

Subdivided Module Catalogue for the Subject

Mathematics

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

> Examination regulations version: 2012 Responsible: Institute of Mathematics



Course of Studies - Contents and Objectives

The mathematics Master programme is offered by the Department of Mathematics, with a total of currently (SS 2010) 9 chairs.

The Masters study programme in mathematics is intended to provide the students with the following abilities.

- capacity of abstraction,
- exactness in analytic reasoning,
- excellent capacity to realize the structure of complex interconnections,
- sound qualification in applying mathematical methods to specific problems,
- insight into the intrinsic mathematical interdependence of different mathematical fields, as well as into interdisciplinary connections,
- high stamina in dealing with difficult problems,
- high competence in problem solving,
- ability to carry our independent scientific work on a high level,
- ability to cooperate as responsible mathematician within an interdisciplinary team of mathematicians, computer scientists, natural scientists, engineers, or specialists in economical sciences and entrepreneurship,
- insight into and overview over current research in at least one field of contemporary mathematics,
- qualification for meeting the standards of a Ph.D. study in mathematics (if applicable).

For the Master thesis the student should work on a thematic and temporally closely limited frame in order to carry out independently a mathematical task, using well-known procedures and scientific criteria, or modifying them if necessary.

The Masters exam should ascertain whether the candidate overlooks the context of the basics in mathematics and possesses the ability to use the corresponding scientific methods, achieving in this way a further professional and/or scientific qualification.



Abbreviations used

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

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:

ASPO2009

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

28-Nov-2012 (2012-197)

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.



The subject is divided into

| Abbreviation | Module title | ECTS credits | Method of grading | page | | | | |
|--------------------------------------|---|--------------|-------------------|------|--|--|--|--|
| Mathematics (60 ECTS cre | dits) | ļ. | | | | | | |
| Advanced Programme (15 ECTS credits) | | | | | | | | |
| 10-M=AAAN-102-m01 | Applied Analysis | 10 | NUM | 64 | | | | |
| 10-M=AALG-102-m01 | Topics in Algebra | 10 | NUM | 66 | | | | |
| 10-M=ADGM-102-m01 | Differential Geometry | 10 | NUM | 68 | | | | |
| 10-M=AFTH-102-m01 | Complex Analysis | 10 | NUM | 70 | | | | |
| 10-M=AGMS-102-m01 | Geometric Structures | 10 | NUM | 72 | | | | |
| 10-M=AIST-102-m01 | Industrial Statistics 1 | 10 | NUM | 76 | | | | |
| 10-M=ALTH-102-m01 | Lie Theory | 10 | NUM | 78 | | | | |
| 10-M=ANGG-102-m01 | Numeric of large Systems of Equations | 10 | NUM | 80 | | | | |
| 10-M=AOPT-102-m01 | Basics of Optimization | 10 | NUM | 82 | | | | |
| 10-M=ARTH-102-m01 | Introduction to Control Theory | 10 | NUM | 84 | | | | |
| 10-M=ASMR-102-m01 | Stochastic Models for Risk Analysis | 10 | NUM | 86 | | | | |
| 10-M=ASTP-102-m01 | Stochastical Processes | 10 | NUM | 88 | | | | |
| 10-M=ATOP-102-m01 | Topology | 10 | NUM | 90 | | | | |
| 10-M=AVSM-102-m01 | Insurance Mathematics | 10 | NUM | 92 | | | | |
| 10-M=AZRA-102-m01 | Time Series Analysis 1 | 10 | NUM | 94 | | | | |
| 10-M=AZTH-102-m01 | Number Theory | 10 | NUM | 96 | | | | |
| 10-M=AGPC-102-m01 | Giovanni-Prodi Lecture (Master) | 5 | NUM | 74 | | | | |
| Specialisation (15 ECTS o | redits) | ' | | | | | | |
| 10-M=VANA-122-m01 | Selected Topics in Analysis | 10 | NUM | 127 | | | | |
| 10-M=VATP-102-m01 | Algebraic Topology | 10 | NUM | 129 | | | | |
| 10-M=VFNM-102-m01 | Special Topics in Financial Mathematics | 10 | NUM | 135 | | | | |
| 10-M=VGDS-102-m01 | Groups and their Representations | 10 | NUM | 137 | | | | |
| 10-M=VGEM-102-m01 | Geometrical Mechanics | 10 | NUM | 139 | | | | |
| 10-M=VIST-102-m01 | Industrial Statistics 2 | 10 | NUM | 147 | | | | |
| 10-M=VKAR-102-m01 | Field Arithmetics | 10 | NUM | 149 | | | | |
| 10-M=VGPC-122-m01 | Giovanni-Prodi Lecture Selected Topics (Master) | 10 | NUM | 143 | | | | |
| 10-M=VNPE-102-m01 | Numeric of Partial Differential Equations | 10 | NUM | 161 | | | | |
| 10-M=VOPT-102-m01 | Selected Topics in Optimization | 10 | NUM | 163 | | | | |
| 10-M=VSTA-102-m01 | Statistical Analysis | 10 | NUM | 169 | | | | |
| 10-M=VVSM-102-m01 | Insurance Mathematics 2 | 10 | NUM | 171 | | | | |
| 10-M=VZRA-102-m01 | Time Series Analysis 2 | 10 | NUM | 175 | | | | |
| 10-M=VDIM-102-m01 | Discrete Mathematic | 5 | NUM | 131 | | | | |
| 10-M=VDSR-102-m01 | Dynamical Systems and Control | 5 | NUM | 133 | | | | |
| 10-M=VGEO-102-m01 | Aspects of Geometry | 5 | NUM | 141 | | | | |
| 10-M=VGRM-102-m01 | Basics in Mathematics | 5 | NUM | 145 | | | | |
| 10-M=VKOM-122-m01 | Mathematical Continuum Mechanics | 5 | NUM | 151 | | | | |
| 10-M=VMBV-102-m01 | Mathematical Imaging | 5 | NUM | 153 | | | | |
| 10-M=VMPH-102-m01 | Selected Topics in Mathematical Physics | 5 | NUM | 155 | | | | |
| 10-M=VMTH-102-m01 | Modul Theory | 5 | NUM | 157 | | | | |
| 10-M=VNAN-102-m01 | Non-Linear Analysis | 5 | NUM | 159 | | | | |



| 10-M=VOST-102-m01 | Optimal Control | 5 | NUM | 165 |
|--|--|---|-----------------------------------|-----------------|
| 10-M=VQKC-102-m01 | Quantum Control and Quantum Computing | 5 | NUM | 167 |
| 10-M=VVSY-102-m01 | Networked Systems | 5 | NUM | 173 |
| Workshops and Seminars | s (10 ECTS credits) | | | |
| 10-M=GALG-102-m01 | 10 | NUM | 101 | |
| 10-M=GDIM-102-m01 | Study Group Discrete Mathematics | 10 | NUM | 102 |
| 10-M=GDSR-102-m01 | Study Group Dynamical Systems and Control | 10 | NUM | 103 |
| 10-M=GFTH-102-m01 | Study Group Complex Analysis | 10 | NUM | 104 |
| 10-M=GGMT-102-m01 | Study Group Geometry and Topology | 10 | NUM | 105 |
| 10-M=GMKX-102-m01 | Study Group Mathematics in its Context | 10 | NUM | 106 |
| 10-M=GMNW-122-m01 | Study Group Mathematics in the Sciences | 10 | NUM | 107 |
| 10-M=GMUI-102-m01 | Study Group Measure and Integral | 10 | NUM | 108 |
| 10-M=GNMA-102-m01 | Study Group Numerical Mathematics and Applied Analysis | 10 | NUM | 109 |
| 10-M=GROK-102-m01 | Study Group Robotic, Optimization and Control Theory | 10 | NUM | 110 |
| 10-M=GSTA-102-m01 | Study Group Statistics | 10 | NUM | 111 |
| 10-M=GZRA-102-m01 | Study Group Time Series Analysis | 10 | NUM | 112 |
| 10-M=GZTH-102-m01 | Study Group Number Theory | 10 | NUM | 113 |
| 10-M=SADG-102-m01 | Seminar in Applied Differential Geometry | 5 | NUM | 115 |
| 10-M=SALG-102-m01 | Seminar in Algebra | 5 | NUM | 116 |
| 10-M=SDSR-102-m01 | Seminar in Dynamical Systems and Control | 5 | NUM | 117 |
| 10-M=SFTH-102-m01 | Seminar in Complex Analysis | 5 | NUM | 118 |
| 10-M=SFVM-102-m01 | Seminar Financial and Insurance Mathematics | 5 | NUM | 119 |
| 10-M=SGMT-102-m01 | Seminar in Geometry and Topology | 5 | NUM | 120 |
| 10-M=SGPC-102-m01 | Giovanni-Prodi Seminar (Master) | 5 | NUM | 121 |
| 10-M=SIDZ-102-m01 | Interdisciplinary Seminar | 5 | NUM | 122 |
| 10-M=SMNW-122-m01 | Seminar in Mathematics in the Sciences | 5 | NUM | 123 |
| 10-M=SNMA-102-m01 | Seminar in Numerical Mathematics and Applied Analysis | 5 | NUM | 124 |
| 10-M=SOPT-102-m01 | Seminar in Optimization | 5 | NUM | 125 |
| 10-M=SSTA-102-m01 | Seminar in Statistics | 5 | NUM | 126 |
| Learning by Teaching Students may choose who | ether or not to take modules in this area. | | | - |
| 10-M=ELT1-102-m01 | Learning by teaching Mathematics 1 | 5 | NUM | 98 |
| 10-M=ELT2-102-m01 | Learning by Teaching 2 | 5 | NUM | 99 |
| Students may choose who specified application-orie ECTS credits. | ented Subject and/or Application-oriented Work Placement ether or not to take modules in this area. Students may choose ented subjects and/or an application-oriented work placement | e to complete worth a tota | e modules fror l of no more th | n the ian 30 |
| · · · | bject Biology (10 ECTS credits) | , , , , , , , , , , , , , , , , , , , | | , |
| | Bioinformatics (Lecture and Seminar) | 10 | NUM | 9 |
| 07-MS2BIF1-102-m01 | Bioinformatics (Practical Course and Seminar 1) | 10 | NUM | 10 |
| 07-MS2BIF2-102-mo1 Bioinformatics (Practical Course and Seminar 2) | | 15 | B/NB | 11 |
| 07-MBI-B-121-m01 Bioinformatics B | | 5 | B/NB | 8 |
| 07-MS3S-102-m01 | System Biology (Lecture and Seminar) | 10 | NUM | 12 |
| | System Biology (Practical Course and Seminar 1) | 10 | NUM | 13 |
| 07-MS3SYF1-102-m01 | | | | |
| | System Biology (Practical Course and Seminar 2) | 15 | B/NB | 14 |



| 08-TCM2-102-m01 | Computation | onal Chemistry | 5 | NUM | 26 |
|-------------------------------------|-----------------------|---|-----------|-------|---------|
| 08-TCM1-102-m01 | Theoretica | Chemistry | 5 | NUM | 25 |
| 08-TCM3-102-m01 | Programmi | ng in Theoretical Chemistry | 5 | NUM | 27 |
| 08-TCAP-102-m01 | Theoretica | Chemistry - Project work | 10 | B/NB | 23 |
| 08-PCM1-102-m01 | Advanced | Physical Chemistry | 10 | NUM | 16 |
| 08-PCM2-102-m01 | Chemical D | ynamics | 5 | NUM | 18 |
| 08-PCM3-102-m01 | Nanoscale | Materials | 5 | NUM | 19 |
| 08-PCM4-102-m01 | Ultrafast sp | pectroscopy and quantum-control | 5 | NUM | 20 |
| 08-PCM5-102-m01 | Physical ch | emistry of supramolecular assemblies | 5 | NUM | 21 |
| 08-PCM6-102-m01 | Physical Ch | nemistry (Advanced Lab) | 5 | B/NB | 22 |
| Application-oriented S | ubject Comp | uter Science | | | |
| 10-I-DB-102-m01 | Databases | | 5 | NUM | 54 |
| 10-I-DM-102-m01 | Data Minin | g | 5 | NUM | 56 |
| 10-I-AGT-122-m01 | Algorithmic | Graph Theory | 5 | NUM | 51 |
| 10-I-KT-102-m01 | Theory of C | omplexity | 5 | NUM | 57 |
| 10-I-WBS-102-m01 | Knowledge | -based Systems | 5 | NUM | 63 |
| 10-l=AG-102-m01 | Computation | onal Geometry | 5 | NUM | 29 |
| 10-I=AGIS-102-m01 | Algorithms | for Geographic Information Systems | 5 | NUM | 30 |
| 10-I=APA-102-m01 | Approxima | tion Algorithms | 5 | NUM | 31 |
| 10-I=AUT-102-m01 | Automata 1 | heory | 5 | NUM | 32 |
| 10-I=BER-102-m01 | Computabi | lity Theory | 5 | NUM | 33 |
| 10-I=DB2-102-m01 | Databases | II | 5 | NUM | 35 |
| 10-l=EL-102-m01 | E-Learning | | 5 | NUM | 37 |
| 10-l=KD-102-m01 | Cryptograp | ryptography and Data Security | | NUM | 39 |
| 10-l=MI-102-m01 | Medical Inf | ormatics | 5 | NUM | 42 |
| 10-l=ML-102-m01 | Mathemati | cal Logic | 5 | NUM | 43 |
| 10-I=PA-102-m01 | Program De | esign and Analysis | 5 | NUM | 44 |
| 10-I=RAM-102-m01 | Computer / | Arithmetic | 5 | NUM | 45 |
| 10-I-AR-102-m01 | Automatio | n and Control Technology | 8 | NUM | 52 |
| 10-I=CB-102-m01 | Compiler C | onstruction | 8 | NUM | 34 |
| 10-I=DDB-102-m01 | Deductive | Databases | 8 | NUM | 36 |
| 10-l=Kl-102-m01 | Artificial In | telligence | 8 | NUM | 40 |
| 10-I=KT2-122-m01 | Advanced ⁻ | Topics in Computational Complexity | 5 | NUM | 41 |
| 10-I-RK-102-m01 | Computer I | Networks and Communication Systems | 8 | NUM | 61 |
| 10-I=ST-102-m01 | Simulation | Techniques for Performance Evaluation | 8 | NUM | 50 |
| Application-oriented S | ubject Aeros | pace Computer Science | | | |
| 10-I-RAK-102-m01 | Computer / | Architecture | 5 | NUM | 59 |
| 10-I-AR-102-m01 | Automatio | n and Control Technology | 8 | NUM | 52 |
| 10-I-RK-102-m01 | Computer I | Networks and Communication Systems | 8 | NUM | 61 |
| 10-I=AA-102-m01 | Advanced | Advanced Automation | | NUM | 28 |
| 10-I=ES-102-m01 | Embedded | mbedded Systems | | NUM | 38 |
| 10-I=RO-102-m01 | Robotics | | | NUM | 46 |
| 10-l=RO2-102-m01 | Robotics II: | Networked Robots | 8 | NUM | 48 |
| 10-l=SSD-102-m01 | Spacecraft | Spacecraft Systems Design 8 | | | 49 |
| Application-oriented S | | | ı | | |
| 11-SPD-102-m01 | | actor Physics and Devices | 6 | NUM | 213 |
| Master's with 1 major Mathematics (| | JMU Würzburg • generated 26-Aug-2024 • e: | xam. reg. | page | 6 / 226 |
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| 11-FK2-092-m01 | Solid State Physics 2 | 8 | NUM | 189 |
|--------------------------|--|-----|-----|-----|
| 11-FKS-092-m01 | | | | |
| 11-HLF-092-m01 | 6 | NUM | 195 | |
| 11-HLP-092-m01 | Semiconductor Physics | 6 | NUM | 197 |
| 11-HNS-092-m01 | Semiconductor Nanostructures | 6 | NUM | 199 |
| 11-TPE-092-m01 | Experimental Particle Physics | 4 | NUM | 221 |
| 11-A4-072-m01 | Astrophysics | 6 | NUM | 177 |
| 11-AWP-092-m01 | Atmosphere and Space Physics | 6 | NUM | 185 |
| 11-TPS-092-m01 | Particle Physics (Standard Model) | 8 | NUM | 223 |
| 11-SDC-092-m01 | Statistics, Data Analysis and Computer Physics | 4 | NUM | 211 |
| 11-QM2-092-m01 | Quantum Mechanics II | 8 | NUM | 203 |
| 11-TFK-092-m01 | Theoretical Solid State Physics | 8 | NUM | 219 |
| 11-TSL-092-m01 | Theory of Superconduction | 5 | NUM | 225 |
| 11-AKM-092-m01 | Cosmology | 6 | NUM | 179 |
| 11-APL-092-m01 | Plasma-Astrophysics | 6 | NUM | 181 |
| 11-ASP-092-m01 | Introduction to Space Physics | 6 | NUM | 183 |
| 11-TEP-092-m01 | Theoretical Elementary Particle Physics | 8 | NUM | 217 |
| 11-GRT-092-m01 | Group Theory | 6 | NUM | 193 |
| 11-NMA-111-m01 | Computational Astrophysics | 6 | NUM | 201 |
| 11-SUS-092-m01 | Supersymmetry I and II | 6 | NUM | 215 |
| 11-RNT-092-m01 | Renormalization Theory | 6 | NUM | 205 |
| 11-RQFT-092-m01 | Relativistical Quantumfield Theory | 8 | NUM | 207 |
| 11-EPP-092-m01 | Introduction to Plasmaphysics | 6 | NUM | 187 |
| 11-RTT-092-m01 | Theory of Relativity | 6 | NUM | 209 |
| Application-oriented W | ork Placement (10 ECTS credits) | • | • | • |
| 10-M=EPRK-102-m01 | Internship (Lab Course) Applied Mathematics | 10 | NUM | 100 |
| Thesis (30 ECTS credits) | | - | • | |
| 10-M=MAAR-102-m01 | Master Thesis Mathematics | 30 | NUM | 114 |



| Module title | | | | | Abbreviation |
|------------------|-----------------------|-------------------------|----------------------|--------------------|------------------|
| Bioinformatics B | | | | • | 07-MBI-B-121-m01 |
| Modul | e coord | linator | | Module offered by | |
| holder | of the | Chair of Bioinformatics | | Faculty of Biology | |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 5 | (not) | successfully completed | | | |
| Duratio | Duration Module level | | Other prerequisites | | |
| 1 seme | 1 semester graduate | | | | |
| Conter | nts | | | | |

Advances and current results of bioinformatics are explained and discussed, this includes results from genome and sequence analysis, protein domains and protein families, large-scale data analysis (e. g. net generation sequences, proteomics data), analysis of different functional RNAs (e. g. miRNAs, lncRNAs).

Intended learning outcomes

Understand recent results in bioinformatics. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions in bioinformatics.

Courses (type, number of weekly contact hours, language — if other than German)

V (no information on SWS (weekly contact hours) and course language available)

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)

Students will be informed about the method, length and scope of the assessment prior to the course. a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Biology (2011)

Master's degree (1 major) Biology (2014)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Biomedicine (2013)

Master's degree (1 major) Biomedicine (2012)



| Module title | | | | | Abbreviation | | |
|---------------------|-----------------------|-------------------------|----------------------|--------------------|------------------|--|--|
| Bioinfo | ormatic | s (Lecture and Semina | r) | | 07-MS2BI-102-m01 | | |
| Modul | e coord | linator | | Module offered by | | | |
| holder | of the | Chair of Bioinformatics | | Faculty of Biology | | | |
| ECTS | Meth | od of grading | Only after succ. cor | npl. of module(s) | | | |
| 10 | nume | rical grade | | | | | |
| Durati | Duration Module level | | Other prerequisites | | | | |
| 1 semester graduate | | | | | | | |
| Contor | Contents | | | | | | |

Advances and current results of bioinformatics are explained and discussed, this includes results from genome and sequence analysis, protein domains and protein families, large-scale data analysis (e. g. net generation sequences, proteomics data), analysis of different functional RNAs (e. g. miRNAs, lncRNAs).

Intended learning outcomes

Understand recent results in bioinformatics. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions in bioinformatics.

Courses (type, number of weekly contact hours, language - if other than German)

S + V (no information on SWS (weekly contact hours) and course language available)

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)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes)

Allocation of places

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Additional information

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Workload

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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) Biochemistry (2012)

Master's degree (1 major) Biology (2011)

Master's degree (1 major) Biology (2010)

Master's degree (1 major) Biology (2014)

Master's degree (1 major) Mathematics (2012)



| Module | e title | | Abbreviation | | | | |
|---|---------------------------------------|---------------|----------------------|--------------------|--------------------|--|--|
| Bioinformatics (Practical Course and Seminar 1) | | | | | 07-MS2BIF1-102-m01 | | |
| Module | e coord | inator | Module offered by | | | | |
| holder | holder of the Chair of Bioinformatics | | | Faculty of Biology | | | |
| ECTS | Metho | od of grading | Only after succ. con | npl. of module(s) | | | |
| 10 | nume | rical grade | | | | | |
| Duratio | on | Module level | Other prerequisites | | | | |
| 1 semester graduate | | | | | | | |
| Conten | Contents | | | | | | |

Detailed insight into methods in bioinformatics; depending on the topic selected, fields covered include: genomics (sequence-, domain analysis and annotation), omics data analysis (NGS, transcriptomics, metabolomics, proteomics), topological and structural analysis of biological interactions including statistical methods, phylogenetic analysis, protein structure analysis. Results are documented in the form of a presentation, a publication or a term paper.

Intended learning outcomes

Students have gained knowledge on experimental setups and methods used in the field of bioinformatics. They are able to design experiments, collect data and interpret them statistically, adhering to the principles of good scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

S + P (no information on SWS (weekly contact hours) and course language available)

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)

Students will be informed about the length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (approx. 10 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or e) presentation (20 to 45 minutes)

Allocation of places

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Additional information

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Workload

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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) Biology (2011)

Master's degree (1 major) Biology (2010)

Master's degree (1 major) Biology (2014)

Master's degree (1 major) Mathematics (2012)



| Module title Abbreviation | | | | | Abbreviation | | |
|---|---|-------------------------|----------------------|---------------------|--------------------|--|--|
| Bioinformatics (Practical Course and Seminar 2) | | | | | 07-MS2BIF2-102-m01 | | |
| Module | coord | inator | | Module offered by | | | |
| holder | of the (| Chair of Bioinformatics | | Faculty of Biology | | | |
| ECTS | Meth | od of grading | Only after succ. con | mpl. of module(s) | | | |
| 15 | (not) | successfully completed | | | | | |
| Duratio | n | Module level | Other prerequisites | Other prerequisites | | | |
| 1 seme | ster graduate Admission prerequisite to assessment: regular attendance of la and successful completion of the respective exercises as specific beginning of the course. | | | | | | |
| Conten | Contents | | | | | | |

Advanced insight into methods in bioinformatics; depending on the topic selected, fields covered include: genomics (sequence-, domain analysis and annotation), omics data analysis (NGS, transcriptomics, metabolomics, proteomics), topological and structural analysis of biological interactions including statistical methods, phylogenetic analysis, protein structure analysis. The techniques applied are evaluated on the basis of the results obtained and are modified where necessary. Results are documented in the form of a presentation, a publication or a term paper.

