagation in resonant media Photon statistics and correlations 					
7. Quantum optics of many-body systems					
Intended learning outcomes					
Comprehensive understanding of phenomena involving light and its interaction with atoms at the microscopi- cal level. Knowledge of density matrix formalism for quantum systems and the related mathematical concepts. In-depth understanding of quantum properties of light and their experimental signatures, including photon sta- tistics and correlations. Knowledge of the theory of open systems and master equation description involving Lindblad superoperators. Understanding and modeling the role of coherence and interference in light propagati- on effects in resonant atomic media. Knowledge of cooperative effects in many-body systems: super- and subra- diance, collective light shifts and their applications.					
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 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					
Additional information					
Workload					
240 h					
Teaching cycle					

Module appears in

Master's degree (1 major) Mathematical Physics (2016) Master's degree (1 major) Physics (2020) Master's degree (1 major) Mathematical Physics (2020) Master's degree (1 major) Quantum Technology (2021) Master's degree (1 major) Mathematical Physics (2022) exchange program Physics (2023)