Intended learning outcomes

Proficiency in one or more methods in bioinformatics that allows students to independently perform and organise a scientific project in the field of bioinformatics and to document the results obtained. Students are able to design a research project and are prepared for working on a scientific question for their thesis.

Courses (type, number of weekly contact hours, language — if other than German)

S + P (no information on SWS (weekly contact hours) and course language available)

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)

Students will be informed about the length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (approx. 10 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or e) presentation (20 to 45 minutes)

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Biology (2011)

Master's degree (1 major) Biology (2010)

Master's degree (1 major) Biology (2014)

Master's degree (1 major) Mathematics (2012)



| Module | e title | | | Abbreviation | | | |
|--------------------------------------|-----------------------|-------------------------|----------------------|--------------------|-----------------|--|--|
| System Biology (Lecture and Seminar) | | | | | 07-MS3S-102-m01 | | |
| Module | e coord | inator | | Module offered by | | | |
| holder | of the | Chair of Bioinformatics | | Faculty of Biology | | | |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | | | |
| 10 | nume | rical grade | | | | | |
| Duratio | Duration Module level | | Other prerequisites | | | | |
| 1 seme | 1 semester graduate | | | | | | |
| Conten | Contents | | | | | | |

Advances and current results of computational systems biology are explained and discussed, this includes results from functional genomics, dynamics of the transcriptome, of metabolism and metabolic networks as well as regulatory networks.

Intended learning outcomes

Understand recent results in systems biology. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions of systems biology.

Courses (type, number of weekly contact hours, language — if other than German)

S + V (no information on SWS (weekly contact hours) and course language available)

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)

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes)

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Biology (2011)

Master's degree (1 major) Biology (2010)

Master's degree (1 major) Biology (2014)

Master's degree (1 major) Mathematics (2012)



| Module | e title | ' | | Abbreviation | | | |
|---|----------|---------------|----------------------|--------------------|--------------------|--|--|
| System Biology (Practical Course and Seminar 1) | | | | | 07-MS3SYF1-102-m01 | | |
| Module | e coord | inator | | Module offered by | | | |
| holder of the Chair of Bioinformatics | | | | Faculty of Biology | | | |
| ECTS | Metho | od of grading | Only after succ. con | npl. of module(s) | | | |
| 10 | nume | rical grade | | | | | |
| Duratio | on | Module level | Other prerequisites | | | | |
| 1 semester graduate | | | | | | | |
| Conten | Contents | | | | | | |

The practical course will provide students with advanced insights into a field of systems biology and will, in particular, make students proficient in a dynamical method in systems biology (areas that may be selected include protein structure analysis and protein folding, genome analysis and evolution; dynamic network analysis, the dynamics of protein-protein interactions, modelling cellular regulation; modelling metabolism, statistical modelling).

Intended learning outcomes

Students have gained knowledge on experimental setups and methods used in the field of systems biology. They are able to design scientific research, to collect data and to interpret them statistically, adhering to the principles of good scientific practice.

Courses (type, number of weekly contact hours, language — if other than German)

P + S (no information on SWS (weekly contact hours) and course language available)

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)

Students will be informed about the length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (approx. 10 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or e) presentation (20 to 45 minutes)

Allocation of places

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Additional information

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Workload

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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) Biology (2011)

Master's degree (1 major) Biology (2010)

Master's degree (1 major) Biology (2014)

Master's degree (1 major) Mathematics (2012)



| Module title | | | | | Abbreviation | |
|--|---------|-------------------------|----------------------|--------------------------------------|--------------------|--|
| System Biology (Practical Course and Semi | | | Seminar 2) | | 07-MS3SYF2-102-m01 | |
| Modul | e coord | linator | | Module offered by | | |
| holder | of the | Chair of Bioinformatics | | Faculty of Biology | | |
| ECTS | Meth | od of grading | Only after succ. con | Only after succ. compl. of module(s) | | |
| 15 | (not) | successfully completed | | | | |
| Duratio | on | Module level | Other prerequisites | | | |
| 1 semester graduate Admission prerequisite to assessment: regular attendance and successful completion of the respective exercises as speginning of the course. | | <u> </u> | | | | |
| Contents | | | | | | |
| The practical course will provide students with advanced insights into a field of systems biology and will, in particular, make students proficient in a dynamical method in systems biology (areas that may be selected include | | | | | | |

sary. Results are documented in the form of a presentation, a publication or a term paper. **Intended learning outcomes**

Proficiency in one or more methods in systems biology that allows students to independently perform and organise a scientific project in the field of bioinformatics and to document the results obtained. Students are able to design a research project and are prepared for working on a scientific question for their thesis.

protein structure analysis and protein folding, genome analysis and evolution; dynamic network analysis, the dynamics of protein-protein interactions, modelling cellular regulation; modelling metabolism, statistical modelling). The techniques applied are evaluated on the basis of the results obtained and are modified where neces-

Courses (type, number of weekly contact hours, language — if other than German)

P + S (no information on SWS (weekly contact hours) and course language available)

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)

Students will be informed about the length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (approx. 10 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or e) presentation (20 to 45 minutes)

Allocation of places

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Additional information

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Workload

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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) Biology (2011)

Master's degree (1 major) Biology (2010)

Master's degree (1 major) Biology (2014)

Master's degree (1 major) Mathematics (2012)



| Module | e title | | Abbreviation | | | |
|---------------------|-----------------------|-------------------------|--------------------------------------|--------------------|-----------------|--|
| Systems Biology B | | | | | 07-MS-B-121-m01 | |
| Module | e coord | inator | | Module offered by | | |
| holder | of the | Chair of Bioinformatics | | Faculty of Biology | | |
| ECTS | Meth | od of grading | Only after succ. compl. of module(s) | | | |
| 5 | (not) | successfully completed | | | | |
| Duratio | Duration Module level | | Other prerequisites | | | |
| 1 semester graduate | | | | | | |
| Conten | Contents | | | | | |

Advances and current results of computational systems biology are explained and discussed, this includes results from functional genomics, dynamics of the transcriptome, of metabolism and metabolic networks as well as regulatory networks.

Intended learning outcomes

Understand recent results in systems biology. Discuss their implications. Have an advanced (Master) level knowledge of typical technologies and research questions of systems biology.

Courses (type, number of weekly contact hours, language — if other than German)

V (no information on SWS (weekly contact hours) and course language available)

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)

Students will be informed about the method, length and scope of the assessment prior to the course. a) written examination (30 to 60 minutes, including multiple choice questions) or b) oral examination of one candidate each (30 to 60 minutes) or c) oral examination in groups of up to 3 candidates (30 to 60 minutes)

Allocation of places

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Additional information

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Workload

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) Biology (2011)

Master's degree (1 major) Biology (2014)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Biomedicine (2013)

Master's degree (1 major) Biomedicine (2012)



| Module title | | | | | Abbreviation |
|---|---------|---------------------|----------------------|---|-----------------|
| Advanced Physical Chemistry | | | | | 08-PCM1-102-m01 |
| Module | e coord | inator | | Module offered by | |
| lecturer of seminar "Laserspektroskopie" (Laser Spectroscopy) | | | ie" (Laser Spectros- | Institute of Physical and Theoretical Chemistry | |
| ECTS | Metho | od of grading | Only after succ. con | npl. of module(s) | |
| 10 | nume | rical grade | | | |
| Duration Module level Other | | Other prerequisites | | | |
| 1 semester graduate - | | | | | |
| Contents | | | | | |

This module introduces students to the fundamental principles of laser spectroscopy. It discusses absorption and emission spectroscopy. In addition, the module gives students the opportunity to use modern experimental methods in physical chemistry in the laboratory. After a safety briefing, the students autonomously conduct experiments in the laboratory. Students will be expected to take tests and write lab reports to demonstrate their knowledge.

Intended learning outcomes

Students are able to explain the components and operating principles of lasers as well as the optical principles of laser technology. They are able to describe the principles of absorption and emission spectroscopy. Students have developed a high level of proficiency in modern experimental methods in physical chemistry. They are able to analyse the resulting measurements and write a lab report.

Courses (type, number of weekly contact hours, language — if other than German)

This module comprises 2 module components. Information on courses will be listed separately for each module component.

- 08-PCM1-1-102: S + Ü (no information on SWS (weekly contact hours) and course language available)
- 08-PCM1-2-102: P (no information on SWS (weekly contact hours) and course language available)

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)

Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

Assessment in module component o8-PCM1-1-102: Laser Spectroscopy Laser Spectroscopy

- 5 ECTS, Method of grading: numerical grade
- written examination (90 minutes) or oral examination (20 minutes)
- Language of assessment: German or English

Assessment in module component o8-PCM1-2-102: Advanced Physical Chemistry (Lab)

- 5 ECTS, Method of grading: (not) successfully completed
- Vortestate (pre-experiment exams) and Nachtestate (post-experiment exams) (approx. 15 minutes), log (approx. 15 pages)
- Language of assessment: German or English



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

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Module appears in

Master's degree (1 major) Chemistry (2010)

Master's degree (1 major) Mathematics (2012)



| Module title | | | | | Abbreviation | |
|---|--|--|----------------------|-----------------------|---|--|
| Chemic | cal Dyn | amics | | | 08-PCM2-102-m01 | |
| Module | e coord | inator | | Module offered by | | |
| lecture mics) | r of sen | ninar "Chemische Dynam | ik" (Chemical Dyna- | Institute of Physica | l and Theoretical Chemistry | |
| ECTS | Metho | od of grading | Only after succ. con | ıpl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | on | Module level | Other prerequisites | | | |
| 1 seme | ster | graduate | | | | |
| Conten | its | | | | | |
| | | | | | ical kinetics and reaction dyna- cribing chemical reactions. | |
| | | ning outcomes | | | | |
| Studen | its are a | - | | | dynamics. They can describe me- | |
| Course | s (type | , number of weekly conta | ct hours, language – | - if other than Germa | n) | |
| | | mation on SWS (weekly | | | | |
| | | sessment (type, scope, la on on whether module ca | | | tion offered $-$ if not every seme- | |
| | | nation (90 minutes) or or ssessment: German or E | | e candidate each (20 | o minutes) or talk (30 minutes) | |
| Allocat | | | . - | | | |
| | | | | | | |
| Additio | nal inf | ormation | | | | |
| | | | | | | |
| Worklo | ad | | | | | |
| | | | | | | |
| Teaching cycle | | | | | | |
| | | | | | | |
| Referred to in LPO I (examination regulations for teaching-degree programmes) | | | | | | |
| Module appears in | | | | | | |
| Master's degree (1 major) Chemistry (2013) | | | | | | |
| | _ | ee (1 major) Chemistry (2 | = - | | | |
| | | ee (1 major) Chemistry (2 | | | | |
| AA 4 | AA - to de de sur e (o sur e e e) AA - th - sur et e e (o - sur e) | | | | | |

Master's degree (1 major) Mathematics (2012)



| Module | Abbreviation | | | | | |
|----------------------------------|---|---------------|---------------------|---|-----------------|--|
| Nanoscale Materials | | | | | 08-PCM3-102-m01 | |
| Module coordinator Module offere | | | | Module offered by | | |
| lecture | lecturer of the seminar "Nanoskalige Materialien" | | | Institute of Physical and Theoretical Chemistry | | |
| ECTS | Meth | od of grading | Only after succ. co | mpl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | Duration Module level Oth | | Other prerequisite | S | | |
| 1 semester graduate | | | | | | |
| Conten | Contents | | | | | |

This module discusses advanced topics in nanoscale materials. It focuses on the structure, properties, fabrication, modern characterisation methods and application areas of nanoscale materials.

Intended learning outcomes

Students are able to characterise nanoscale materials. They are able to name analytical methods and application areas of nanoscale materials.

Courses (type, number of weekly contact hours, language — if other than German)

S + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (90 minutes) or oral examination of one candidate each (20 minutes) or talk (30 minutes) Language of assessment: German or English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Nanostructure Technology (2010)

Bachelor' degree (1 major) Nanostructure Technology (2012)

Master's degree (1 major) Chemistry (2013)

Master's degree (1 major) Chemistry (2010)

Master's degree (1 major) Chemistry (2014)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Computational Mathematics (2012)

Master's degree (1 major) Functional Materials (2012)



| Module title | | | | | Abbreviation | |
|---|--|--|-----------------------------------|-----------------------|---|--|
| Ultrafa | st spec | troscopy and quantum-c | ontrol | | 08-PCM4-102-m01 | |
| Module | e coord | inator | | Module offered by | | |
| | | seminar "Ultrakurzzeitsp | ektroskopie and | Institute of Physica | l and Theoretical Chemistry | |
| Quante | | | | | | |
| ECTS | | od of grading | Only after succ. con | ipl. of module(s) | | |
| 5 | Щ, | rical grade | | | | |
| Duratio | | Module level | Other prerequisites | | | |
| 1 seme | | graduate | | | | |
| Conten | | | | | | |
| | | iscusses advanced topic ime-resolved laser spect | | | control. It focuses on ultrashort | |
| | | ning outcomes | | | | |
| plain th princip | ne theo les and | ry of time-resolved laser I applications of quantum | spectroscopy and na n control. | me experimental me | aracterise them. They can ex- thods. They can describe the | |
| Course | s (type | , number of weekly conta | ct hours, language – | · if other than Germa | n) | |
| S + Ü (r | no infor | mation on SWS (weekly o | contact hours) and co | ourse language avail | able) | |
| | | sessment (type, scope, la on on whether module ca | | | tion offered — if not every seme- | |
| | | nation (90 minutes) or or ssessment: German or Er | | e candidate each (20 | minutes) or talk (30 minutes) | |
| Allocat | ion of p | olaces | | | | |
| | | | | | | |
| Additio | nal inf | ormation | | | | |
| | | | | | | |
| Worklo | ad | | | | | |
| | | | | | | |
| Teaching cycle | | | | | | |
| | | | | | | |
| Referred to in LPO I (examination regulations for teaching-degree programmes) | | | | | | |
| | | | | | | |
| Module appears in | | | | | | |
| Master's degree (1 major) Chemistry (2010) | | | | | | |
| Master | Master's degree (1 major) Mathematics (2012) | | | | | |



| Module | e title | | | Abbreviation | |
|---|---------|--------------------------|----------------------|---|-----------------|
| Physic | al chen | nistry of supramolecular | assemblies | | 08-PCM5-102-m01 |
| Module | e coord | inator | | Module offered by | |
| lecturer of the seminar "Physikalische Chemie Supramole- kularer Strukturen" | | | Chemie Supramole- | Institute of Physical and Theoretical Chemistry | |
| ECTS | Metho | od of grading | Only after succ. con | mpl. of module(s) | |
| 5 | nume | rical grade | | | |
| Duratio | on | Module level | Other prerequisites | | |
| 1 seme | ster | graduate | | | |
| Contents | | | | | |
| This module examines the basic interactions between molecules. It discusses the formation and physical-chemical properties of aggregates as well as key applications of supramolecular chemistry. | | | | | |

Intended learning outcomes

Students are able to explain the basic interactions between molecules demonstrating a high degree of expertise in the field. They can describe the formation and physical-chemical properties of aggregates. They can name modern applications of supramolecular chemistry.

 $\textbf{Courses} \ (\textbf{type}, \textbf{number of weekly contact hours, language} - \textbf{if other than German})$

S + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (90 minutes) and/or oral examination of one candidate each (20 minutes) and/or talk (30 minutes)

Language of assessment: German or English

Allocation of places

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Additional information

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Workload

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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) Chemistry (2013)

Master's degree (1 major) Chemistry (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Technology of Functional Materials (2010)

Master's degree (1 major) Technology of Functional Materials (2009)

Master's degree (1 major) Computational Mathematics (2012)

Master's degree (1 major) Functional Materials (2012)



| Modul | Module title Abbreviation | | | | | |
|---|--|---|----------------------|-----------------------|--|--|
| Physic | al Cher | nistry (Advanced Lab) | | | 08-PCM6-102-m01 | |
| Modul | e coord | inator | | Module offered by | | |
| | | ikalische Chemie (Physic | ral Chemistry) | | l and Theoretical Chemistry | |
| ECTS | | od of grading | Only after succ. con | • | t and Theoretical Chemistry | |
| 5 | | successfully completed | | ipt. or modute(s) | | |
| Duratio | | Module level | Other prerequisites | | | |
| 1 seme | | graduate | | | | |
| Conter | nts | | | | | |
| | | | | | the research groups based at | |
| | | f Physical Chemistry and | learn some advance | d synthesis and ana | lytical methods. | |
| | | ning outcomes | | | | |
| | | | | | relevant physical chemistry resequestions in physical chemistry. | |
| Course | es (type | , number of weekly conta | ct hours, language – | · if other than Germa | n) | |
| P (no i | nformat | tion on SWS (weekly cont | act hours) and cours | e language available | 2) | |
| | | sessment (type, scope, la ion on whether module ca | | | tion offered — if not every seme- | |
| • | | (20 minutes) ssessment: German or Eı | nglish | | | |
| Allocat | tion of p | olaces | | | | |
| | | | | | | |
| Additio | onal inf | ormation | | | | |
| | | | | | | |
| Worklo | oad | | | | | |
| | | | | | | |
| Teachi | Teaching cycle | | | | | |
| | | | | | | |
| Referred to in LPO I (examination regulations for teaching-degree programmes) | | | | | | |
| | | | | | | |
| Module appears in | | | | | | |
| Master's degree (1 major) Chemistry (2010) | | | | | | |
| | Master's degree (1 major) Mathematics (2012) | | | | | |
| Master | Master's degree (1 major) Computational Mathematics (2012) | | | | | |



| Module | e title | | | | Abbreviation |
|--|----------|------------------------|----------------------|---|-----------------|
| Theoretical Chemistry - Project work | | | | | 08-TCAP-102-m01 |
| Module coordinator | | | | Module offered by | |
| head of the research group offering the module | | | e module | Institute of Physical and Theoretical Chemistry | |
| ECTS | Metho | od of grading | Only after succ. con | pl. of module(s) | |
| 10 | (not) | successfully completed | | | |
| Duration Module level | | Other prerequisites | | | |
| 1 semester graduate | | | | | |
| Cantan | Contents | | | | |

This module gives students the opportunity to get involved in the work of one of the research groups based at the Institute of Theoretical Chemistry and learn some of the methods typically used in the discipline.

Intended learning outcomes

Students have learned some of the methods typically used in theoretical chemistry. They are able to explain issues that are relevant to the fields covered.

Courses (type, number of weekly contact hours, language — if other than German)

This module has 3 components; information on courses listed separately for each component.

- 08-TCAP-1-102: P (no information on language and number of weekly contact hours available)
- o8-TCAP-2-102: P (no information on language and number of weekly contact hours available)
- 08-TCAP-3-102: P (no information on language and number of weekly contact hours available)

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)

This module has the following 3 assessment components. To pass the module as a whole students must pass two out of these three assessment components.

Assessment component to module component o8-TCAP-1-102: Theoretische Chemie Arbeitsgruppenpraktikum Wellenpaketdynamik

- 5 ECTS credits, method of grading: (not) successfully completed
- presentation (approx. 30 minutes)
- Language of assessment: German or English

Assessment component to module component o8-TCAP-2-102: Theoretische Chemie Arbeitsgruppenpraktikum Wellenfunktionsmethoden

- 5 ECTS credits, method of grading: (not) successfully completed
- presentation (approx. 30 minutes)
- Language of assessment: German or English

Assessment component to module component o8-TCAP-3-102: Theoretische Chemie Arbeitsgruppenpraktikum Dichtefunktionaltheorie

- 5 ECTS credits, method of grading: (not) successfully completed
- presentation (approx. 30 minutes)
- Language of assessment: German or English

Allocation of places

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Additional information

Additional information on module duration: 4 weeks..

Workload

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Teaching cycle

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

| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | page 23 / 226 |
|--|---|---------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Module appears in

Master's degree (1 major) Chemistry (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)



| Module | Module title | | | | Abbreviation | |
|----------------------------|---|---|---|------------------------|--|--|
| Theore | Theoretical Chemistry | | | | 08-TCM1-102-m01 | |
| Module | Module coordinator | | | Module offered by | | |
| lecture | r of lec | ture "Theoretische Chemi | e" | Institute of Physica | l and Theoretical Chemistry | |
| ECTS | | od of grading | Only after succ. com | pl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | | Module level | Other prerequisites | | | |
| 1 seme | ster | graduate | Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unex sed absence). | | d at the beginning of the course fully completed) as well as regu- | |
| Conten | ts | | | | | |
| This mo | odule ii | ntroduces students to the | e fundamental princip | oles of theoretical ch | emistry. | |
| Intende | ed lear | ning outcomes | | | | |
| | | able to describe the math amical approaches of the | | al principles underly | ing the quantum chemical and | |
| Course | s (type | , number of weekly conta | ct hours, language – | · if other than Germa | n) | |
| S + Ü (r | no info | rmation on SWS (weekly o | contact hours) and co | ourse language avail | able) | |
| | | sessment (type, scope, la ion on whether module ca | | | tion offered $-$ if not every seme- | |
| | | nation (90 minutes) ssessment: German or Ei | nglish | | | |
| Allocat | ion of p | places | | | | |
| | | | • | | | |
| Additio | nal inf | ormation | | | | |
| | | | | | | |
| Worklo | ad | | • | | | |
| | | | , | | | |
| Teachi | ng cycl | e | | | | |
| | | | • | | | |
| Referre | d to in | LPO I (examination regu | lations for teaching-o | degree programmes) | | |
| | | | | | | |
| Module | Module appears in | | | | | |
| Master Master Master | Master's degree (1 major) Chemistry (2010) Master's degree (1 major) Mathematics (2012) Master's degree (1 major) Mathematics (2010) Master's degree (1 major) Computational Mathematics (2012) Master's degree (1 major) FOKUS Pharmacy (2012) | | | | | |



| Module title | | | | | Abbreviation | |
|---|--|---|--|---------------------------------------|-----------------------------------|--|
| Compu | tationa | al Chemistry | | | 08-TCM2-102-m01 | |
| Module | e coord | inator | | Module offered by | | |
| | | ture "Computational Che | mistn/" | | l and Theoretical Chemistry | |
| ECTS | 1 | od of grading | Only after succ. com | · · · · · · · · · · · · · · · · · · · | t and medical enemistry | |
| 5 | | rical grade | | | | |
| Duratio | n | Module level | Other prerequisites | | | |
| 1 seme | ster | graduate | Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence). | | | |
| Conten | its | | | | | |
| This mo | odule i | ntroduces students to the | e fundamental princip | oles of computationa | al chemistry. | |
| Intende | ed lear | ning outcomes | | | | |
| | | able to explain the theore emistry. | etical principles of co | mputational chemist | ry and to apply methods in com- | |
| Course | s (type | , number of weekly conta | ct hours, language — | if other than Germa | n) | |
| S + Ü (r | no info | rmation on SWS (weekly | contact hours) and co | urse language avail | able) | |
| | | sessment (type, scope, la ion on whether module ca | | | tion offered — if not every seme- | |
| | | nation (90 minutes) ssessment: German or El | nglish | | | |
| Allocat | ion of | places | | | | |
| | | | | | | |
| Additio | nal inf | ormation | | | | |
| | | | | | | |
| Worklo | ad | | | | | |
| | | | | | | |
| Teachi | Teaching cycle | | | | | |
| | | | | | | |
| Referred to in LPO I (examination regulations for teaching-degree programmes) | | | | | | |
| | | | | | | |
| Module appears in | | | | | | |
| Master's degree (1 major) Chemistry (2010) | | | | | | |
| | Master's degree (1 major) Mathematics (2012) | | | | | |
| | Master's degree (1 major) Mathematics (2010) | | | | | |
| Master's degree (1 major) Computational Mathematics (2012) | | | | | | |



| Module title | | | | | Abbreviation | |
|-------------------|--|--------------------------|--|-----------------------|--|--|
| Progra | amming | in Theoretical Chemis | | 08-TCM3-102-m01 | | |
| Modu | le coord | linator | | Module offered by | | |
| lectur mie" | er of lec | ture "Programmieren i | n Theoretischer Che- | Institute of Physica | ll and Theoretical Chemistry | |
| ECTS | Meth | od of grading | Only after succ. cor | npl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Durati | ion | Module level | Other prerequisites | i | | |
| 1 sem | ester | graduate | | | | |
| Conte | nts | | | | | |
| | | provides an introduction | on to the fundamentals | of programming in th | neoretical chemistry and discus- | |
| Intend | ded lear | ning outcomes | | | | |
| | | able to explain and us | | ng languages typical | lly used in theoretical chemistry | |
| Cours | es (type | , number of weekly co | ntact hours, language – | - if other than Germa | an) | |
| S + Ü | (no info | rmation on SWS (week | cly contact hours) and c | ourse language avail | lable) | |
| ster, i | nformat letion a | ion on whether modul | e can be chosen to earn ox. 5 programming exerc | a bonus) | ation offered — if not every seme- (approx. 45 minutes) | |
| | tion of | | T LIIGUSII | | | |
| | | - | | | | |
| Vqqiti | ional inf | ormation | | | | |
| Additi | Ullat IIII | Officiation | | | | |
| Workl | | | | | | |
| WOIK | oau | | | | | |
| | | | | | | |
| Teach | ing cycl | e | | | | |
| | | | | | | |
| Referr | ed to in | LPO I (examination re | egulations for teaching- | degree programmes) | | |
| | | | | | | |
| Module appears in | | | | | | |
| | Master's degree (1 major) Chemistry (2013) | | | | | |
| | Master's degree (1 major) Chemistry (2010) | | | | | |
| | Master's degree (1 major) Chemistry (2014) | | | | | |
| | _ | ree (1 major) Mathema | | | | |
| Maste | Master's degree (1 major) Mathematics (2010) | | | | | |



| Module title | | | | | Abbreviation | | |
|---------------------|---|---------------|--|-------------------------------|-----------------|--|--|
| Advand | ced Aut | omation | | | 10-I=AA-102-m01 | | |
| Modul | e coord | inator | | Module offered by | | | |
| holder | holder of the Chair of Computer Science VII | | | Institute of Computer Science | | | |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | | | |
| 8 | nume | rical grade | | | | | |
| Duratio | on | Module level | Other prerequisites | | | | |
| 1 semester graduate | | graduate | Where applicable, prerequisites as specified by the lecturer at the begin- | | | | |
| | | | ning of the course (e. g. completion of exercises). | | | | |
| <i>c</i> . | Combando | | | | | | |

Advanced topics in automation systems as well as instrumentation and control engineering, for example from the field of sensor data processing, actuators, cooperating systems, mission and trajectory planning.

Intended learning outcomes

The students have an advanced knowledge of selected topics in automation systems. They are able to implement advanced automation systems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 80 to 90 minutes). If announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups. A 80 to 90 minute written examination is equivalent to a 20 minute (approx.) oral examination of one candidate each, a 30 minute (approx.) oral examination in groups of 2 and a 40 minute (approx.) oral examination in groups of 3.

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)



| Modul | e title | | Abbreviation | | | |
|-----------------|--|---------------|---|-------------------------------|-----------------|--|
| Compu | tation | al Geometry | | • | 10-I=AG-102-m01 | |
| Modul | e coord | inator | | Module offered by | | |
| holder | holder of the Chair of Computer Science I | | | Institute of Computer Science | | |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | on | Module level | Other prerequisites | | | |
| 1 semester grad | | graduate | Where applicable, prerequisites as specified by the lecturer at the begin | | | |
| | ning of the course (e.g. completion of exercises). | | | xercises). | | |
| <i>c</i> . | | | | | | |

In many areas of computer science -- for example robotics, computer graphics, virtual reality and geographic information systems -- it is necessary to store, analyse, create or manipulate spatial data. This class is about the algorithmic aspects of these tasks: We will acquire techniques that are needed to plan and analyse geometric algorithms and data structures. Every technique will be illustrated with a problem in the practical areas listed above.

Intended learning outcomes

The students are able to decide which algorithms or data structures are suitable for the solution of a given geometric problem. The students are able to analyse new problems and to come up with their own efficient solutions based on the concepts and techniques acquired in the lecture.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Modul | e title | | Abbreviation | | | |
|---|---|--|----------------------|-------------------------------|-------------------|--|
| Algorithms for Geographic Information Systems | | | | | 10-l=AGIS-102-m01 | |
| Modul | Module coordinator | | | | | |
| holder | holder of the Chair of Computer Science I | | | Institute of Computer Science | | |
| ECTS | Meth | od of grading | Only after succ. com | ıpl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | on | Module level | Other prerequisites | | | |
| 1 semester graduate | | Where applicable, prerequisites as specified by the lecturer at the begin- | | | | |
| | | | ning of the course (| xercises). | | |
| Contor | Contents | | | | | |

Algorithmic foundations of geographic information systems and their application in selected problems of acquisition, processing, analysis and presentation of spatial information. Processes of discrete and continuous optimisation. Applications such as the creation of digital height models, working with GPS trajectories, tasks of spatial planning as well as cartographic generalisation.

Intended learning outcomes

The students are able to formalise algorithmic problems in the field of geographic information systems as well as to select and improve suitable approaches to solving these problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes) Language of assessment: German, English if agreed upon with the examiner

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | | Abbreviation | |
|---------------------|---|---------------------|--|---|------------------|--|
| Approx | imatio | n Algorithms | | | 10-I=APA-102-m01 | |
| Module | e coord | inator | | Module offered by | | |
| holder | holder of the Chair of Computer Science I | | | Institute of Computer Science | | |
| ECTS | Metho | od of grading | Only after succ. cor | npl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | on | Module level | Other prerequisites | 3 | | |
| 1 semester graduate | | Where applicable, p | Where applicable, prerequisites as specified by the lecturer at the begin- | | | |
| | | | ning of the course (| ning of the course (e. g. completion of exercises). | | |

The task of finding the optimal solution for a given problem is omnipresent in computer science. Unfortunately, there are many problems without an efficient algorithm for an optimal solution. As a result, in practice, methods are used which do not always give the optimal solution but always give good solutions. This lecture will discuss drafting and analysing techniques for algorithms which have a proven approximation quality. With the help of practical optimisation problems, the lecture will introduce students to important drafting techniques such as greedy, local search, scaling as well as methods based on linear programming.

Intended learning outcomes

The students are able to analyse easy approximation methods in terms of their quality. They understand fundamental drafting techniques such as greedy, local search and scaling as well as methods based on linear programming and are able to apply these to new problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | | Abbreviation | |
|---------------------|--|-------------------------|---|-------------------------------|------------------|--|
| Automata Theory | | | | | 10-I=AUT-102-m01 | |
| Modul | e coord | inator | | Module offered by | | |
| Dean o | f Studi | es Informatik (Computer | Science) | Institute of Computer Science | | |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | on | Module level | Other prerequisites | | | |
| 1 semester graduate | | graduate | Admission prerequisite to assessment: exercises (type and scope to be | | | |
| | announced by the lecturer at the beginning of the course). | | | ing of the course). | | |
| <i>c</i> . | Ckk- | | | | | |

Finite automata, regular languages, star-free languages, natural equivalence relations, predicate logic with words, language acceptance through monoids, syntactic monoid, predicate logical and algebraic characterisation of regular languages and star-free languages, two-way automata.

Intended learning outcomes

The students possess a fundamental and applicable knowledge in the areas of finite automata, regular languages, star-free languages, natural equivalence relations, predicate logic with words, language acceptance through monoids, syntactic monoid, predicate logical and algebraic characterisation of regular and star-free languages, two-way automata.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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 (2012)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | | Abbreviation | |
|----------------------|--|--------------|---|-------------------------------|------------------|--|
| Computability Theory | | | | | 10-l=BER-102-m01 | |
| Module | e coord | inator | | Module offered by | | |
| Dean o | Dean of Studies Informatik (Computer Science | | | Institute of Computer Science | | |
| ECTS | Method of grading Only after succ. | | Only after succ. con | mpl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | on | Module level | Other prerequisites | | | |
| 1 seme | 1 semester graduate | | Admission prerequisite to assessment: exercises (type and scope to be | | | |
| | announced by the lecturer at the begin | | | ing of the course). | | |
| Conton | Contents | | | | | |

Gödel numbering, computable functions, decidable and countable sets, halting problem, m-reducibility, creative and productive sets, relative computability, Turing reduction, countable degrees, arithmetic hierarchy.

Intended learning outcomes

The students possess a fundamental and applicable knowledge in the areas of Gödel numbers, countable functions, decidable and countable sets, halting problem, m-reducibility, creative and productive sets, relative computability, Turing reduction, countable degrees, arithmetic hierarchy.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes) Language of assessment: German, English if agreed upon with the examiner

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Computational Mathematics (2012)



| Module | Module title | | | | Abbreviation | | |
|---------|--|---------------|--|-------------------------------|-----------------|--|--|
| Compi | ler Con | struction | | | 10-I=CB-102-m01 | | |
| Modul | e coord | inator | | Module offered by | | | |
| holder | holder of the Chair of Computer Science II | | | Institute of Computer Science | | | |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | | | |
| 8 | nume | rical grade | | | | | |
| Duratio | on | Module level | Other prerequisites | | | | |
| 1 seme | 1 semester graduate | | Where applicable, prerequisites as specified by the lecturer at the begin- | | | | |
| | | | ning of the course (e. g. completion of exercises). | | | | |
| C t | | | | | | | |

Lexical analysis, syntactic analysis, semantics, compiler generators, code generators, code optimisation.

Intended learning outcomes

The students possess knowledge in the formal description of programming languages and their compilation. They are able to perform transformations between them with the help of finite automata, push-down automata and compiler generators.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 80 to 90 minutes). If announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups. A 80 to 90 minute written examination is equivalent to a 20 minute (approx.) oral examination of one candidate each, a 30 minute (approx.) oral examination in groups of 2 and a 40 minute (approx.) oral examination in groups of 3.

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Module | e title | | | Abbreviation | | |
|--------------|---|---------------|--|-------------------------------|------------------|--|
| Databases II | | | | | 10-I=DB2-102-m01 | |
| Module | e coord | inator | | Module offered by | | |
| Dean o | Dean of Studies Informatik (Computer Science) | | | Institute of Computer Science | | |
| ECTS | Meth | od of grading | Only after succ. compl. of module(s) | | | |
| 5 | nume | rical grade | | | | |
| Duratio | n | Module level | Other prerequisites | i | | |
| 1 seme | ster | graduate | Where applicable, prerequisites as specified by the lecturer at the begin- | | | |
| | | | ning of the course (e.g. completion of exercises). | | | |
| Contents | | | | | | |
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Data warehouses and data mining; XML databases; web databases; introduction to Datalog.

Intended learning outcomes

The students have advanced knowledge about relational databases, XML and data mining.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Business Information Systems (2011)

Master's degree (1 major) Business Information Systems (2013)

Master's degree (1 major) Computational Mathematics (2012)

Master's degree (1 major) Functional Materials (2012)



| Module title | | | | Abbreviation | | |
|---------------------|----------|--|---|------------------------------------|------------------|--|
| Deductive Databases | | | | | 10-I=DDB-102-m01 | |
| Modul | e coord | inator | | Module offered by | | |
| Dean o | f Studi | es Informatik (Computer | Science) | nce) Institute of Computer Science | | |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | | |
| 8 | nume | rical grade | | | | |
| Duratio | on | Module level | Other prerequisites | | | |
| 1 semester graduate | | Where applicable, prerequisites as specified by the lecturer at the begin- | | | | |
| | | | ning of the course (e. g. completion of exercises). | | | |
| C 4 | Containt | | | | | |

Syntax and semantics of logic programs; data structures, program structures and applications for Prolog; analytical methods for Datalog; negation and stratification; disjunctive logic programs.

Intended learning outcomes

The students possess expertise in working with Prolog and Datalog (including negation and disjunction).

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 80 to 90 minutes). If announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups. A 80 to 90 minute written examination is equivalent to a 20 minute (approx.) oral examination of one candidate each, a 30 minute (approx.) oral examination in groups of 2 and a 40 minute (approx.) oral examination in groups of 3.

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Module | e title | | Abbreviation | | |
|--------------------|---|----------------------------------|---|----------------------------------|-------------------------------------|
| E-Learning | | | | | 10-l=EL-102-m01 |
| Module coordinator | | | | Module offered by | |
| holder | of the | Chair of Computer Scienc | e VI | VI Institute of Computer Science | |
| ECTS | Meth | thod of grading Only after succ. | | ompl. of module(s) | |
| 5 | nume | rical grade | | | |
| Duratio | on | Module level | Other prerequisites | | |
| 1 seme | ster | graduate | Where applicable, prerequisites as specified by the lecturer at the beginning | | ified by the lecturer at the begin- |
| | ning of the course (e. g. completion of exercises). | | | xercises). | |
| <u> </u> | | | | | |

Learning paradigms, learning system types, author systems, learning platforms, standards for learning systems, intelligent tutoring systems, student models, didactics, problem-oriented learning and case-based training systems, adaptive tutoring systems, computer-supported cooperative learning, evaluation of learning systems.

Intended learning outcomes

The students possess a theoretical and practical knowledge about eLearning and are able to assess possible applications.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Business Information Systems (2011)

Master's degree (1 major) Business Information Systems (2013)

Master's degree (1 major) Computational Mathematics (2012)

Master's degree (1 major) Functional Materials (2012)



| Module | Module title Abbreviation | | | | | |
|--------------------|--|---------------------------|--|--------------------|-----------------|--|
| Embed | ded Sy | stems | | | 10-l=ES-102-m01 | |
| Module coordinator | | | | Module offered by | | |
| Dean o | f Studi | es Informatik (Computer : | cience) Institute of Computer Science | | er Science | |
| ECTS | CTS Method of grading Only after succ. | | Only after succ. con | ompl. of module(s) | | |
| 8 | nume | rical grade | | | | |
| Duratio | n | Module level | Other prerequisites | | | |
| 1 seme | 1 semester graduate | | Where applicable, prerequisites as specified by the lecturer at the begin- | | | |
| | | | ning of the course (e. g. completion of exercises). | | | |

Models of embedded systems, implementation methods (ASIC, AISIP, micro controller), verification of embedded systems, implementation planning static, periodic and dynamic, binding problems, hardware synthesis, software synthesis.

Intended learning outcomes

The students are familiar with the technical possibilities for the design of embedded systems and master the most important techniques for the modelling, verification and optimisation of such systems in hardware and software.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 80 to 90 minutes). If announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups. A 80 to 90 minute written examination is equivalent to a 20 minute (approx.) oral examination of one candidate each, a 30 minute (approx.) oral examination in groups of 2 and a 40 minute (approx.) oral examination in groups of 3.

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Module | e title | , | Abbreviation | | |
|--------------------------------|---|----------------------------------|---|-------------------------------|-----------------|
| Cryptography and Data Security | | | | | 10-I=KD-102-m01 |
| Module coordinator | | | | Module offered by | |
| Dean o | Dean of Studies Informatik (Computer Science | | | Institute of Computer Science | |
| ECTS | Meth | thod of grading Only after succ. | | mpl. of module(s) | |
| 5 | nume | rical grade | | | |
| Duratio | n | Module level | Other prerequisites | | |
| 1 seme | ster | graduate | Where applicable, prerequisites as specified by the lecturer at the begin | | |
| | ning of the course (e. g. completion of exercises). | | | xercises). | |
| <i>c</i> . | | | | | |

Private key cryptography systems, Vernam one-time pad, AES, perfect security, public key cryptography systems, RSA, Diffie-Hellman, Elgamal, Goldwasser-Micali, digital signature, challenge-response methods, secret sharing, millionaire problem, secure circuit evaluation, homomorphous encryption.

Intended learning outcomes

The students possess a fundamental and applicable knowledge in the areas of private key cryptography systems, Vernam one-time pad, AES, perfect security, public key cryptography, RSA, Diffie-Hellman, Elgamal, Goldwasser-Micali, digital signature, challenge-response method, secret sharing, millionaire problem, secure circuit evaluation, homomorphous encryption

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | | Abbreviation | |
|-------------------------|--|---------------|---------------------|---|-----------------|--|
| Artificial Intelligence | | | | | 10-l=Kl-102-m01 | |
| Module coordinator | | | | Module offered by | | |
| holder | holder of the Chair of Computer Science VI | | | Institute of Computer Science | | |
| ECTS | Metho | od of grading | Only after succ. co | mpl. of module(s) | | |
| 8 | nume | rical grade | | | | |
| Duratio | n | Module level | Other prerequisite | Other prerequisites | | |
| 1 semes | ster | graduate | Where applicable, | Where applicable, prerequisites as specified by the lecturer at the begin | | |
| | ning of the course (e.g. completion of exercises). | | | xercises). | | |

Intelligent agents, uninformed and heuristic search, constraint problem solving, search with partial information, propositional and predicate logic and inference, knowledge representation, planning, probabilistic closure and Bayesian networks, utility theory and decidability problems, learning from observations, knowledge while learning, neural networks and statistical learning methods, reinforcement learning.

Intended learning outcomes

The students possess theoretical and practical knowledge about artificial intelligence and are able to assess possibilities for its application.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 80 to 90 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Module title Abbreviation | | | | | | |
|--|----------------|---|---|--|--|--|
| Advanc | ed Top | oics in Computationa | l Complexity | | 10-I=KT2-122-m01 | |
| Module | e coord | linator | | Modu | ile offered by | |
| Dean o | f Studi | es Informatik (Comp | uter Science) | Institu | ute of Computer Science | |
| ECTS | Meth | od of grading | Only after suc | cc. compl. of r | module(s) | |
| 5 | nume | rical grade | | | | |
| Duratio | n | Module level | Other prerequ | uisites | | |
| 1 seme | ster | graduate | Admission pro | erequisite to a | assessment: exercises (type and scope to be | |
| | | | announced by | announced by the lecturer at the beginning of the course). | | |
| Conten | ts | | | | | |
| • | | NP-complete sets, au istic algorithms. | itoreducibility, inte | ractive proof | systems, polynomial time hierarchy, complexi | |
| Intende | ed lear | ning outcomes | | | | |
| | | | | | n the areas of properties of NP-complete sets, rchies, complexity of probabilistic algorithms. | |
| Course | s (type | e, number of weekly o | ontact hours, langu | uage — if othe | er than German) | |
| V + Ü (r | no info | rmation on SWS (we | ekly contact hours) | and course la | anguage available) | |
| 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) | | | | | | |
| tion da aminat | te, the | written examination | can be replaced by te each: 15 minutes | an oral exam , groups of 2: | the lecturer by four weeks prior to the examination of one candidate each or an oral extension of the examination of one candidate each or an oral examination of 3: 25 minutes) | |

Allocation of places

Additional information

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Workload

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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 (2012)



| Module | e title | | Abbreviation | | |
|---------------------|---|-------------------------------|--|-------------------------------|-----------------|
| Medical Informatics | | | | | 10-l=Ml-102-m01 |
| Module coordinator | | | | Module offered by | |
| holder | holder of the Chair of Computer Science V | | e VI | Institute of Computer Science | |
| ECTS | Meth | thod of grading Only after su | | compl. of module(s) | |
| 5 | nume | rical grade | | | |
| Duratio | on | Module level | Other prerequisites | | |
| 1 seme | 1 semester graduate | | Where applicable, prerequisites as specified by the lecturer at the begin- | | |
| | | | ning of the course (e. g. completion of exercises). | | |
| | | | • | | |

Electronic patient folder, coding of medical data, hospital information systems, operation of computers in infirmary and functional units, medical decision making and assistance systems, statistics and data mining in medical research, case-based training systems in medical training.

Intended learning outcomes

The students possess theoretical and practical knowledge about the application of computer science methods in medicine.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)



| Module title Abbreviation | | | | | |
|--|---|--------------|--|-------------------|---------------------------------|
| Mathematical Logic | | | | | 10-l=ML-102-m01 |
| Module coordinator | | | | Module offered by | |
| Dean of Studies Informatik (Computer Scien | | Science) | Institute of Computer Science | | |
| ECTS | ECTS Method of grading | | Only after succ. compl. of module(s) | | |
| 5 | nume | rical grade | | | |
| Duratio | on | Module level | Other prerequisites | i | |
| 1 seme | ster | graduate | Admission prerequisite to assessment: exercises (type and scope to b | | exercises (type and scope to be |
| | announced by the lecturer at the beginn | | ing of the course). | | |
| Conton | Contonto | | | | |

Propositional logic, first-order predicate logic, proof and deduction, Gödel's completeness theorem, Tarski theorem, Gödel's incompleteness theorem, undecidability and nonaxiomatisability of elemental arithmetic.

Intended learning outcomes

The students possess a fundamental and applicable knowledge in the areas of propositional logic, first-order predicate logic, proof and deduction, Gödel's completeness theorem, Tarski theorem, Gödel's incompleteness theorem, undecidability and nonaxiomatisability of elemental arithmetic.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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 (2012)

Master's degree (1 major) Computational Mathematics (2012)



| Module | e title | | | | Abbreviation | |
|--|----------|-----------------------|---|-------------------------------------|-----------------|--|
| Program Design and Analysis | | | | | 10-I=PA-102-m01 | |
| Module coordinator | | | | Module offered by | | |
| holder of the Chair of Computer Science II | | e II | Institute of Computer Science | | | |
| ECTS | Meth | od of grading | Only after succ. con | nly after succ. compl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | on | Module level | Other prerequisites | | | |
| 1 seme | ester | graduate | Where applicable, prerequisites as specified by the lecturer at the begin | | | |
| ning of the course (e. g. | | e.g. completion of ex | xercises). | | | |
| Conten | Contents | | | | | |

Program analysis, model creation in software engineering, program quality, test of programs, process models.

Intended learning outcomes

The students are able to analyse programs, to use testing frameworks and metrics as well as to judge program quality.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes) Language of assessment: German, English if agreed upon with the examiner

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Business Information Systems (2011)

Master's degree (1 major) Business Information Systems (2013)

Master's degree (1 major) Computational Mathematics (2012)



| Module | Module title Abbreviation | | | | | | |
|---|-------------------------------------|--------------|--|-------------------------------|------------------|--|--|
| Computer Arithmetic | | | | | 10-I=RAM-102-m01 | | |
| Module coordinator | | | | Module offered by | | | |
| holder of the Chair of Computer Science II | | | e II | Institute of Computer Science | | | |
| ECTS | TS Method of grading Only after suc | | Only after succ. com | compl. of module(s) | | | |
| 5 | nume | rical grade | | | | | |
| Duratio | on | Module level | Other prerequisites | | | | |
| 1 seme | 1 semester graduate | | Where applicable, prerequisites as specified by the lecturer at the begin- | | | | |
| ning of the course (e. g. completion of exercises). | | | xercises). | | | | |
| Conton | Contonte | | | | | | |

Spaces of numerical computation, raster and rounding, definition and implementation of computational arithmetic and interval calculation.

Intended learning outcomes

The students possess knowledge about the spaces of numerical computation, raster and roundings, definition and implementation of computational arithmetic and interval calculation. They master the application of algorithms.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Module | e title | | Abbreviation | | |
|---|---------|-----------------------------------|---|----------------------------------|-----------------|
| Robotics | | | | | 10-l=RO-102-m01 |
| Module coordinator | | | | Module offered by | |
| holder of the Chair of Computer Science VII | | | ce VII | II Institute of Computer Science | |
| ECTS | Meth | ethod of grading Only after succ. | | mpl. of module(s) | |
| 8 | nume | rical grade | | | |
| Duratio | on | Module level | Other prerequisites | | |
| 1 seme | ster | graduate | Where applicable, prerequisites as specified by the lecturer at the begin | | |
| | | | ning of the course (e.g. completion of exercises). | | |
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History, applications and properties of robots, direct kinematics of manipulators: coordinate systems, rotations, homogenous coordinates, axis coordinates, arm equation. Inverse kinematics: solution properties, end effector configuration, numerical and analytical approaches, examples of different robots for analytical approaches. Workspace analysis and trajectory planning, dynamics of manipulators: Lagrange-Euler model, direct and inverse dynamics. Mobile robots: direct and inverse kinematics, propulsion system, tricycle, Ackermann steering, holonomes and non-holonome restrictions, kinematic classification of mobile robots, posture kinematic model. Movement control and path planning: roadmap methods, cell decomposition methods, potential field methods. Sensors: position sensors, speed sensors, distance sensors.

Intended learning outcomes

The students master the fundamentals of robot manipulators and vehicles and are, in particular, familiar with their kinematics and dynamics as well as the planning of paths and task execution.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 80 to 90 minutes). If announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups. A 80 to 90 minute written examination is equivalent to a 20 minute (approx.) oral examination of one candidate each, a 30 minute (approx.) oral examination in groups of 2 and a 40 minute (approx.) oral examination in groups of 3.

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)





| Modul | e title | | Abbreviation | | | |
|---|---------|---------------|---|-------------------------------|------------------|--|
| Robotics II: Networked Robots | | | | | 10-l=RO2-102-m01 | |
| Module coordinator Module | | | Module offered by | | | |
| holder of the Chair of Computer Science VII | | | ce VII | Institute of Computer Science | | |
| ECTS | Meth | od of grading | Only after succ. con | mpl. of module(s) | | |
| 8 | nume | rical grade | | | | |
| Duratio | on | Module level | Other prerequisites | Other prerequisites | | |
| 1 seme | ster | graduate | Where applicable, prerequisites as specified by the lecturer at the begin | | | |
| | | | ning of the course (e.g. completion of exercises). | | | |
| | | | * | | | |

Foundations of dynamic systems, controllability and observability, controller design through pole assignment: feedback and feed-forward, state observer, feedback with state observer, time discrete systems, stochastic systems: foundations of stochastics, random processes, stochastic dynamic systems, Kalman filter: derivation, initialising, application examples, problems of Kalman filters, extended Kalman filter.

Intended learning outcomes

The students master all fundamentals that are necessary to understand Kalman filters and their use in applications of robotics. The students possess a knowledge of advanced controller and observer methods and recognise the connections between the dual pairs controllability - observability as well as controller design and observer design. They also recognise the relationship between the Kalman filter as a state estimator and an observer.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 80 to 90 minutes). If announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups. A 80 to 90 minute written examination is equivalent to a 20 minute (approx.) oral examination of one candidate each, a 30 minute (approx.) oral examination in groups of 2 and a 40 minute (approx.) oral examination in groups of 3.

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | | Abbreviation | |
|---------------------------|---|---------------|---|---|------------------|--|
| Spacecraft Systems Design | | | | | 10-l=SSD-102-m01 | |
| Module coordinator | | | | Module offered by | | |
| holder | holder of the Chair of Computer Science VII | | | Institute of Computer Science | | |
| ECTS | Metho | od of grading | Only after succ. co | mpl. of module(s) | | |
| 8 | nume | rical grade | | | | |
| Duratio | Duration Module level Other p | | Other prerequisite | Other prerequisites | | |
| 1 seme | ster | graduate | Where applicable, | Where applicable, prerequisites as specified by the lecturer at the begin | | |
| | | | ning of the course (e. g. completion of exercises). | | | |

Introduction: history of space flight, system design of spacecraft. Space dynamics: two-body dynamics, Kepler orbits, disturbance forces, transfer orbits. Mission analysis: earth and sun-synchronous orbits, shadows, solar angle of incidence. Thermal control of satellites: thermal analysis, thermal design and technologies, verification of thermal designs. Telecommunication: ground contact analysis, data transmission, satellite monitoring (telemetry, telecommando). Structure and mechanisms. Energy systems: primary, secondary, management, power generation: solar cells. On-board data processing. Propulsion systems. Tests (mechanical, electrical). Operation of spacecraft. Ground segment.

Intended learning outcomes

The students master system aspects of the layouting of technical systems. Using the example of spacecraft, major subsystems and their integration into a working whole are being analysed.

Courses (type, number of weekly contact hours, language - if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 80 to 90 minutes). If announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups. A 80 to 90 minute written examination is equivalent to a 20 minute (approx.) oral examination of one candidate each, a 30 minute (approx.) oral examination in groups of 2 and a 40 minute (approx.) oral examination in groups of 3.

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)



| Module title | | | | | Abbreviation | | |
|--|---|---------------|---------------------|---|-----------------|--|--|
| Simulation Techniques for Performance Evaluation | | | | | 10-l=ST-102-m01 | | |
| Module coordinator | | | | Module offered by | | | |
| holder | holder of the Chair of Computer Science III | | | Institute of Computer Science | | | |
| ECTS | Meth | od of grading | Only after succ. co | c. compl. of module(s) | | | |
| 8 | nume | rical grade | | | | | |
| Duratio | on | Module level | Other prerequisite | Other prerequisites | | | |
| 1 seme | ster | graduate | Where applicable, | Where applicable, prerequisites as specified by the lecturer at the begin | | | |
| | | | ning of the course | ning of the course (e.g. completion of exercises). | | | |

Introduction to simulation techniques, statistical groundwork, creation of random numbers and random variables, random sample theory and estimation techniques, statistical analysis of simulation values, inspection of measured data, planning and evaluation of simulation experiments, special random processes, possibilities and limits of model creation and simulation, advanced concepts and techniques, practical execution of simulation projects.

Intended learning outcomes

The students possess the methodic knowledge and the practical skills necessary for the stochastic simulation of (technical) systems, the evaluation of results and the correct assessment of the possibilities and limits of simulation methods.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 80 to 90 minutes). If announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups. A 80 to 90 minute written examination is equivalent to a 20 minute (approx.) oral examination of one candidate each, a 30 minute (approx.) oral examination in groups of 2 and a 40 minute (approx.) oral examination in groups of 3.

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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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) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Modul | e title | | Abbreviation | | | |
|---|---------|----------------------|---|-------------------------------|------------------|--|
| Algorithmic Graph Theory | | | | | 10-I-AGT-122-m01 | |
| Module coordinator | | | | Module offered by | | |
| holder of the Chair of Computer Science I | | | e l | Institute of Computer Science | | |
| ECTS | Meth | od of grading | Only after succ. con | mpl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | on | Module level | Other prerequisites | | | |
| 1 seme | ster | undergraduate | Where applicable, prerequisites as specified by the lecturer at the begin | | | |
| ning of the course (e. g. comp | | e.g. completion of e | xercises). | | | |
| C 4 | | | | | | |

We discuss typical graph problems: We solve round trip problems, calculate maximal flows, find matchings and colourings, work with planar graphs and find out how the ranking algorithm of Google works. Using the examples of graph problems, we also become familiar with new concepts, for example how we model problems as linear programs or how we show that they are fixed parameter computable.

Intended learning outcomes

The students are able to model typical problems in computer science as graph problems. In addition, the participants are able to decide which tool from the course helps solve a given graph problem algorithmically. In this course, students learn in detail how to estimate the run time of given graph algorithms.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: English, German if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Mathematics (2012)

Bachelor' degree (1 major) Mathematics (2013)

Bachelor' degree (1 major) Computational Mathematics (2012)

Bachelor' degree (1 major) Computational Mathematics (2013)

Master's degree (1 major) Mathematics (2012)



| Module title | | | | | Abbreviation | |
|---|-------|---------------|--|-------------------------------|-----------------|--|
| Automation and Control Technology | | | | | 10-I-AR-102-m01 | |
| Module coordinator | | | | Module offered by | | |
| holder of the Chair of Computer Science VII | | | ce VII | Institute of Computer Science | | |
| ECTS | Metho | od of grading | Only after succ. con | mpl. of module(s) | | |
| 8 | nume | rical grade | | | | |
| Duratio | n | Module level | Other prerequisites | | | |
| 1 semester | | undergraduate | Admission prerequisite to assessment: exercises (type and scope to be announced by the lecturer at the beginning of the course). | | | |

Overview of automation systems, fundamental principles of control technology, Laplace transformation, transfer function, plant, controller types, basic feedback loop, fundamental principles of control engineering, automata, structure of Petri nets, Petri nets for automisation, machine-related structure of processing computation machines, communication between process computers and periphery devices, software for automation systems, process synchronisation, process communication, real-time operating systems, real-time planning.

Intended learning outcomes

The students master the fundamentals of automation and control.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 80 to 90 minutes). If announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups. A 80 to 90 minute written examination is equivalent to a 20 minute (approx.) oral examination of one candidate each, a 30 minute (approx.) oral examination in groups of 2 and a 40 minute (approx.) oral examination in groups of 3.

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Mathematics (2012)

Bachelor' degree (1 major) Mathematics (2013)

Bachelor' degree (1 major) Computational Mathematics (2012)

Bachelor' degree (1 major) Computational Mathematics (2013)

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)



Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | | Abbreviation | |
|--|---------|---------------|---|-------------------------------|-----------------|--|
| Databases | | | | | 10-I-DB-102-m01 | |
| Modul | e coord | inator | | Module offered by | | |
| Dean of Studies Informatik (Computer S | | | Science) | Institute of Computer Science | | |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | on | Module level | Other prerequisites | | | |
| 1 seme | ster | undergraduate | Admission prerequisite to assessment: exercises (type and scope to be | | | |
| | | | announced by the lecturer at the beginning of the course). | | | |
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Relational algebra and complex SQL statements; database planning and normal forms; transaction management.

Intended learning outcomes

The students possess knowledge about database modelling and queries in SQL as well as transactions.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes)

if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

§ 49 (1) 1. b) Datenbanksysteme und Softwaretechnologie

§ 69 (1) 1. b) Datenbanksysteme und Softwaretechnologie

Module appears in

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Mathematics (2012)

Bachelor' degree (1 major) Mathematics (2013)

Bachelor' degree (1 major) Business Information Systems (2013)

Bachelor' degree (1 major) Computational Mathematics (2012)

Bachelor' degree (1 major) Computational Mathematics (2013)

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Bachelor' degree (1 major) Functional Materials (2012)

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)



Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Computational Mathematics (2012)

First state examination for the teaching degree Realschule Computer Science (2012)



| Module title | | | | | Abbreviation | |
|--|---------|---------------|---|-------------------------------|-----------------|--|
| Data Mining | | | | | 10-I-DM-102-m01 | |
| Modul | e coord | inator | | Module offered by | | |
| holder of the Chair of Computer Science VI | | | e VI | Institute of Computer Science | | |
| ECTS | Meth | od of grading | Only after succ. con | compl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | on | Module level | Other prerequisites | | | |
| 1 seme | ster | undergraduate | Admission prerequisite to assessment: exercises (type and scope to be | | | |
| | | | announced by the lecturer at the beginning of the course). | | | |
| | | | | | | |

Foundations in the following areas: definition of data mining and knowledge, discovery in databases, process model, relationship to data warehouse and OLAP, data preprocessing, data visualisation, unsupervised learning methods (cluster and association methods), supervised learning (e. g. Bayes classification, KNN, decision trees, SVM), learning methods for special data types, other learning paradigms.

Intended learning outcomes

The students possess a theoretical and practical knowledge of typical methods and algorithms in the area of data mining and machine learning. They are able to solve practical knowledge discovery problems with the help of the knowledge acquired in this course and by using the KDD process. They have acquired experience in the use or implementation of data mining algorithms.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Business Information Systems (2013)

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | | Abbreviation |
|----------------------|---|---------------|---|-------------------------------|-----------------|
| Theory of Complexity | | | | | 10-I-KT-102-m01 |
| Module coordinator | | | | Module offered by | |
| Dean o | Dean of Studies Informatik (Computer Science) | | | Institute of Computer Science | |
| ECTS | Metho | od of grading | Only after succ. compl. of module(s) | | |
| 5 | nume | rical grade | | | |
| Duratio | n | Module level | Other prerequisites | | |
| 1 seme | ster | undergraduate | Admission prerequisite to assessment: exercises (type and scope to be | | |
| | | | announced by the lecturer at the beginning of the course). | | |

Complexity measurements and classes, general relationships between space and time classes, memory consumption versus computation time, determinism versus indeterminism, hierarchical theorems, translation methods, P-NP problem, completeness problems, Turing reduction, interactive proof systems.

Intended learning outcomes

The students possess a fundamental and applicable knowledge in the areas of complexity measurements and classes, general relationships between space and time classes, memory consumption versus computation time, determinism versus indeterminism, hierarchical theorems, translation methods, P-NP problem, completeness problems, Turing reduction, interactive proof systems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Mathematics (2012)

Bachelor' degree (1 major) Mathematics (2013)

Bachelor' degree (1 major) Computational Mathematics (2012)

Bachelor' degree (1 major) Computational Mathematics (2013)

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)



Master's degree (1 major) Computational Mathematics (2012)
First state examination for the teaching degree Gymnasium Computer Science (2009)



| Module title | | | | | Abbreviation | |
|--|---------|---------------|---|--------------------------------------|------------------|--|
| Computer Architecture | | | | | 10-I-RAK-102-m01 | |
| Modul | e coord | inator | | Module offered by | | |
| Dean of Studies Informatik (Computer S | | | Science) | Institute of Computer Science | | |
| ECTS | Meth | od of grading | Only after succ. con | Only after succ. compl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | on | Module level | Other prerequisites | | | |
| 1 seme | ster | undergraduate | Admission prerequisite to assessment: exercises (type and scope to be | | | |
| | | | announced by the lecturer at the beginning of the course). | | | |
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Instruction set architectures, command processing through pipelining, statical and dynamic instruction scheduling, caches, vector processors, multi-core processors.

Intended learning outcomes

The students master the most important techniques to design fast computers as well as their interaction with compilers and operating systems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

§ 69 (1) 1. c) Informatik Technische Informatik

Module appears in

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Mathematics (2012)

Bachelor' degree (1 major) Mathematics (2013)

Bachelor' degree (1 major) Computational Mathematics (2012)

Bachelor' degree (1 major) Computational Mathematics (2013)

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)



Master's degree (1 major) Nanostructure Technology (2010) Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | | Abbreviation | |
|---|-------|---------------|----------------------|---|-----------------|--|
| Computer Networks and Communication Systems | | | | _ | 10-I-RK-102-m01 | |
| Module coordinator | | | | Module offered by | | |
| holder of the Chair of Computer Science III | | | ence III | Institute of Computer Science | | |
| ECTS | Metho | od of grading | Only after succ. cor | compl. of module(s) | | |
| 8 | nume | rical grade | | | | |
| Duratio | n | Module level | Other prerequisites | Other prerequisites | | |
| 1 seme | ster | undergraduate | Admission prerequi | Admission prerequisite to assessment: exercises (type and scope to be | | |
| | | | announced by the l | announced by the lecturer at the beginning of the course). | | |

Properties of computer and communication systems: data traffic in distributed systems. Performance analysis of computer networks and communication systems: problem statement and introduction to method architecture and structure of computer networks: network structure, network access, access methods, digital transfer hierarchies, dataflow control and traffic control, transfer network. Communication protocols: fundamental principles and ISO architecture models. Internet: structure and basic mechanism, TCP/IP, routing, network management. Mobile communication networks: fundamental concepts, GSM, UMTS. Future communication systems and networks.

Intended learning outcomes

The students possess an intricate knowledge of the structure of computer networks and communication systems as well as fundamental principles to rate these systems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 80 to 90 minutes). If announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups. A 80 to 90 minute written examination is equivalent to a 20 minute (approx.) oral examination of one candidate each, a 30 minute (approx.) oral examination in groups of 2 and a 40 minute (approx.) oral examination in groups of 3.

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Mathematics (2012)

Bachelor' degree (1 major) Mathematics (2013)

Bachelor' degree (1 major) Computational Mathematics (2012)

Bachelor' degree (1 major) Computational Mathematics (2013)

Bachelor' degree (1 major) Aerospace Computer Science (2009)



Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | | Abbreviation |
|-------------------------|--|---------------|---------------------|-------------------------------|------------------|
| Knowledge-based Systems | | | | | 10-l-WBS-102-m01 |
| Module coordinator | | | | Module offered by | |
| holder | holder of the Chair of Computer Science VI | | | Institute of Computer Science | |
| ECTS | Meth | od of grading | Only after succ. co | mpl. of module(s) | |
| 5 | nume | rical grade | | | |
| Durati | Duration Module level | | Other prerequisite | Other prerequisites | |
| 1 seme | 1 semester undergraduate | | | | |
| Conte | nte | | | | |

Foundations in the following areas: knowledge management systems, knowledge representation, solving methods, knowledge acquisition, learning, guidance dialogue, semantic web.

Intended learning outcomes

The students possess theoretical and practical knowledge for the understanding and design of knowledge-based systems including knowledge formalisation and have acquired experience in a small project.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 50 to 60 minutes)

if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Bachelor' degree (1 major) Computer Science (2010)

Bachelor' degree (1 major) Business Information Systems (2013)

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Computer Science (2010)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | Abbreviation |
|---------------|-----------------------|--|---|-------------------|
| Applied Analy | /sis | | | 10-M=AAAN-102-m01 |
| Module coord | linator | | Module offered by | |
| Dean of Studi | es Mathematik (Mathem | natics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 10 nume | rical grade | | | |
| Duration | Module level | Other prerequisites | | |
| 1 semester | graduate | r as announced by the ration deadlines. Ceresion to assessment (of exercises). The lector is at the beginning of sidered a declaration its have obtained the ecourse of the sement into effect. Studies assessment in the cures in the cures of the sement in the cure of the sement in the sement in the cure of the sement in the | nde via SB@home at the begin- me lecturer in accordance with tain prerequisites must be met fe. g. successful completion of a furer will inform students about of the course. Registration for the m of will to seek admission to as- e qualification for admission to ester, the lecturer will put their re- udents who meet all prerequisites arrent or in the subsequent seme- dents will have to obtain the qua- new. | |

In-depth study of functional analysis and operator theory, Sobolev spaces and partial differential equations, theory of Hilbert spaces and Fourier analysis, spectral theory and quantum mechanics, numerical methods (in particular FEM methods), principles of functional analysis, function spaces, embedding theorems, compactness, theory of elliptic, parabolic and hyperbolic partial differential equations with methods from functional analysis.

Recommended previous knowledge:

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/She is able to establish a connection between his/her acquired skills and other branches of mathematics and questions in physics and other natural and engineering sciences.

Courses (type, number of weekly contact hours, language — if other than German)

 $V + \ddot{U}$ (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | page 64 / 226 |
|--|---|---------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation |
|---|----------------------|----------------------|--|---|
| Topics in Alge | ebra | | | 10-M=AALG-102-m01 |
| Module coord | linator | | Module offered by | |
| Dean of Studi | es Mathematik (Mathe | matics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 10 nume | rical grade | | | |
| Duration | Module level | Other prerequisites | | |
| Duration Module level Other prerequise 1 semester graduate Registration for ning of the count the specified reto qualify for accertain percent the respective of exercise will be sessment. If studies assessment over gistration for as will be admitted ster. For assess | | | r as announced by the ration deadlines. Ceresion to assessment (of exercises). The lector is at the beginning of sidered a declaration its have obtained the ecourse of the sement into effect. Studies assessment in the cures in the cures of the sement in the cure of the sement in the sement in the cure of the sement in the | nde via SB@home at the begin- ne lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a turer will inform students about of the course. Registration for the n of will to seek admission to as- e qualification for admission to ester, the lecturer will put their re- udents who meet all prerequisites urrent or in the subsequent seme- dents will have to obtain the qua- new. |

Contemporary topics in algebra, for example coding theory, elliptic curves, algebraic combinatorics or computer algebra.

Recommended previous knowledge:

Basic knowledge of algebra is assumed, such as can be acquired in the modules "Introduction to Algebra" and "Applied Algebra".

Intended learning outcomes

The student is acquainted with fundamental concepts and methods in a contemporary field of algebra, and is able to apply these skills to complex questions.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

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| Allocation of places |
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| Additional information |
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| Workload |
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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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation | |
|--|--------------|---|--------------------------|--|--|
| Differential Geometry | | | | 10-M=ADGM-102-m01 | |
| Module coordinator | | | Module offered by | | |
| Dean of Studies Mathematik (Mathematics) | | ematics) | Institute of Mathematics | | |
| | | Only after succ. con | npl. of module(s) | | |
| 10 nume | erical grade | | | | |
| Duration | Module level | Other prerequisites | Other prerequisites | | |
| 1 semester | graduate | Registration for the exercise must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Certain prerequisites must be not of qualify for admission to assessment (e.g., successful completion certain percentage of exercises). The lecturer will inform students all the respective details at the beginning of the course. Registration for exercise will be considered a declaration of will to seek admission to sessment. If students have obtained the qualification for admission assessment over the course of the semester, the lecturer will put the gistration for assessment into effect. Students who meet all prerequivall be admitted to assessment in the current or in the subsequent ster. For assessment at a later date, students will have to obtain the lification for admission to assessment anew. | | the lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a sturer will inform students about of the course. Registration for the n of will to seek admission to aste qualification for admission to ester, the lecturer will put their redents who meet all prerequisites arrent or in the subsequent semedents will have to obtain the quadrates. | |

Central and advanced results in differential geometry, in particular about differentiable and Riemannian manifolds.

Recommended previous knowledge:

Basic knowledge from the modules "Introduction to Differential Geometry", "Introduction to Topology" and "Geometric Analysis" is recommended.

Intended learning outcomes

The student is acquainted with concepts and methods for differentiable manifolds or Riemannian manifolds, is able to apply these methods and knows about the interaction of local and global methods in differential geometry.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

| Allocation of places | |
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| Additional information | |
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| Workload | |
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Teaching cycle

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

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Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation | |
|--|--------------|---|--------------------------------------|--|--|
| Complex Analysis | | | | 10-M=AFTH-102-m01 | |
| Module coordinator | | | Module offered by | | |
| Dean of Studies Mathematik (Mathematics) | | ematics) | Institute of Mathematics | | |
| | | Only after succ. con | Only after succ. compl. of module(s) | | |
| 10 nume | rical grade | | | | |
| Duration | Module level | Other prerequisites | | | |
| 1 semester | graduate | Registration for the exercise must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Certain prerequisites must be more to qualify for admission to assessment (e.g. successful completion of certain percentage of exercises). The lecturer will inform students about the respective details at the beginning of the course. Registration for exercise will be considered a declaration of will to seek admission to sessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their gistration for assessment into effect. Students who meet all prerequisions will be admitted to assessment in the current or in the subsequent sets ster. For assessment at a later date, students will have to obtain the collification for admission to assessment anew. | | ne lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a turer will inform students about of the course. Registration for the n of will to seek admission to aster, the lecturer will put their residents who meet all prerequisites arrent or in the subsequent semedents will have to obtain the quadrates. | |

In-depth study of mapping properties of analytic functions and their generalisations with modern analytic and geometric methods. Structural properties of families of holomorphic and meromorphic functions. Special functions (e. g. elliptic functions).

Recommended previous knowledge:

Basic knowledge of the contents of the module "Introduction to Complex Analysis" is recommended.

Intended learning outcomes

The student is acquainted with the fundamental notions, methods and results of higher complex analysis, in particular the (geometric) mapping properties of holomorphic functions. He/She is able to establish a connection between his/her acquired skills and other branches of mathematics and applications in other subjects.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places -Additional information -Workload --



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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation |
|--------------------------------------|--------------|---|--------------------------|--|
| Geometric Structures | | | | 10-M=AGMS-102-m01 |
| Module coordinator | | | Module offered by | |
| Dean of Studies Mathematik (Mathemat | | natics) | Institute of Mathematics | |
| ECTS Method of grading | | Only after succ. compl. of module(s) | | |
| 10 nume | rical grade | | | |
| Duration | Module level | Other prerequisites | | |
| 1 semester | graduate | Registration for the exercise must be made via SB@home at the bening of the course or as announced by the lecturer in accordance we the specified registration deadlines. Certain prerequisites must be to qualify for admission to assessment (e.g., successful completion certain percentage of exercises). The lecturer will inform students at the respective details at the beginning of the course. Registration for exercise will be considered a declaration of will to seek admission assessment. If students have obtained the qualification for admission assessment over the course of the semester, the lecturer will put the gistration for assessment into effect. Students who meet all prerequivaled by admitted to assessment in the current or in the subsequent ster. For assessment at a later date, students will have to obtain the lification for admission to assessment anew. | | ne lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a turer will inform students about of the course. Registration for the n of will to seek admission to aster, the lecturer will put their residents who meet all prerequisites arrent or in the subsequent semedents will have to obtain the quadrates. |

Tits buildings, generalised polygons or related geometric structures, automorphisms, BN pairs in groups, Moufang conditions, classification results.

Recommended previous knowledge:

Basic knowledge from the modules "Introduction to Differential Geometry" and "Introduction to Topology" is recommended.

Intended learning outcomes

The student is acquainted with the fundamental notions, methods and results concerning a type of geometric structure. He/She is able to establish a connection between these results and broader theories, and learns about the interactions of geometry and other fields of mathematics.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English

| Allocation of places | |
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| | |
| Additional information | |
| | |
| Workload | |
| | |
| 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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation |
|---------------------------------|-----------------------|--|---|-------------------|
| Giovanni-Prodi Lecture (Master) | | | - | 10-M=AGPC-102-m01 |
| Module coo | rdinator | | Module offered by | , |
| Dean of Stu | dies Mathematik (Matl | hematics) | Institute of Mathem | natics |
| ECTS Met | hod of grading | Only after succ. con | npl. of module(s) | |
| 5 nun | nerical grade | | | |
| Duration | Module level | Other prerequisites | ; | |
| 1 semester | graduate | ning of the course of the specified registr to qualify for admis certain percentage the respective detail exercise will be con sessment. If studen assessment over the gistration for assess | Registration for the exercise must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Certain prerequisites must be more to qualify for admission to assessment (e.g. successful completion of certain percentage of exercises). The lecturer will inform students about the respective details at the beginning of the course. Registration for exercise will be considered a declaration of will to seek admission to sessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put the gistration for assessment into effect. Students who meet all prerequing will be admitted to assessment in the current or in the subsequent sets. For assessment at a later date, students will have to obtain the | |

Introduction to a specialised topic in mathematics by an international expert.

Intended learning outcomes

The student is acquainted with the fundamental concepts and methods of a contemporary research topic in mathematics. He/She is able to establish a connection between his/her acquired skills and other branches of mathematics and applications in other subjects.

 $\textbf{Courses} \ (\textbf{type}, \, \textbf{number of weekly contact hours, language} - \textbf{if other than German})$

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

Language of assessment: English, German if agreed upon with the examiner

Allocation of places --Additional information --Workload --Teaching cycle

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

Module appears in

| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | page 74 / 226 |
|--|---|---------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Master's degree (1 major) Mathematics (2010) Master's degree (1 major) Mathematical Physics (2012) Master's degree (1 major) Computational Mathematics (2012) exchange program Mathematics (2023)



| Module title | | | | Abbreviation |
|-------------------------|--------------------|--|---|--|
| Industrial Statistics 1 | | | | 10-M=AIST-102-m01 |
| Module coord | linator | | Module offered by | |
| Dean of Studi | ies Mathematik (Ma | thematics) | Institute of Mathen | natics |
| ECTS Meth | od of grading | Only after succ. cor | mpl. of module(s) | |
| 10 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | 5 | |
| 1 semester | graduate | ning of the course of the specified regist to qualify for admiss certain percentage the respective deta exercise will be con- sessment. If studer assessment over the gistration for asses will be admitted to ster. For assessmer | or as announced by the ration deadlines. Centerion to assessment of exercises). The leading at the beginning control and the leading to the sement into effect. Strassessment in the control of the sement into effect. | nde via SB@home at the begin- the lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a cturer will inform students about of the course. Registration for the n of will to seek admission to ester, the lecturer will put their re- udents who meet all prerequisites urrent or in the subsequent seme- dents will have to obtain the qua- new. |

Theory of parameter and domain estimates, tests for statistical estimates, distribution models, empirical distribution analysis, comparative analysis, statistical product testing, survey sampling, audit sampling.

Intended learning outcomes

The student masters the fundamental statistical methods for industrial applications.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012) Master's degree (1 major) Mathematics (2010)

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|--|---|---------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Master's degree (1 major) Economathematics (2011)



| Module title | | | | Abbreviation |
|--------------|-----------------------|--|---------------------|--|
| Lie Theory | | | | 10-M=ALTH-102-m01 |
| Module coord | dinator | | Module offered by | |
| Dean of Stud | lies Mathematik (Matl | hematics) | Institute of Mathen | natics |
| ECTS Meth | nod of grading | Only after succ. cor | npl. of module(s) | |
| 10 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | 3 | |
| 1 semester | graduate | Registration for the exercise must be made via SB@home at the beg ning of the course or as announced by the lecturer in accordance wit the specified registration deadlines. Certain prerequisites must be not of qualify for admission to assessment (e.g., successful completion certain percentage of exercises). The lecturer will inform students about the respective details at the beginning of the course. Registration for exercise will be considered a declaration of will to seek admission assessment. If students have obtained the qualification for admission assessment over the course of the semester, the lecturer will put the gistration for assessment into effect. Students who meet all prerequivally be admitted to assessment in the current or in the subsequent ster. For assessment at a later date, students will have to obtain the | | the lecturer in accordance with retain prerequisites must be met (e.g. successful completion of a cturer will inform students about of the course. Registration for the n of will to seek admission to assequalification for admission to ester, the lecturer will put their reudents who meet all prerequisites arrent or in the subsequent seme- |

Linear Lie groups and their Lie algebras, exponential function, structure and classification of Lie algebras, classic examples, applications, e. g. in physics and control theory.

Recommended previous knowledge:

Basic knowledge of the contents of the modules "Functional Analysis" and "Introduction to Topology" is recommended. Furthermore, basic knowledge of the contents of the module "Introduction to Differential Geometry" is useful.

Intended learning outcomes

The student is acquainted with the fundamental results, theorems and methods in Lie theory. He/She is able to apply these to common problems, and knows about the interactions of group theory, analysis, topology and linear algebra.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation |
|---------------|----------------------|---|---------------------|--|
| Numeric of la | rge Systems of Equat | ions | | 10-M=ANGG-102-m01 |
| Module coord | linator | | Module offered by | • |
| Dean of Studi | es Mathematik (Math | ematics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 10 nume | rical grade | | | |
| Duration | Module level | Other prerequisites | ; | |
| 1 semester | graduate | Other prerequisites Registration for the exercise must be made via SB@home at the begining of the course or as announced by the lecturer in accordance with the specified registration deadlines. Certain prerequisites must be more to qualify for admission to assessment (e.g. successful completion of certain percentage of exercises). The lecturer will inform students about the respective details at the beginning of the course. Registration for exercise will be considered a declaration of will to seek admission to sessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their gistration for assessment into effect. Students who meet all prerequipments admitted to assessment in the current or in the subsequent sets. For assessment at a later date, students will have to obtain the collification for admission to assessment anew. | | the lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a sturer will inform students about of the course. Registration for the n of will to seek admission to aster, the lecturer will put their resudents who meet all prerequisites arrent or in the subsequent semedents will have to obtain the quadrates. |

Discretisation of elliptic differential equations, classical iteration methods, preconditioners, multigrid methods.

Recommended previous knowledge:

Basic knowledge of numerical mathematics, such as that acquired in the modules "Numerical Mathematics 1" and "Numerical Mathematics 2", is required. Knowledge of the contents of the module "Basics in Optimization" is also recommended.

Intended learning outcomes

The student is acquainted with the most important methods for solving large systems of equations, and knows the most efficient way to solve a given system of equations.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English

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| Allocation of places |
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| Additional information |
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| Workload |
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| 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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | Abbreviation |
|--------------|----------------------|--|---|
| Basics of Op | timization | | 10-M=AOPT-102-m01 |
| Module coor | dinator | | Module offered by |
| Dean of Stud | lies Mathematik (Mat | hematics) | Institute of Mathematics |
| ECTS Meth | nod of grading | Only after succ. cor | npl. of module(s) |
| 10 num | erical grade | | |
| Duration | Module level | Other prerequisites | 5 |
| 1 semester | graduate | ning of the course of the specified regist to qualify for admiss certain percentage the respective deta exercise will be con- sessment. If studer assessment over the gistration for asses will be admitted to ster. For assessmer | exercise must be made via SB@home at the begin- or as announced by the lecturer in accordance with ration deadlines. Certain prerequisites must be met sion to assessment (e. g. successful completion of a of exercises). The lecturer will inform students about ils at the beginning of the course. Registration for the esidered a declaration of will to seek admission to aster have obtained the qualification for admission to the course of the semester, the lecturer will put their re- sment into effect. Students who meet all prerequisites assessment in the current or in the subsequent seme- at at a later date, students will have to obtain the qua- sion to assessment anew. |

Fundamental methods and techniques in continuous optimization, unrestricted optimization, conditions for optimality, restricted optimization, examples and applications in natural and engineering sciences as well as economics.

Intended learning outcomes

The student knows the fundamental methods of continous optimization, can judge their strengths and weaknesses and can decide which method is the most suitable in applications.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

Teaching cycle

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

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| | data record Master (120 ECTS) Mathematik - 2012 | |



Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation |
|--------------------------------|----------------------|--|---------------------|--|
| Introduction to Control Theory | | | | 10-M=ARTH-102-m01 |
| Module coord | dinator | | Module offered by | • |
| Dean of Stud | ies Mathematik (Math | ematics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 10 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | i e | |
| 1 semester | graduate | Other prerequisites Registration for the exercise must be made via SB@home at the be ning of the course or as announced by the lecturer in accordance we the specified registration deadlines. Certain prerequisites must be to qualify for admission to assessment (e. g. successful completion certain percentage of exercises). The lecturer will inform students at the respective details at the beginning of the course. Registration for exercise will be considered a declaration of will to seek admission assessment. If students have obtained the qualification for admission assessment over the course of the semester, the lecturer will put the gistration for assessment into effect. Students who meet all prerequilible admitted to assessment in the current or in the subsequent ster. For assessment at a later date, students will have to obtain the lification for admission to assessment anew. | | the lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a sturer will inform students about of the course. Registration for the n of will to seek admission to aste qualification for admission to ester, the lecturer will put their redents who meet all prerequisites arrent or in the subsequent semedents will have to obtain the quadrates. |

Introduction to mathematical systems theory: stability, controllability and observability, state feedback and stability, basics in optimal control.

Recommended previous knowledge:

Basic knowledge of the contents of the module "Ordinary Differential Equations" is useful.

Intended learning outcomes

The student is acquainted with the fundamental notions and methods of control theory. He/She is able to establish a connection between these results and broader theories, and learns about the interactions of geometry and other fields of mathematics.

Courses (type, number of weekly contact hours, language — if other than German)

 $V + \ddot{U}$ (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 90 to 120 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German or English

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| allocation of places |
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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | Abbreviation |
|--------------|-----------------------|--|---|
| Stochastic | Models for Risk Analy | rsis | 10-M=ASMR-102-m01 |
| Module co | ordinator | | Module offered by |
| Dean of St | udies Mathematik (Ma | thematics) | Institute of Mathematics |
| ECTS Me | ethod of grading | Only after succ. co | mpl. of module(s) |
| 10 nu | merical grade | | |
| Duration | Module level | Other prerequisite | S |
| 1 semester | graduate | ning of the course the specified regist to qualify for admiss certain percentage the respective deta exercise will be consessment. If stude assessment over the gistration for assess will be admitted to ster. For assessment | exercise must be made via SB@home at the begin- or as announced by the lecturer in accordance with tration deadlines. Certain prerequisites must be met ssion to assessment (e. g. successful completion of a of exercises). The lecturer will inform students about ills at the beginning of the course. Registration for the asidered a declaration of will to seek admission to as- nts have obtained the qualification for admission to ne course of the semester, the lecturer will put their re- sment into effect. Students who meet all prerequisites assessment in the current or in the subsequent seme- nt at a later date, students will have to obtain the qua- sion to assessment anew. |

Measure theory, risk diagrams, failure mode and effects analysis, risk assessment in auditing, shortfall measures, value at risk, conditional value at risk, axiomatic of risk measures, modelling of interdependencies, copula, 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.

Intended learning outcomes

The student is acquainted with the fundamental methods of stochastic risk analysis.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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|--|---|---------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)



| Module title | | | | Abbreviation |
|--------------|-----------------------|--|---|--|
| Stochastica | Processes | | - | 10-M=ASTP-102-m01 |
| Module coor | dinator | | Module offered by | , |
| Dean of Stud | lies Mathematik (Math | nematics) | Institute of Mathem | natics |
| ECTS Met | hod of grading | Only after succ. con | npl. of module(s) | |
| 10 num | erical grade | | | |
| Duration | Module level | Other prerequisites | ; | |
| 1 semester | graduate | ning of the course of the specified registr to qualify for admis certain percentage of the respective detail exercise will be con- sessment. If studen assessment over the gistration for assess will be admitted to ster. For assessment | or as announced by the ration deadlines. Certains to assessment (of exercises). The least the beginning of sidered a declaration its have obtained the ecourse of the sement into effect. Strassessment in the cursessment in the curses. | nde via SB@home at the begin- the lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a cturer will inform students about of the course. Registration for the en of will to seek admission to as- e qualification for admission to ester, the lecturer will put their re- udents who meet all prerequisites urrent or in the subsequent seme- dents will have to obtain the qua- new. |

Markov chains, queues, stochastic processes in C[0,1], Brownian motion, Donsker's theorem, projective limits.

Recommended 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.

Intended learning outcomes

The student is acquainted with the fundamental notions and methods of stochastical processes and can apply them to practical problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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| | data record Master (120 ECTS) Mathematik - 2012 | |



Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation |
|--------------|----------------------|--|--|---|
| Topology | | | | 10-M=ATOP-102-m01 |
| Module coor | dinator | | Module offered by | , |
| Dean of Stud | ies Mathematik (Math | nematics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 10 num | erical grade | | | |
| Duration | Module level | Other prerequisites | 1 | |
| 1 semester | graduate | ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consessment. If studen assessment over the gistration for assess will be admitted to a ster. For assessment | or as announced by the ration deadlines. Certain to assessment (of exercises). The least the beginning of sidered a declaration its have obtained the ecourse of the sement into effect. Strassessment in the cuassessment in the cuasses in the cuasing the c | de via SB@home at the begin- he lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a cturer will inform students about of the course. Registration for the n of will to seek admission to as- e qualification for admission to ester, the lecturer will put their re- udents who meet all prerequisites urrent or in the subsequent seme- dents will have to obtain the qua- new. |

Set-theoretic topology, topological invariants (e. g. fundamental group, connection), construction of topological spaces, covering spaces.

Intended learning outcomes

The student is acquainted with the fundamental results, theorems and methods in topology and is able to apply these to common problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | page 90 / 226 |
|--|---|---------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation |
|---------------|----------------------|--|--|---|
| Insurance Ma | thematics | | | 10-M=AVSM-102-m01 |
| Module coord | linator | | Module offered by | |
| Dean of Studi | ies Mathematik (Math | nematics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 10 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | | |
| 1 semester | graduate | ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consessment. If studen assessment over the gistration for assess will be admitted to a ster. For assessment | r as announced by the ration deadlines. Certain to assessment (of exercises). The lectain at the beginning of sidered a declaration its have obtained the ecourse of the sement into effect. Studies assessment in the curses. | de via SB@home at the beginne lecturer in accordance with tain prerequisites must be met e.g. successful completion of a turer will inform students about of the course. Registration for the n of will to seek admission to aster, the lecturer will put their readents who meet all prerequisites arrent or in the subsequent semedents will have to obtain the quanew. |

The module discusses policies on one life: distributions of future lifetime, life tables, life table approximations, types of benefits, present value, expection principle, premium calculation, commutation functions, reserves and policy values, expenses, bonus, recursive methods, Thiele's differential equation.

Recommended previous knowledge:

Depending on the content, basic and advanced knowledge from different areas of statistics or stochastics is required. In case of doubt, it is recommended to consult the lecturer.

Intended learning outcomes

The student is acquainted with the fundamental notions and methods of life insurance mathematics and can apply them to practical problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places -Additional information -Workload --



Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Economathematics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)



| Module title | • | | | Abbreviation |
|--------------|-----------------------|---|---|---|
| Time Series | Analysis 1 | | | 10-M=AZRA-102-m01 |
| Module coo | rdinator | | Module offered by | |
| Dean of Stu | dies Mathematik (Matl | hematics) | Institute of Mathem | natics |
| ECTS Met | hod of grading | Only after succ. con | npl. of module(s) | |
| 10 nun | nerical grade | | | |
| Duration | Module level | Other prerequisites | . | |
| 1 semester | graduate | ning of the course of the specified registre to qualify for admiss certain percentage of the respective detail exercise will be con- sessment. If studen assessment over the gistration for assess will be admitted to ster. For assessment | or as announced by the ration deadlines. Cer sion to assessment (of exercises). The lectils at the beginning of sidered a declaration its have obtained the e course of the sement into effect. Stuassessment in the cu | de via SB@home at the beginne lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a sturer will inform students about of the course. Registration for the n of will to seek admission to aster, the lecturer will put their resudents who meet all prerequisites arrent or in the subsequent semedents will have to obtain the quanew. |

Additive model, linear filters, autocorrelation, moving average, autoregressive processes, Box-Jenkins method.

Recommended 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.

Intended learning outcomes

The student is acquainted with the fundamental methods of time series analysis and can apply them to practical problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | page 94 / 226 |
|--|---|---------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)



| Module title | | | | Abbreviation |
|---------------|-----------------------|---|---|--|
| Number Theo | ry | | | 10-M=AZTH-102-m01 |
| Module coord | linator | | Module offered by | |
| Dean of Studi | es Mathematik (Mather | natics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 10 nume | rical grade | | | |
| Duration | Module level | Other prerequisites | | |
| 1 semester | graduate | ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consistent. If student assessment over the gistration for assess will be admitted to a | r as announced by the ration deadlines. Ceresion to assessment (of exercises). The lect is at the beginning of sidered a declaration its have obtained the ecourse of the sement into effect. Studies assessment in the cut at a later date, studies. | de via SB@home at the beginne lecturer in accordance with tain prerequisites must be met e.g. successful completion of a turer will inform students about of the course. Registration for the n of will to seek admission to aster, the lecturer will put their residents who meet all prerequisites arrent or in the subsequent semedents will have to obtain the quanew. |

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 "Introduction 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 + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Modul | Module title Abbreviation | | | | |
|------------------------------------|---|---|-----------------------|-----------------------|------------------------------------|
| Learning by teaching Mathematics 1 | | | | 10-M=ELT1-102-m01 | |
| Module coordinator | | Module offered by | | | |
| Dean o | f Studi | es Mathematik (Mathema | atics) | Institute of Mathen | natics |
| ECTS | | od of grading | Only after succ. con | | |
| 5 | | rical grade | | - | |
| Duratio | on | Module level | Other prerequisites | | |
| 1 seme | ster | graduate | | | |
| Conter | its | | | | |
| Superv | ising a | tutorial or study group in | the Bachelor's progi | ramme under guidar | nce of the respective lecturer. |
| Intend | ed lear | ning outcomes | | | |
| | | ains his/her first experied can apply them in praction | | rsity mathematics. H | He/She knows basic didactical |
| Course | s (type | , number of weekly conta | act hours, language – | - if other than Germa | an) |
| Ü (no i | nforma | tion on SWS (weekly con | tact hours) and cours | e language availabl | e) |
| | | sessment (type, scope, la ion on whether module c | | | ation offered — if not every seme- |
| | | nination (approx. 90 min essessment: German, Eng | | | |
| Allocat | ion of | olaces | | | |
| - | | | | | |
| Additio | nal inf | ormation | | | |
| | | | - | | |
| Worklo | ad | | | | |
| | | | | | |
| Teachi | ng cycl | e | | | |
| | | | | | |
| Referre | Referred to in LPO I (examination regulations for teaching-degree programmes) | | | | |
| | | | | | |
| Module | e appea | ars in | | | |
| Master | Master's degree (1 major) Mathematics (2012) | | | | |
| | Master's degree (1 major) Mathematics (2010) | | | | |
| Master | Master's degree (1 major) Mathematical Physics (2012) | | | | |



| Module | e title | | | | Abbreviation |
|----------|---|---|-----------------------|-----------------------|------------------------------------|
| Learnii | Learning by Teaching 2 | | | | 10-M=ELT2-102-m01 |
| Module | Module coordinator | | | Module offered by | |
| | | es Mathematik (Mathema | atics) | Institute of Mathem | natics |
| ECTS | | od of grading | Only after succ. con | | Tatres |
| 5 | | rical grade | | , , , | |
| Duratio | on | Module level | Other prerequisites | | |
| 1 seme | ster | graduate | | | |
| Conten | its | | | | |
| Superv | ising a | tutorial or study group in | the Bachelor's progr | ramme under guidar | ice of the respective lecturer. |
| Intend | ed lear | ning outcomes | | | |
| | _ | ains his/her first experie can apply them in practio | _ | rsity mathematics. F | He/She knows basic didactical |
| Course | s (type | , number of weekly conta | ict hours, language – | - if other than Germa | an) |
| Ü (no iı | nforma | tion on SWS (weekly con | tact hours) and cours | e language available | e) |
| | | sessment (type, scope, la ion on whether module c | | | ation offered — if not every seme- |
| | | nination (approx. 90 min Issessment: German, Eng | - | | |
| Allocat | ion of | places | | | |
| | | | | | |
| Additio | nal inf | ormation | | | |
| | | | | | |
| Worklo | ad | | | | |
| | | | | | |
| Teachi | Teaching cycle | | | | |
| | | | | | |
| Referre | Referred to in LPO I (examination regulations for teaching-degree programmes) | | | | |
| | | | | | |
| Module | Module appears in | | | | |
| | Master's degree (1 major) Mathematics (2012) | | | | |
| Master | Master's degree (1 major) Mathematics (2010) | | | | |



| Module | e title | , | | | Abbreviation |
|----------|---|--|-------------------------|------------------------|---|
| Interns | hip (La | b Course) Applied Math | nematics | | 10-M=EPRK-102-m01 |
| Module | Module coordinator | | | Module offered by | |
| | | es Mathematik (Mathen | natics) | Institute of Mathen | |
| ECTS | | od of grading | Only after succ. con | | iatics |
| 10 | | rical grade | | ipt. or modute(3) | |
| Duratio | | Module level | Other prerequisites | | |
| 1 semes | ster | graduate | Module can only be | taken if a lecturer fr | om the Institute of Mathematics or she will register the student for |
| | | | assessment. | | |
| Conten | ts | | | | |
| Work pl | laceme | ent in economy, industry | , research or administ | tration. | |
| | | ning outcomes | | | |
| | | pplies his/her skills obt research, economy or i | | studies in the maste | r programme to a specific practi- |
| Course | s (type | , number of weekly cont | tact hours, language – | - if other than Germa | an) |
| P (no in | format | ion on SWS (weekly cor | ntact hours) and cours | e language available | e) |
| | | sessment (type, scope, on on whether module | | | ation offered — if not every seme- |
| port on | techni | oort / fieldwork report / cal course (oral: approx ssessment: German, En | a. 30 to 60 minutes, wr | | ctical course / project report / re- 30 pages) |
| Allocati | ion of p | olaces | , | | |
| | | | | | |
| Additio | nal inf | ormation | | | |
| | | | | | |
| Worklo | ad | | | | |
| | | | | | |
| Teachir | Teaching cycle | | | | |
| | | | | | |
| Referre | Referred to in LPO I (examination regulations for teaching-degree programmes) | | | | |
| | | | | | |
| Module | Module appears in | | | | |
| | Master's degree (1 major) Mathematics (2012) | | | | |
| Master' | Master's degree (1 major) Mathematics (2010) | | | | |



| Module | Module title Abbreviation | | | | | |
|---------------------|---------------------------|---|---|---|-------------------|--|
| Study Group Algebra | | | | | 10-M=GALG-102-m01 | |
| Module coordinator | | | | Module offered by | | |
| Dean of | f Studi | es Mathematik (Math | nematics) | Institute of Mathen | natics | |
| ECTS | Metho | od of grading | Only after succ. co | mpl. of module(s) | | |
| 10 | nume | rical grade | | | | |
| Duratio | n | Module level | Other prerequisite | Other prerequisites | | |
| 1 semester graduate | | ning of the course specified registrati ly be open for stud | or as announced by t ion deadlines. Some s lents with previous kr | nde via SB@home at the begin- he lecturer in accordance with the seminars or workshops might on- nowledge and/or skills in certain specified in the class schedule. | | |

Selected modern topics in algebra (e.g. ring theory, commutative algebra, differential algebra, local fields, computer algebra, algebras, division rings, quadratic forms).

Recommended previous knowledge:

Basic knowledge of algebra is assumed, such as can be acquired in the modules "Introduction to Algebra" and "Applied Algebra".

Intended learning outcomes

The student gains insight into contemporary research problems in algebra. He/She masters advanced techniques in this field and can apply them to complex problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 120 minutes, c) written examination (approx. 90 to 120 minutes), d) oral examination of one candidate each (approx. 20 minutes), e) oral examination in groups (groups of 2, approx. 30 minutes) Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)



| Module | e title | | | | Abbreviation | |
|-------------------------------------|-------------------------------|--|---|--|---|--|
| Study Group Discrete Mathematics | | | | | 10-M=GDIM-102-m01 | |
| A4 - J1 | Module coordinator | | | AA - dula - ff - m - d bus | | |
| | | | \ | Module offered by | | |
| Dean of Studies Mathematik (Mathema | | · | Institute of Mathem | natics | | |
| ECTS 10 | | od of grading rical grade | Only after succ. compl. of module(s) | | | |
| Duratio | | Module level | Other prerequisites | | | |
| 1 seme | | graduate | Registration for the seminar must be made via SB@home at the begin | | de via SB@home at the begin- | |
| | | 0 | ning of the course or as announced by the lecturer in accordance with the | | | |
| | | | specified registration deadlines. Some seminars or workshops might on- | | | |
| | | | ly be open for stude | nts with previous kn | owledge and/or skills in certain | |
| | | | areas. Where applicable, details will be specified in the class schedule. | | | |
| Conten | ıts | | | | | |
| Selecte | ed mod | ern topics in discrete ma | thematics. | | | |
| Intend | ed lear | ning outcomes | • | | | |
| | | ains insight into contempes in this field and can ap | | | nematics. He/She masters advan | |
| Course | s (type | , number of weekly conta | ct hours, language – | - if other than Germa | ın) | |
| V + S (ı | no info | mation on SWS (weekly o | contact hours) and co | ourse language avail | able) | |
| | | sessment (type, scope, la | | | tion offered — if not every seme- | |
| minar p sentati of one | present ion of a candid | ation (approx. 60 to 120 pprox. 60 to 120 | minutes), b) written e , c) written examinat utes), e) oral examin | elaboration of conter ion (approx. 90 to 12 | ng methods of assessment: a) sents equivalent to a seminar precominutes), d) oral examination ups of 2, approx. 30 minutes) | |
| Allocat | tion of | olaces | | | | |
| | | | • | | | |
| Additio | onal inf | ormation | | | | |
| | | | | | | |
| Worklo | ad | | | | | |
| | | | | | | |
| Teachi | ng cycl | e | | | | |
| | | | | | | |
| Referre | ed to in | LPO I (examination regu | lations for teaching-o | degree programmes) | | |
| | | | | | | |
| Module | e appea | ars in | | | | |
| | | ee (1 major) Mathematics | 5 (2012) | | | |
| | _ | ee (1 major) Mathematics | | | | |
| 110-4- | | (! | 1 Dl () | | | |



| Module | e title | | | Abbreviation | | | |
|---|----------|----------------------|---|---|--|--|--|
| Study Group Dynamical Systems and Control | | | | | 10-M=GDSR-102-m01 | | |
| Modul | e coord | linator | | Module offered by | L | | |
| Dean o | of Studi | es Mathematik (Mat | hematics) | Institute of Mathen | Institute of Mathematics | | |
| ECTS | Meth | od of grading | Only after succ. co | mpl. of module(s) | | | |
| 10 | nume | rical grade | | | | | |
| Duratio | on | Module level | Other prerequisite | Other prerequisites | | | |
| 1 semester | | graduate | ning of the course of specified registrations be open for students. | or as announced by t on deadlines. Some s ents with previous kr | nde via SB@home at the beginhe lecturer in accordance with the seminars or workshops might onweledge and/or skills in certain specified in the class schedule. | | |
| Conten | nts | | · | | | | |
| Selecte | ed mod | lern topics in dynam | ical systems and control | theory. | | | |

Recommended previous knowledge:

Knowledge of the contents of the module "Mathematical Control Theory" or "Control Theory" is required.

Intended learning outcomes

The student gains insight into contemporary research problems in dynamical systems and control theory. He/ She masters advanced techniques in this field and can apply them to complex problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 120 minutes, c) written examination (approx. 90 to 120 minutes), d) oral examination of one candidate each (approx. 20 minutes), e) oral examination in groups (groups of 2, approx. 30 minutes) Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)



| Modul | Module title Abbreviation | | | | | |
|-------------------------|--------------------------------|--|---|---|--|--|
| Study | Group (| Complex Analysis | | | 10-M=GFTH-102-m01 | |
| Modul | e coord | linator | | Module offered | by ['] | |
| Dean | of Studi | es Mathematik (Mat | hematics) | Institute of Math | nematics | |
| ECTS | Meth | od of grading | Only after succ. cor | npl. of module(s) | | |
| 10 | nume | rical grade | | | | |
| Durati | on | Module level | Other prerequisites | , | | |
| 1 semester | | graduate | ning of the course of specified registration ly be open for stude | Registration for the seminar must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance wit specified registration deadlines. Some seminars or workshops mightly be open for students with previous knowledge and/or skills in certareas. Where applicable, details will be specified in the class schedule. | | |
| Conte | nts | | | | | |
| geome Recom Depen | etric cor nmende ding or | nplex analysis, value d previous knowledg the current focus of | e distribution theory). | om different area | otential theory, complex dynamics, s of analysis is required. Consultati- | |
| | | ning outcomes | | | | |
| | | | | | | |

The student gains insight into contemporary research problems in complex analysis. He/She masters advanced techniques in this field and can apply them to complex problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 120 minutes, c) written examination (approx. 90 to 120 minutes), d) oral examination of one candidate each (approx. 20 minutes), e) oral examination in groups (groups of 2, approx. 30 minutes) Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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 (2012)

Master's degree (1 major) Mathematics (2010)



| Module | e title | | | | Abbreviation |
|------------------------------|-------------------------------------|--|--|--|--|
| Study | Group (| Geometry and Topology | | | 10-M=GGMT-102-m01 |
| Module | e coord | inator | | Module offered by | |
| Dean o | Dean of Studies Mathematik (Mathema | | natics) | cs) Institute of Mathematics | |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 10 numerical grade | | | | | |
| Duratio | on | Module level | Other prerequisites | | |
| 1 semester | | graduate | Registration for the seminar must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Some seminars or workshops might on ly be open for students with previous knowledge and/or skills in certain areas. Where applicable, details will be specified in the class schedule. | | |
| Conten | ıts | | | | |
| Selecte | ed mod | ern topics in geometry a | and topology. | | |
| Intend | ed lear | ning outcomes | | | |
| | | ains insight into contemiques in this field and ca | | | d topology. He/She masters ad- |
| Course | s (type | , number of weekly cont | tact hours, language – | - if other than Germa | an) |
| V + S (1 | no info | rmation on SWS (weekly | contact hours) and co | ourse language avail | able) |
| | | sessment (type, scope, ion on whether module | | | ation offered — if not every seme- |
| minar p sentati of one | present ion of a candid | tation (approx. 60 to 120 pprox. 60 to 120 | o minutes), b) written e es, c) written examinat inutes), e) oral examin | elaboration of conter ion (approx. 90 to 12 | ng methods of assessment: a) se nts equivalent to a seminar pre- 20 minutes), d) oral examination ups of 2, approx. 30 minutes) |
| Allocat | tion of | places | - | | |
| | | | | | |
| Additio | onal inf | ormation | | | |
| | | | | | |
| Worklo | oad | | | | |
| | _ | | | | |
| Teachi | ng cvcl | e | | | |
| | | | | | |
| Referre | ed to in | LPO I (examination reg | ulations for teaching- | degree programmes) | |
| | | (* * * * * * * * * * * * * * * * * * * | , | <u> </u> | |
| Module | e appea | ars in | | | |
| Master | 's degr | ee (1 major) Mathematio ee (1 major) Mathematio | ` ' | | |



| Modul | Module title Abbreviation | | | | | |
|---|---------------------------|--|--|--|--|--|
| Study | Group | Mathematics in its (| Context | | 10-M=GMKX-102-m01 | |
| Modul | e coor | dinator | | Module offered by | | |
| Dean of Studies Mathematik (Mathemat | | hematics) | Institute of Mathematics | | | |
| ECTS | Meth | od of grading | Only after succ. con | Only after succ. compl. of module(s) | | |
| 10 | nume | erical grade | | | | |
| Duration Module level Other prerequisites | | | | | | |
| 1 semester | | graduate | ning of the course o specified registration ly be open for stude | Registration for the seminar must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Some seminars or workshops might on ly be open for students with previous knowledge and/or skills in certain areas. Where applicable, details will be specified in the class schedule. | | |
| Conter | nts | | | | | |
| ven by | a hist | orical period, a geog | | ar field of mathemat | of the history of mathematics, giics. Other possibilities arise from a. | |
| Intend | ed lea | rning outcomes | | | | |
| The stu | udent r | realises the cultural o | dimension of mathematics | and its relation to c | other cultural fields. | |
| Course | es (type | e, number of weekly | contact hours, language – | - if other than Germa | an) | |
| V + S (| no info | ormation on SWS (we | ekly contact hours) and co | ourse language avail | lable) | |
| | | | pe, language — if other th ule can be chosen to earn | | ation offered — if not every seme- | |
| minar sentat of one | presention of a candid | itation (approx. 60 to approx. 60 to 120 mi | o 120 minutes), b) written o nutes, c) written examinat o minutes), e) oral examin | elaboration of conte ion (approx. 90 to 12 | ng methods of assessment: a) sents equivalent to a seminar pre- zo minutes), d) oral examination ups of 2, approx. 30 minutes) | |
| Alloca | tion of | places | | | | |
| | | | | | | |
| Additio | onal in | formation | , | | | |
| | | | | | | |
| Worklo | oad | | | | | |
| | | | , | | | |
| Teachi | ng cvc | le | | | | |
| | | | | | | |
| Referre | ed to i | n LPO I (examination | regulations for teaching- | degree programmes | | |
| | | (* 12 | | <u> </u> | | |
| Modul | e appe | ars in | | | | |
| | | ree (1 major) Mathen | natics (2012) | | | |
| Maste | | ree (1 major) Mathen | | | | |

Master's degree (1 major) Mathematics (2010)



| Module title Abbreviation | | | | | |
|---------------------------|---------|-------------------------|---|---|--|
| Study | Group | Mathematics in the Scie | nces | | 10-M=GMNW-122-m01 |
| Modul | e coord | linator | | Module offered by | |
| Dean o | f Studi | es Mathematik (Mathem | natics) | Institute of Mathematics | |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 10 | nume | rical grade | | | |
| Duratio | on | Module level | Other prerequisites | | |
| 1 semester graduate | | graduate | ning of the course of specified registration ly be open for stude | or as announced by the on deadlines. Some s ents with previous kn | de via SB@home at the beginhe lecturer in accordance with the seminars or workshops might onwledge and/or skills in certain specified in the class schedule. |
| Conter | ıts | | | | |

A modern topic in mathematics in the sciences.

Recommended previous knowledge:

Basic knowledge from the modules "Ordinary Differential Equations" and "Introduction to Partial Differential Equations" is recommended, as well as basic knowledge of functional analysis.

Intended learning outcomes

The student gains insight into contemporary research problems in mathematics in the sciences. He/She masters advanced techniques in this field and can apply them to complex problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 120 minutes, c) written examination (approx. 90 to 120 minutes), d) oral examination of one candidate each (approx. 20 minutes), e) oral examination in groups of 2 candidates (approx. 30 minutes) Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematical Physics (2012)



| | Module title Abbreviation | | | | | | |
|------------|---------------------------|-----------------------|----------------------|--|---|--|--|
| Study | Group I | Measure and Integra | al | | 10-M=GMUI-102-m01 | | |
| Modul | e coord | linator | | Module offe | red by | | |
| Dean c | of Studi | es Mathematik (Mat | hematics) | Institute of N | Mathematics | | |
| ECTS | Meth | od of grading | Only after su | cc. compl. of module | e(s) | | |
| 10 | nume | rical grade | | | | | |
| Duratio | on | Module level | Other prereq | uisites | | | |
| 1 semester | | graduate | ning of the co | Registration for the seminar must be made via SB@home at the begining of the course or as announced by the lecturer in accordance with specified registration deadlines. Some seminars or workshops might be open for students with previous knowledge and/or skills in cert | | | |
| | | | 1 ' ' | areas. Where applicable, details will be specified in the class schedule. | | | |
| Conter | ıts | | | | | | |
| functio | ns and | Lebesgue integrals | , selected applicati | | s, volume and measure, measurable easures (with Fubini's theorem and the pological spaces. | | |
| Intend | ed lear | ning outcomes | | | | | |
| | | | | n problems in measu y them to complex p | re and integration theory. He/She maroblems. | | |
| Course | es (type | , number of weekly | contact hours, lang | uage — if other than | German) | | |
| V + S (ı | no info | rmation on SWS (we | ekly contact hours) | and course languag | re available) | | |
| | | sessment (type, sco | | | xamination offered — if not every seme | | |
| minar | present | tation (approx. 60 to | 120 minutes), b) w | ritten elaboration of | following methods of assessment: a) s contents equivalent to a seminar pre- to to 120 minutes), d) oral examination | | |

Allocation of places

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Additional information

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Workload

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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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)



| Module title | | | | | Abbreviation | |
|---|----------|-----------------------|--|-----------------------|-------------------|--|
| Study Group Numerical Mathematics and Applied Analysi | | | | | 10-M=GNMA-102-m01 | |
| Module coordinator | | | | Module offered by | | |
| Dean c | of Studi | es Mathematik (Math | ematics) | Institute of Mathen | natics | |
| ECTS | Meth | od of grading | Only after succ. compl. of module(s) | | | |
| 10 | nume | erical grade | | | | |
| Durati | on | Module level | Other prerequisites | Other prerequisites | | |
| 1 semester graduate Registration for the seminar must be made via SB@home at the ning of the course or as announced by the lecturer in accordance specified registration deadlines. Some seminars or workshops my be open for students with previous knowledge and/or skills in areas. Where applicable, details will be specified in the class sch | | | he lecturer in accordance with the seminars or workshops might on- nowledge and/or skills in certain | | | |
| Conte | nts | | • | | | |
| Select | ed topi | cs in numerical mathe | ematics, applied analysis | s or scientific compu | ting. | |

Selected topics in numerical mathematics, applied analysis or scientific computing.

Recommended previous knowledge:

Depending on the content, basic and advanced knowledge from different areas of analysis and/or numerical mathematics is required. In case of doubt, it is recommended to consult the lecturer.

Intended learning outcomes

The student gains insight into a contemporary research problems in numerical mathematics or applied analysis. He/She masters advanced techniques in this field and can apply them to complex problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 120 minutes, c) written examination (approx. 90 to 120 minutes), d) oral examination of one candidate each (approx. 20 minutes), e) oral examination in groups (groups of 2, approx. 30 minutes) Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | | Abbreviation |
|--|--|-------------------------|--|--|---|
| Study Group Robotic, Optimization and Control Theory | | | | | 10-M=GROK-102-m01 |
| Modul | Module coordinator | | | Module offered by | |
| Dean c | of Studi | es Mathematik (Mather | natics) | Institute of Mathen | natics |
| ECTS | Method of grading Only after succ. compl. of module(s) | | | | |
| 10 | nume | erical grade | | | |
| Duratio | on | Module level | Other prerequisites | | |
| 1 semester graduate Reg ning spe ly b | | | ning of the course o specified registration ly be open for stude | r as announced by t n deadlines. Some s nts with previous kr | ide via SB@home at the beginhe lecturer in accordance with the seminars or workshops might onlowledge and/or skills in certain specified in the class schedule. |
| Conter | nts | 1 | | | |
| Selecti | ed mod | lern tonics in robotics | ontimisation and contr | ol theory | |

Selected modern topics in robotics, optimisation and control theory.

Recommended previous knowledge:

Knowledge of the contents of the module "Mathematical Control Theory" or "Control Theory" is required.

Intended learning outcomes

The student gains insight into contemporary research problems in robotics, optimization and control theory. He/ She masters advanced techniques in this field and can apply them to complex problems.

Courses (type, number of weekly contact hours, language - if other than German)

V + S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 120 minutes, c) written examination (approx. 90 to 120 minutes), d) oral examination of one candidate each (approx. 20 minutes), e) oral examination in groups (groups of 2, approx. 30 minutes) Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| | up Statistics | | Module title Abbreviation | | | | |
|---------------------------------------|-------------------------|---|--|---|--|--|--|
| Module co | | | | 10-M=GSTA-102-m01 | | | |
| | oordinator | | Module offered by | | | | |
| Dean of S | tudies Mathematik (Matl | nematics) | Institute of Mathen | natics | | | |
| ECTS M | ethod of grading | Only after succ. con | npl. of module(s) | | | | |
| 10 ni | umerical grade | | | | | | |
| Duration | Module level | Other prerequisites | Other prerequisites | | | | |
| 1 semeste | er graduate | ning of the course o specified registratio ly be open for stude | or as announced by to on deadlines. Some s ents with previous kr | nde via SB@home at the beginhe lecturer in accordance with the seminars or workshops might onwowledge and/or skills in certain specified in the class schedule. | | | |
| Contents | | | | | | | |
| Selected modern topics in statistics. | | | | | | | |

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 prior knowledge may also be helpful; consultation with the lecturer is recommended.

Intended learning outcomes

The student gains insight into contemporary research problems in statistics. He/She masters advanced techniques in this field and can apply them to complex problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 120 minutes, c) written examination (approx. 90 to 120 minutes), d) oral examination of one candidate each (approx. 20 minutes), e) oral examination in groups (groups of 2, approx. 30 minutes) Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)



| Module title Abbreviation | | | | | |
|----------------------------------|---------------------|--|---|--|--|
| Study Group Time Series Analysis | | | | | 10-M=GZRA-102-m01 |
| Module coordinator | | | | Module offered by | 1 |
| Dean o | of Studi | es Mathematik (Math | nematics) | Institute of Mather | matics |
| ECTS | Metho | od of grading | Only after succ. co | mpl. of module(s) | |
| 10 | nume | rical grade | | | |
| Durati | on | Module level | Other prerequisite | S | |
| 1 seme | ester | graduate | Registration for the | e seminar must be m | ade via SB@home at the begin- |
| | | | ning of the course | or as announced by | the lecturer in accordance with the |
| | | | · - | | seminars or workshops might on- |
| | | | 1 ' | • | nowledge and/or skills in certain |
| | | | areas. Where appl | cable, details will be | e specified in the class schedule. |
| Conte | nts | | | | |
| Select | ed mod | ern topics in time se | ries analysis. | | |
| | | d previous knowledg | | aguirad in tha "Ctack | anatias «" madula Knowladas af |
| | | | astics 2" is also recomm | | nastics 1" module. Knowledge of |
| | | ning outcomes | | | |
| | _ | _ | temporary research prob In apply them to comple | | analysis. He/She masters advan- |
| | <u>·</u> | | ontact hours, language | • | an) |
| | | • | ekly contact hours) and o | | · · · · · · · · · · · · · · · · · · · |
| Metho | d of ass | sessment (type, scop | | han German, examin | ation offered — if not every seme- |
| • | _ | | | • | |
| minar sentat | present ion of a | ation (approx. 60 to pprox. 60 to 120 min | 120 minutes), b) written lutes, c) written examina | elaboration of contention (approx. 90 to 1 | ing methods of assessment: a) seents equivalent to a seminar pre- 20 minutes), d) oral examination oups of 2, approx. 30 minutes) |
| | | ssessment: German | | | |
| Alloca | tion of I | olaces | | | |

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)



| Module title Abbreviation | | | | | |
|---|--|--|---|--|--|
| Study Group Number Theory | | | | | 10-M=GZTH-102-m01 |
| Modul | e coord | inator | | Module offered by | |
| Dean c | of Studi | es Mathematik (Mathem | atics) | Institute of Mathen | natics |
| ECTS | | od of grading | Only after succ. co | mpl. of module(s) | |
| 10 | nume | rical grade | | | |
| Duratio | on | Module level | Other prerequisites | | |
| 1 seme | ester | graduate | ning of the course of | or as announced by t | ade via SB@home at the begin- he lecturer in accordance with the |
| | | | 1 ' | | seminars or workshops might on- |
| | | | 1 ' | · | nowledge and/or skills in certain specified in the class schedule. |
| Conter | | | areas. Wriere applic | cable, details will be | specified in the class schedule. |
| | 11.5 | | | | |
| Selecte | ed mod | ern topics in number the | eory (e. g. algebraic n | umber theory, modu | lar forms, diophantine analysis). |
| Recom Basic k | mende knowled | d previous knowledge: | per theory is assumed | l, such as can be acq | lar forms, diophantine analysis). Juired in the modules "Introducti- |
| Recom Basic k on to A | mende knowled Algebra | d previous knowledge: dge of algebra and numb | per theory is assumed | l, such as can be acq | , |
| Recom Basic k on to A Intendent | mende knowled Algebra ed lear udent g | d previous knowledge: dge of algebra and numb ", "Introduction to Numb ning outcomes | per theory is assumed er Theory" and "Appl porary research prob | I, such as can be acq ied Algebra". lems in numer theory | , |
| Recom Basic k on to A Intend The stu niques | mende knowled Algebra ed lear udent g s in this | d previous knowledge: dge of algebra and numb ", "Introduction to Numb ning outcomes ains insight into contem | per theory is assumed er Theory" and "Appl porary research prob m to complex problen | I, such as can be acq ied Algebra". lems in numer theory | juired in the modules "Introducti- y. He/She masters advanced tech |
| Recom Basic k on to A Intend The stu niques | mende knowled Algebra ed lear udent g in this | d previous knowledge: dge of algebra and numb ", "Introduction to Numb ning outcomes ains insight into contem field and can apply ther | per theory is assumed er Theory" and "Appl porary research prob n to complex problen act hours, language - | I, such as can be acq ied Algebra". lems in numer theory ns. – if other than Germa | uired in the modules "Introducti- y. He/She masters advanced tech |
| Recom Basic k on to A Intend The stu niques Course V + S (I | mende knowled Algebra' ed lear udent g is in this es (type no infor | d previous knowledge: dge of algebra and numb ", "Introduction to Numb ning outcomes ains insight into contem field and can apply ther number of weekly cont | per theory is assumed the Theory" and "Applored Theory" and "Applored Theory research problem to complex problem act hours, language contact hours) and canguage — if other the contact hours. | I, such as can be acquied Algebra". lems in numer theoryns. if other than German ourse language avail | uired in the modules "Introducti- y. He/She masters advanced tech |
| Recom Basic k on to A Intend The stuniques Course V + S (I Methoster, in At the I minar I sentation | ed lear udent g in this es (type no informat beginni present ion of a candid | d previous knowledge: dge of algebra and numb ", "Introduction to Numb ning outcomes ains insight into contem field and can apply ther number of weekly cont rmation on SWS (weekly sessment (type, scope, l ion on whether module of ing of the course, the lect ation (approx. 60 to 120 pprox. 60 to 120 minute ate each (approx. 20 minute | porary research probes to complex problem to complex problem act hours, language contact hours) and contact hours are and contact hours are an expectation. | I, such as can be acquied Algebra". lems in numer theoryns. if other than German ourse language avail an German, examinan a bonus) or two of the followielaboration of contestion (approx. 90 to 12 | y. He/She masters advanced technology. He/She masters advanced tec |
| Recom Basic k on to A Intend The stu niques Course V + S (n Methor ster, in At the l minar p sentation of one Languar | ed lear udent g in this es (type no informat beginni present ion of a candid | d previous knowledge: dge of algebra and numb ", "Introduction to Numb ning outcomes ains insight into contem field and can apply ther rmation on SWS (weekly rmation on SWS (weekly sessment (type, scope, l ion on whether module of ing of the course, the lect ation (approx. 60 to 120 pprox. 60 to 120 minute ate each (approx. 20 minute ate each (approx. 20 minusessessment: German, En | porary research probes to complex problem to complex problem act hours, language contact hours) and contact hours are and contact hours are an expectation. | I, such as can be acquied Algebra". lems in numer theoryns. if other than German ourse language avail an German, examinan a bonus) or two of the followielaboration of contestion (approx. 90 to 12 | y. He/She masters advanced techan) lable) ation offered — if not every sements equivalent to a seminar prezo minutes), d) oral examination |

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)



| Modu | le title | | | | Abbreviation | |
|--|--|----------------------|--|--|--|--|
| Maste | er Thesis | Mathematics | | | 10-M=MAAR-102-m01 | |
| Modu | le coord | inator | | Module offered by | | |
| Dean of Studies Mathematik (Mathematics) | | | thematics) | Institute of Mathen | natics | |
| ECTS | | | | npl. of module(s) | | |
| 30 | nume | rical grade | | | | |
| Durati | uration Module level Other prerequi | | | | | |
| 1 sem | ester | graduate | supervisor. The sup | Registration for assessment and assignment of topic in consultation with supervisor. The supervisor may make the successful completion of certain modules that are relevant for the respective topic a prerequisite for the assignment of the topic. | | |
| Conte | nts | | | | | |
| Indep | endently | y researching and w | riting on a topic in mather | natics selected in co | onsultation with the supervisor. | |
| Intend | ded lear | ning outcomes | | | | |
| tained suitab | d during ole form. | his/her studies in t | he master programme. He | /She can write down | pply the skills and methods ob- the result of his/her work in a | |
| | | • | contact hours, language – | - if other than Germa | an) | |
| | urses as | | | | | |
| | | | pe, language — if other thouseled in the can be chosen to earn | | ation offered — if not every seme- | |
| | n thesis age of a | ssessment: Germar | n, English | | | |
| Alloca | tion of | olaces | | | | |
| | | | | | | |
| Additi | ional inf | ormation | | | | |
| | | | | | | |
| Workl | oad | | , | | | |
| | | | | | | |
| Teach | ing cycl | e | | | | |
| | | | | | | |
| Referr | red to in | LPO I (examination | regulations for teaching- | degree programmes) | | |
| | | | | | | |
| Modu | le appea | ars in | | | | |
| | Master's degree (1 major) Mathematics (2012) Master's degree (1 major) Mathematics (2010) | | | | | |



| Module title Ab | | | | | Abbreviation |
|--|---------------------------------------|------------------------|---|---|--|
| Seminar in Applied Differential Geometry | | | | | 10-M=SADG-102-m01 |
| Module coordinator | | | | Module offered by | |
| Dean o | f Studi | es Mathematik (Mathema | atics) | Institute of Mathem | natics |
| ECTS | Method of grading Only after succ. co | | | npl. of module(s) | |
| 5 | nume | rical grade | | | |
| Duratio | on | Module level | Other prerequisites | | |
| 1 semester graduate Registration ning of the c specified reg | | | ning of the course o specified registratio ly be open for stude | r as announced by tl n deadlines. Some s nts with previous kn | de via SB@home at the beginhe lecturer in accordance with the seminars or workshops might onwledge and/or skills in certain specified in the class schedule. |
| Conten | ıts | * | • | | |

A modern 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", "Pseudo-Riemannian and Riemannian Geometry" and "Lie Theory" is also recommended.

Intended learning outcomes

The student is able to elaborate a contemporary research topic. This includes comprehending and structuring of the topic and the available literature, preparing a talk and the ability to participate in a scientific discussion.

Courses (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 90 minutes

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)



| Module title | | | | | Abbreviation |
|---------------------------|---------|---|---|---|-------------------|
| Seminar in Algebra | | | | | 10-M=SALG-102-m01 |
| Module coordinator | | | | Module offered by | |
| Dean c | f Studi | es Mathematik (Mathem | atics) | Institute of Mathem | natics |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 5 | nume | rical grade | | | |
| Duratio | on | Module level | Other prerequisites | | |
| 1 semester graduate | | ning of the course o specified registratio ly be open for stude | r as announced by tl n deadlines. Some s nts with previous kn | de via SB@home at the begin- ne lecturer in accordance with the seminars or workshops might on- owledge and/or skills in certain specified in the class schedule. | |
| Conter | its | | | | |
| A madaya tanic in algebra | | | | | |

A modern topic 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".

Intended learning outcomes

The student is able to elaborate a contemporary research topic. This includes comprehending and structuring of the topic and the available literature, preparing a talk and the ability to participate in a scientific discussion.

Courses (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 90 minutes

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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 (2012)

Master's degree (1 major) Mathematics (2010)



| Module title Abbreviation | | | | | |
|---------------------------|---|---|--|--|--|
| Seminar in D | Dynamical Systems a | nd Control | | 10-M=SDSR-102-m01 | |
| Module coor | rdinator | | Module offered by | <u>, </u> | |
| Dean of Stud | dies Mathematik (Ma | thematics) | Institute of Mathe | matics | |
| ECTS Met | hod of grading | Only after succ. cor | mpl. of module(s) | | |
| 5 num | erical grade | | | | |
| Duration | Module level | Other prerequisites | 5 | | |
| ı semester | graduate | ning of the course of specified registration ly be open for students. | or as announced by on deadlines. Some ents with previous k | ade via SB@home at the begin- the lecturer in accordance with the seminars or workshops might on- nowledge and/or skills in certain e specified in the class schedule. | |
| Contents | | | | | |
| | pic in dynamical syst led previous knowled | | | | |

The student is able to elaborate a contemporary research topic. This includes comprehending and structuring of the topic and the available literature, preparing a talk and the ability to participate in a scientific discussion.

Courses (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 90 minutes

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)



| Module title | | | | | Abbreviation | |
|-----------------------------|---------|---|---|---|-------------------|--|
| Seminar in Complex Analysis | | | | | 10-M=SFTH-102-m01 | |
| Modul | e coord | linator | | Module offered by | | |
| Dean o | f Studi | es Mathematik (Matl | nematics) | Institute of Mathen | natics | |
| ECTS | Meth | od of grading | Only after succ. co | mpl. of module(s) | | |
| 5 | nume | erical grade | | | | |
| Duratio | on | Module level | Other prerequisite | isites | | |
| 1 semester graduate | | ning of the course specified registrati ly be open for stud | or as announced by t on deadlines. Some s ents with previous kr | ide via SB@home at the beginhe lecturer in accordance with the seminars or workshops might onwowledge and/or skills in certain specified in the class schedule. | | |
| Conter | ıts | | | | | |
| A mod | ern top | ic in complex analys | s. | | | |

Recommended previous knowledge:

Basic knowledge of the contents of the modules "Introduction to Complex Analysis" and " Complex Analysis" is recommended.

Intended learning outcomes

The student is able to elaborate a contemporary research topic. This includes comprehending and structuring of the topic and the available literature, preparing a talk and the ability to participate in a scientific discussion.

 ${f Courses}$ (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 90 minutes

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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 (2012)

Master's degree (1 major) Mathematics (2010)



| Module title | | | | | Abbreviation | |
|--|--------------------|---|--|---|-----------------------------------|--|
| Seminar Financial and Insurance Mathematics | | | thematics | | 10-M=SFVM-102-m01 | |
| Module | Module coordinator | | | Module offered by | , | |
| Dean o | f Studi | es Mathematik (Mathe | matics) | Institute of Mathe | matics | |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | n | Module level | Other prerequisites | Other prerequisites | | |
| 1 seme | ster | graduate | ning of the course o specified registration ly be open for stude | Registration for the seminar must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Some seminars or workshops might only be open for students with previous knowledge and/or skills in certain areas. Where applicable, details will be specified in the class schedule. | | |
| Conten | ts | | | | | |
| A modern topic in financial and insurance mathematics. | | | | | | |
| | | d previous knowledge: th the contents of the m | | o Stochastic Financ | ial Mathematics" and "Stochastics | |

1" is strongly recommended.

Intended learning outcomes

The student is able to elaborate a contemporary research topic. This includes comprehending and structuring of the topic and the available literature, preparing a talk and the ability to participate in a scientific discussion.

Courses (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 90 minutes

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)



| Module | Module title Abbreviation | | | | | |
|----------------------------------|---|--------------------|---|--|---|--|
| Seminar in Geometry and Topology | | | | • | 10-M=SGMT-102-m01 | |
| Module | e coord | linator | | Module offered b |) | |
| Dean o | f Studi | es Mathematik (Mat | hematics) | Institute of Math | ematics | |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | | |
| 5 | nume | erical grade | | | | |
| Duratio | on | Module level | Other prerequisites | | | |
| 1 seme | ester | graduate | ning of the course of specified registration ly be open for stude | r as announced by In deadlines. Som Ints with previous | made via SB@home at the begin- y the lecturer in accordance with the e seminars or workshops might on- knowledge and/or skills in certain be specified in the class schedule. | |
| Conten | ıts | | | | | |
| Recom Basic k | Contents A modern topic in geometry and topology. Recommended previous knowledge: Basic knowledge of the contents of the modules "Introduction to Differential Geometry" and "Introduction to Topology" is recommended. | | | | | |
| Intend | ed lear | ning outcomes | | | | |

The student is able to elaborate a contemporary research topic. This includes comprehending and structuring of the topic and the available literature, preparing a talk and the ability to participate in a scientific discussion.

Courses (type, number of weekly contact hours, language - if other than German)

S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 90 minutes

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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 (2012)

Master's degree (1 major) Mathematics (2010)



| e title | | | | Abbreviation |
|---|---|--|--|--|
| ni-Proc | li Seminar (Master) | | | 10-M=SGPC-102-m01 |
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| | | | ipi. or module(s) | |
| | | Other prerequisites | | |
| | | | seminar must be ma | de via SB@home at the begin- |
| | J | _ | | _ |
| | | specified registratio | n deadlines. Some s | seminars or workshops might on- |
| | | ly be open for stude | nts with previous kn | owledge and/or skills in certain |
| | | areas. Where applic | able, details will be | specified in the class schedule. |
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| ern topi | c in the research expertis | se of the current hold | er of the Giovanni Pı | rodi Chair. |
| ed learı | ning outcomes | | | |
| The student is able to elaborate a contemporary research topic. This includes comprehending and structuring | | | | omprehending and structuring of |
| ic and | the available literature, p | reparing a talk and th | ne ability to participa | ate in a scientific discussion. |
| s (type | , number of weekly conta | ct hours, language – | · if other than Germa | n) |
| nformat | ion on SWS (weekly cont | act hours) and cours | e language available | 2) |
| | | | | tion offered $-$ if not every seme- |
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| | | minutes), b) written e | elaboration of conter | its equivalent to a seminar pre- |
| | | nan if agreed upon w | ith the examiner | |
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| nal inf | ormation | | | |
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| | | tations for teaching t | zegree programmes) | |
| e annea | nrs in | | | |
| | | (2012) | | |
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| _ | · · · · · | | | |
| Master's degree (1 major) Economathematics (2011) Master's degree (1 major) Mathematical Physics (2012) | | | | |
| | mi-Proce coord f Studio Metho nume on ster ts ern topi ed learn ident is ic and s (type informati peginni present on of a ige of a | ri-Prodi Seminar (Master) c coordinator f Studies Mathematik (Mathematical Studies Mathematik (Mathematical Studies Mathematik (Mathematical Studies Mathematical Grade m | mi-Prodi Seminar (Master) c coordinator f Studies Mathematik (Mathematics) Method of grading numerical grade m Module level m Registration for the enting of the course of specified registration by be open for stude areas. Where applicates ment topic in the research expertise of the current hold ded learning outcomes determing outcomes deferming of the course, language deferming outcomes deferming outcomes deferming outcomes deferming of the course, language deferming outcomes deferming outcomes deferming of the course deferming outcomes deferming of the course deferming outcomes deferming of the course deferming outcomes deferming of the course deferming of the course deferming of the course deferming outcomes deferming outcomes deferming outcomes d | Ini-Prodi Seminar (Master) a coordinator f Studies Mathematik (Mathematics) Method of grading numerical grade on Module level graduate Meduate Meduate Meduate Module level Grading Gradiate Meduate Megistration for the seminar must be maning of the course or as announced by the specified registration deadlines. Some sort in the seminar must be maning of the course or as announced by the open for students with previous knareas. Where applicable, details will be set to be detained to the Giovanni Product of the Gi |



| Modul | le title | | | | Abbreviation |
|--|--|---------------------------|-------------------------|-----------------------|-------------------------------------|
| Interd | isciplin | ary Seminar | | | 10-M=SIDZ-102-m01 |
| Modul | le coord | inator | | Module offered by | |
| Dean o | of Studi | es Mathematik (Mathem | atics) | Institute of Mathem | natics |
| ECTS | Metho | od of grading | Only after succ. con | ipl. of module(s) | |
| 5 | nume | rical grade | | • | |
| Durati | on | Module level | Other prerequisites | | |
| 1 seme | ester | graduate | Registration for the | seminar must be ma | nde via SB@home at the begin- |
| | | | 1 - | • | he lecturer in accordance with the |
| | | | 1 ' | | seminars or workshops might on- |
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| | | | areas. Where applic | able, details will be | specified in the class schedule. |
| Conte | nts | | | | |
| A mod | lern topi | c in mathematics with ir | terdisciplinary aspec | ts. | |
| Intend | led lear | ning outcomes | | | |
| | | | | | omprehending and structuring of |
| the topic and the available literature, preparing a talk and the ability to participate in a scientific discussion. Courses (type, number of weekly contact hours, language — if other than German) | | | | | |
| | | ion on SWS (weekly con | | | |
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| | | on on whether module o | | | ation offered — If flot every seme- |
| At the | beginni | ng of the course, the lec | turer will choose one | or two of the followi | ng methods of assessment: a) se- |
| | | | minutes), b) written e | elaboration of conte | nts equivalent to a seminar pre- |
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| | | ssessment: German, Eng | 311511 | | |
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| Additi | onal inf | ormation | | | |
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| Teachi | ing cycl | e | _ | | |
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| Referr | ed to in | LPO I (examination regu | ulations for teaching-o | degree programmes) | |
| | | | | | |
| Modul | le appea | nrs in | | | |
| Maste | r's degr | ee (1 major) Mathematic | s (2012) | | |
| Macta | Master's degree (4 major) Mathematics (2012) | | | | |

Master's degree (1 major) Mathematics (2010) Master's degree (1 major) Economathematics (2011) Master's degree (1 major) Mathematical Physics (2012) Master's degree (1 major) Computational Mathematics (2012)



| Module | | | | | Abbreviation | |
|--|---|----------------------|---|--|------------------------------------|--|
| Semina | ar in M | athematics in the So | ciences | | 10-M=SMNW-122-m01 | |
| Module | coord | linator | | Module offered b | у | |
| Dean o | f Studi | es Mathematik (Mat | hematics) | Institute of Mathe | ematics | |
| ECTS | Meth | od of grading | Only after succ. co | mpl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | Duration Module level Other prerequisites | | | | | |
| - | | | Registration for the seminar must be made via SB@home at the begin- | | | |
| | | | | ning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Some seminars or workshops might on- | | |
| | | | ' = | | knowledge and/or skills in certain | |
| | | | 1 ' ' | • | e specified in the class schedule. | |
| Conten | ts | | <u>, </u> | | | |
| A mode | ern top | ic in mathematics in | the sciences. | | | |
| Recom | mende | d previous knowled | ge: | | | |
| Basic knowledge from the modules "Ordinary Differential Equations" and "Introduction to Partial Differential Equations" is recommended, as well as basic knowledge of functional analysis. | | | | | | |
| Intended learning outcomes | | | | | | |

Courses (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 90 minutes

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematical Physics (2012)



| Module | e title | | | | Abbreviation |
|---------|----------|----------------------|--|---|--|
| Semina | ar in Nu | ımerical Mathematics | and Applied Analysis | | 10-M=SNMA-102-m01 |
| Module | e coord | inator | | Module offered by | |
| Dean o | f Studi | es Mathematik (Mathe | ematics) | Institute of Mathem | natics |
| ECTS | Meth | od of grading | Only after succ. compl. of module(s) | | |
| 5 | nume | rical grade | | | |
| Duratio | on | Module level | Other prerequisites | 1 | |
| 1 seme | ster | graduate | ning of the course o specified registration ly be open for stude | or as announced by the on deadlines. Some s onts with previous kn | de via SB@home at the beginhe lecturer in accordance with the seminars or workshops might onwledge and/or skills in certain specified in the class schedule. |
| Conten | nts | L | | | • |

A modern topic in numerical mathematics or applied analysis.

Recommended previous knowledge:

Depending on the content, basic and advanced knowledge from different areas of analysis and/or numerical mathematics is required. In case of doubt, it is recommended to consult the lecturer.

Intended learning outcomes

The student is able to elaborate a contemporary research topic. This includes comprehending and structuring of the topic and the available literature, preparing a talk and the ability to participate in a scientific discussion.

Courses (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 90 minutes

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Modul | e title | | | | Abbreviation | |
|---------|-----------------------------|-----------------------|---|---|--|--|
| Semina | ar in O _l | ptimization | | | 10-M=SOPT-102-m01 | |
| Modul | e coord | linator | | Module offered by | | |
| Dean o | f Studi | es Mathematik (Mat | thematics) | Institute of Mathen | natics | |
| ECTS | Meth | od of grading | Only after succ. co | npl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | Duration Module level Other | | Other prerequisites | Other prerequisites | | |
| 1 seme | ester | graduate | ning of the course of specified registration ly be open for students. | Registration for the seminar must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Some seminars or workshops might only be open for students with previous knowledge and/or skills in certain areas. Where applicable, details will be specified in the class schedule. | | |
| Conter | its | | | | | |
| A mod | ern top | ic in optimisation. | | | | |
| Intend | ed lear | ning outcomes | | | | |
| The stu | ıdent is | s able to elaborate a | , , | • | omprehending and structurin ate in a scientific discussion | |

Courses (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 90 minutes

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Module | e title | | | | Abbreviation | |
|---------|----------|--------------------|---|---|-------------------|--|
| Semina | ar in St | atistics | | | 10-M=SSTA-102-m01 | |
| Module | e coord | inator | | Module offered by | | |
| Dean o | f Studi | es Mathematik (Mat | hematics) | Institute of Mather | natics | |
| ECTS | Meth | od of grading | Only after succ. | Only after succ. compl. of module(s) | | |
| 5 | nume | rical grade | | | | |
| Duratio | n | Module level | Other prerequisi | tes | | |
| 1 seme | ster | graduate | ning of the cours specified registra ly be open for stu | Registration for the seminar must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Some seminars or workshops might only be open for students with previous knowledge and/or skills in certain areas. Where applicable, details will be specified in the class schedule. | | |

A modern topic in statistics.

Recommended 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 prior knowledge may also be helpful; consultation with the lecturer is recommended.

Intended learning outcomes

The student is able to elaborate a contemporary research topic. This includes comprehending and structuring of the topic and the available literature, preparing a talk and the ability to participate in a scientific discussion.

Courses (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one or two of the following methods of assessment: a) seminar presentation (approx. 60 to 120 minutes), b) written elaboration of contents equivalent to a seminar presentation of approx. 60 to 90 minutes

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)



| Module | title | | | " | Abbreviation |
|-----------------------------|------------------------------------|-------------------|---|---|-------------------|
| Selected Topics in Analysis | | | | _ | 10-M=VANA-122-m01 |
| Module | coord | inator | | Module offered by | |
| Dean of | Studie | es Mathematik (Ma | thematics) | Institute of Mathem | natics |
| ECTS | Metho | od of grading | Only after succ. co | mpl. of module(s) | |
| 10 | nume | rical grade | | | |
| Duration | n Module level Other prerequisites | | | | |
| 1 semes | ter | graduate | sessment. The lect at the beginning of sidered a declarati dents have obtained the course of the sessment into effected to assessment sessment at a later | Other prerequisites Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective deat the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment the course of the semester, the lecturer will put their registration for sessment into effect. Students who meet all prerequisites will be a ted to assessment in the current or in the subsequent semester. For sessment at a later date, students will have to obtain the qualification admission to assessment anew. | |

Contents

In-depth discussion of a specialised topic in analysis taking into account recent developments and interrelations with other mathematical concepts.

Recommended previous knowledge:

Depending on the content, basic and advanced knowledge from different areas of analysis is required. In case of doubt, it is recommended to consult the lecturer.

Intended learning outcomes

The student is acquainted with advanced results in a selected topic in analysis, and is able to apply these to complex problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (approx. 90 to 120 minutes; usually chosen), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups of 2 candidates (approx. 30 minutes total)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

| Language of assessment: German, English |
|---|
| Allocation of places |
| - |
| Additional information |
| + |
| Workload |
| - |
| Teaching cycle |
| - |
| Referred to in LPO I (examination regulations for teaching-degree programmes) |
| - |
| |



Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation |
|--------------|---------------------|--|--|-------------------|
| Algebraic To | pology | | | 10-M=VATP-102-m01 |
| Module coor | dinator | | Module offered by | |
| Dean of Stud | lies Mathematik (Ma | thematics) | Institute of Mathen | natics |
| ECTS Meth | nod of grading | Only after succ. co | mpl. of module(s) | |
| 10 num | erical grade | | | |
| Duration | Module level | Other prerequisites | S | |
| 1 semester | graduate | ning of the course of the specified regist to qualify for admiss certain percentage the respective deta exercise will be con sessment. If studen assessment over the gistration for asses will be admitted to | Other prerequisites Registration for the exercise must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Certain prerequisites must be ment to qualify for admission to assessment (e. g. successful completion of certain percentage of exercises). The lecturer will inform students about the respective details at the beginning of the course. Registration for the exercise will be considered a declaration of will to seek admission to a sessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their gistration for assessment into effect. Students who meet all prerequisification for assessment at a later date, students will have to obtain the qualification for admission to assessment anew. | |

Homology, homotopy invariance, exact sequences, cohomology, application to the topology of Euclidean spaces.

Recommended previous knowledge:

Basic knowledge of topology is assumed, such as can be acquired in the module "Introduction to Topology".

Intended learning outcomes

The student is acquainted with advanced results in algebraic topology.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (approx. 90 to 120 minutes; usually chosen), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups of 2 candidates (approx. 30 minutes total) Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | page 129 / 226 |
|--|---|----------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Mathematical Physics (2012)

exchange program Mathematics (2023)



| Module title | | | | Abbreviation |
|---------------|---------------------|--|--|-------------------|
| Discrete Matl | hematic | | | 10-M=VDIM-102-m01 |
| Module coord | dinator | | Module offered by | |
| Dean of Studi | ies Mathematik (Mat | hematics) | Institute of Mathen | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 5 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | i | |
| 1 semester | graduate | ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consessment. If studen assessment over the gistration for assess will be admitted to a ster. For assessment | Other prerequisites Registration for the exercise must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Certain prerequisites must be met to qualify for admission to assessment (e. g. successful completion of certain percentage of exercises). The lecturer will inform students about the respective details at the beginning of the course. Registration for the exercise will be considered a declaration of will to seek admission to a sessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their gistration for assessment into effect. Students who meet all prerequisity will be admitted to assessment in the current or in the subsequent sem ster. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew. | |

Contents

Advanced methods and results in a selected field of discrete mathematics (e. g. coding theory, cryptography, graph theory or combinatorics)

Recommended previous knowledge:

Basic knowledge of the contents of the module "Introduction to Discrete Mathematics" is required.

Intended learning outcomes

The student is acquainted with advanced results in a selected topic in discrete mathematics.

Courses (type, number of weekly contact hours, language - if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places --Additional information --Workload

Teaching cycle

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| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | page 131 / 226 |
|--|---|----------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



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

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Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Economathematics (2011)



| Module title | | | Abbreviation | |
|--|-----------------|--|---|--|
| Dynamical Systems and Control | | | 10-M=VDSR-102-m01 | |
| Module cod | ordinator | | Module offered by | |
| Dean of Studies Mathematik (Mathematic | | thematics) | Institute of Mathematics | |
| ECTS Me | thod of grading | Only after succ. con | npl. of module(s) | |
| 5 nur | nerical grade | | | |
| Duration | Module level | Other prerequisites | | |
| 1 semester | graduate | ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consessment. If studen assessment over the gistration for assess will be admitted to a ster. For assessment | Other prerequisites Registration for the exercise must be made via SB@home at the beging ning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Certain prerequisites must be meet to qualify for admission to assessment (e.g. successful completion of certain percentage of exercises). The lecturer will inform students about the respective details at the beginning of the course. Registration for the exercise will be considered a declaration of will to seek admission to sessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their gistration for assessment into effect. Students who meet all prerequisions will be admitted to assessment in the current or in the subsequent sester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew. | |

Contents

Basics in dynamical systems and control: non-linear dynamics, stability theory, ergodic theory, Hamiltonian systems; selected advanced topics, e. g. networked dynamical systems, non-linear stability, dynamics with restricted communication, entropy of dynamical systems.

Recommended previous knowledge:

Basic knowledge of the contents of the module "Ordinary Differential Equations" is useful.

Intended learning outcomes

The student masters the mathematical methods in the theory of dynamic systems and control, and is able to analyse their quality.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places --Additional information --Workload ---



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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation |
|--|------------------------|---|--------------------------|---|
| Special Topic | s in Financial Mathema | tics | | 10-M=VFNM-102-m01 |
| Module coordinator | | | Module offered by | |
| Dean of Studies Mathematik (Mathematik | | natics) | Institute of Mathematics | |
| ECTS Method of grading | | Only after succ. con | npl. of module(s) | |
| 10 nume | rical grade | | | |
| Duration | Module level | Other prerequisites | | |
| 1 semester | graduate | Other prerequisites Registration for the exercise must be made via SB@home at the begin ning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Certain prerequisites must be me to qualify for admission to assessment (e. g. successful completion of certain percentage of exercises). The lecturer will inform students abouthe respective details at the beginning of the course. Registration for the exercise will be considered a declaration of will to seek admission to a sessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their gistration for assessment into effect. Students who meet all prerequis will be admitted to assessment in the current or in the subsequent serser. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew. | | ne lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a sturer will inform students about of the course. Registration for the n of will to seek admission to aster, the lecturer will put their resudents who meet all prerequisites arrent or in the subsequent semedents will have to obtain the quadrates. |

Contents

Selected topics in financial mathematics, e. g. conditional expectation and martingales, fundamental theorem of asset pricing in discrete time for finite spaces, American put, Snell envelope, stopping time, optimal stopping, stochastic integration, stochastic differential equations and Ito calculus, Black-Merton-Scholes model.

Recommended previous knowledge:

Familiarity with the contents of the modules "Introduction to Stochastic Financial Mathematics" and "Stochastics 1" is strongly recommended.

Intended learning outcomes

The student is acquainted with advanced results in financial mathematics. He/She gains the ability to work on contemporary research questions in financial mathematics and can apply his/her skills to complex problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (approx. 90 to 120 minutes; usually chosen), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups of 2 candidates (approx. 30 minutes total)

Language of assessment: German, English

Allocation of places --Additional information --Workload --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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)



| Module title | | | | Abbreviation |
|-------------------------------------|--------------|---|--------------------------|-------------------|
| Groups and their Representations | | s | | 10-M=VGDS-102-m01 |
| Module coord | linator | | Module offered by | |
| Dean of Studies Mathematik (Mathema | | :hematics) | Institute of Mathematics | |
| | | Only after succ. cor | npl. of module(s) | |
| 10 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | Other prerequisites | |
| 1 semester | graduate | Registration for the exercise must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Certain prerequisites must be met to qualify for admission to assessment (e. g. successful completion of certain percentage of exercises). The lecturer will inform students about the respective details at the beginning of the course. Registration for the exercise will be considered a declaration of will to seek admission to a sessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their gistration for assessment into effect. Students who meet all prerequisi will be admitted to assessment in the current or in the subsequent sen ster. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew. | | |

Contents

Finite permutation groups and character theory of finite groups, interrelations and special techniques such as the S-rings of Schur.

Recommended previous knowledge:

Basic knowledge of algebra is assumed, such as can be acquired in the modules "Introduction to Algebra" and "Applied Algebra".

Intended learning outcomes

The student masters advanced algebraic concepts and methods. He/She gains the ability to work on contemporary research questions in group theory and representation theory and can apply his/her skills to complex problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (approx. 90 to 120 minutes; usually chosen), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups of 2 candidates (approx. 30 minutes total)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places --Additional information --Workload



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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation |
|--|--------------|--|--------------------------|---|
| Geometrical Mechanics | | | | 10-M=VGEM-102-m01 |
| Module coordinator | | | Module offered by | |
| Dean of Studies Mathematik (Mathematic | | matics) | Institute of Mathematics | |
| | | Only after succ. con | npl. of module(s) | |
| 10 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | | |
| 1 semester | graduate | Registration for the exercise must be made via SB@home at the beg ning of the course or as announced by the lecturer in accordance wit the specified registration deadlines. Certain prerequisites must be not of qualify for admission to assessment (e.g., successful completion certain percentage of exercises). The lecturer will inform students at the respective details at the beginning of the course. Registration for exercise will be considered a declaration of will to seek admission assessment. If students have obtained the qualification for admission assessment over the course of the semester, the lecturer will put the gistration for assessment into effect. Students who meet all prerequivally be admitted to assessment in the current or in the subsequent ster. For assessment at a later date, students will have to obtain the lification for admission to assessment anew. | | ne lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a turer will inform students about of the course. Registration for the n of will to seek admission to aster, the lecturer will put their residents who meet all prerequisites arrent or in the subsequent semedents will have to obtain the quadrents will have to obtain the |

Contents

Introduction to geometric mechanics: basic notions of differential geometry and symplectic geometry, Euler-Lagrange equations, Hamiltonian mechanics on manifolds.

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 module "Introduction to Topology" is also recommended. Knowledge of theoretical mechanics can also be useful.

Intended learning outcomes

The student is able to apply fundamental methods and concepts of geometry to problems in mechanics, and knows about the interrelation of these fields.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (approx. 90 to 120 minutes; usually chosen), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups of 2 candidates (approx. 30 minutes total)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

| Language of assessment. German, English |
|---|
| Allocation of places |
| - |
| Additional information |
| - |
| Workload |
| |



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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)



| Module title | | | | Abbreviation |
|-------------------------------------|---------------|---|--------------------------|-------------------|
| Aspects of Geometry | | | | 10-M=VGEO-102-m01 |
| Module coordinator | | | Module offered by | |
| Dean of Studies Mathematik (Mathema | | ematics) | Institute of Mathematics | |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 5 num | erical grade | | | |
| Duration | Module level | Other prerequisites | Other prerequisites | |
| 1 semester | graduate | Other prerequisites Registration for the exercise must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Certain prerequisites must be met to qualify for admission to assessment (e. g. successful completion of a certain percentage of exercises). The lecturer will inform students about the respective details at the beginning of the course. Registration for the exercise will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisit will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew. | | |

In-depth discussion of a special type of geometry taking into account recent developments and interrelations with other mathematical structures, e. g. topological geometries, diagram geometries.

Recommended previous knowledge:

Basic knowledge from the modules "Differential Geometry" and "Introduction to Topology" is recommended.

Intended learning outcomes

The student is acquainted with advanced results in a selected field of geometry and can apply his/her skills to complex problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Master's with 1 major Mathematics (2012)

JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Master (120 ECTS) Mathematik - 2012



Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)



| Module title | | | Abbreviation | |
|---|------------------------|---|--|--|
| Giovanni- | Prodi Lecture Selected | Topics (Master) | | 10-M=VGPC-122-m01 |
| Module coordinator | | | Module offered by | |
| Dean of Studies Mathematik (Mathemat | | thematics) | atics) Institute of Mathematics | |
| ECTS Method of grading | | Only after succ. co | mpl. of module(s) | |
| 10 numerical grade | | | | |
| Duration | Module level | Module level Other prerequisites | | |
| 1 semester graduate Ce se at sic de the se tec se | | sessment. The lectuat the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment | urer will inform stude the course. Registrat on of will to seek adn ed the qualification fo emester, the lecturer ct. Students who mee in the current or in th | alify for admission to as- ents about the respective details cion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification fo |

Introduction to a specialised topic in mathematics by an international expert.

Intended learning outcomes

The student is acquainted with the fundamental concepts and methods of a contemporary research topic in mathematics. He/She is able to establish a connection between his/her acquired skills and other branches of mathematics and applications in other subjects.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

 $\textbf{Method of assessment} \ (\textbf{type}, \textbf{scope}, \textbf{language} - \textbf{if other than German, examination offered} - \textbf{if not every seme-like} \ (\textbf{scope}, \textbf{language}) - \textbf{if other than German, examination offered} - \textbf{if not every seme-like} - \textbf{if not every s$ ster, information on whether module can be chosen to earn a bonus)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (approx. 90 to 120 minutes; usually chosen), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups of 2 candidates (approx. 30 minutes total)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: English, German if agreed upon with the examiner

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)





| 10-M=VGRM-102-m01 |
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| the made via SB@home at the beginded by the lecturer in accordance with es. Certain prerequisites must be met sment (e. g. successful completion of a The lecturer will inform students about aning of the course. Registration for the laration of will to seek admission to assed the qualification for admission to e semester, the lecturer will put their reject. Students who meet all prerequisites the current or in the subsequent semete, students will have to obtain the quament anew. |
| 1 |

Discussion of problems and questions on the foundation of mathematics, applying methods of set theory, logic and philosophy.

Intended learning outcomes

The student is acquainted with the foundational methods in mathematics and logic.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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 (2012) Master's degree (1 major) Mathematics (2010)

| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | page 145 / 226 |
|--|---|----------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | Abbi | eviation |
|---|---------------------|--|---|---------------|
| Industrial Statistics 2 | | | 10-M | =VIST-102-m01 |
| Module coor | dinator | | Module offered by | |
| Dean of Stud | lies Mathematik (Ma | thematics) | Institute of Mathematics | |
| ECTS Meth | nod of grading | Only after succ. co | npl. of module(s) | |
| 10 num | erical grade | | | |
| Duration | Module level | Other prerequisites | 5 | |
| Duration 1 semester graduate graduate Registration for the ning of the course of the specified registration percentage of the respective detail exercise will be consessment. If student assessment over the gistration for assess will be admitted to a seminary of the course of the specified registration for assess will be admitted to a seminary of the prerequisites. | | or as announced by the lectration deadlines. Certain pasion to assessment (e.g. stoof exercises). The lecturer ils at the beginning of the exidered a declaration of what have obtained the qual the course of the semester, is sment into effect. Students assessment in the current at at a later date, students | turer in accordance with rerequisites must be met successful completion of a will inform students about course. Registration for the ill to seek admission to as- | |

Linear models, regression analysis, nonlinear regression, experimental design, basics in time series modelling, basics in empirical time series analysis, methods of exponential smoothing, predictions and prediction domains, statistical process monitoring.

Intended learning outcomes

The student masters advanced statistical methods for industrial applications.

 $\textbf{Courses} \ (\textbf{type}, \textbf{number of weekly contact hours, language} - \textbf{if other than German})$

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)

| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | page 147 / 226 |
|--|---|----------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Master's degree (1 major) Mathematics (2010) Master's degree (1 major) Economathematics (2011)



| Module title | | | | Abbreviation |
|---------------|----------------------|--|---------------------|--|
| Field Arithme | tics | | | 10-M=VKAR-102-m01 |
| Module coord | linator | | Module offered by | |
| Dean of Studi | es Mathematik (Mathe | matics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 10 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | | |
| 1 semester | graduate | Other prerequisites Registration for the exercise must be made via SB@home at the ning of the course or as announced by the lecturer in accordance the specified registration deadlines. Certain prerequisites must be to qualify for admission to assessment (e. g. successful complet certain percentage of exercises). The lecturer will inform student the respective details at the beginning of the course. Registration exercise will be considered a declaration of will to seek admission sessment. If students have obtained the qualification for admission assessment over the course of the semester, the lecturer will put gistration for assessment into effect. Students who meet all prerewill be admitted to assessment in the current or in the subseque ster. For assessment at a later date, students will have to obtain lification for admission to assessment anew. | | ne lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a turer will inform students about of the course. Registration for the n of will to seek admission to aster, the lecturer will put their residents who meet all prerequisites arrent or in the subsequent semedents will have to obtain the quadrates. |

Combination of Galois theory, group theory and the theory of function fields with the aim of application in number theory, e. g. topics around Hilbert's irreducibility theorem, permutation polynomials (e. g. Calitz-Wan-conjecture) 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 "Applied Algebra".

Intended learning outcomes

The student masters advanced algebraic concepts and methods. He/She gains the ability to work on contemporary research questions in algebra and can apply his/her skills to complex problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

| Allocation of places |
|------------------------|
| |
| Additional information |
| |
| Workload |
| |
| Teaching cycle |
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Master's degree (1 major) Mathematics (2010)

| Referred to in LPO I (examination regulations for teaching-degree programmes) |
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| |
| Module appears in |
| Master's degree (1 major) Mathematics (2012) |



| Module | title | | | | Abbreviation |
|---------|---------|-----------------------|--|---------------------|---|
| Mathen | natical | Continuum Mechanics | | | 10-M=VKOM-122-m01 |
| Module | coord | inator | | Module offered by | |
| Dean of | f Studi | es Mathematik (Mather | natics) | Institute of Mathem | natics |
| ECTS | Metho | od of grading | Only after succ. con | npl. of module(s) | |
| 5 | nume | rical grade | | | |
| Duratio | n | Module level | Other prerequisites | | |
| 1 semes | ster | graduate | Certain prerequisites must be met to qualify for admission to a sessment. The lecturer will inform students about the respective at the beginning of the course. Registration for the course will sidered a declaration of will to seek admission to assessment. dents have obtained the qualification for admission to assess the course of the semester, the lecturer will put their registration sessment into effect. Students who meet all prerequisites will ted to assessment in the current or in the subsequent semester sessment at a later date, students will have to obtain the qualification to assessment anew. | | nts about the respective details ion for the course will be connission to assessment. If sturadmission to assessment over will put their registration for astall prerequisites will be admites subsequent semester. For as- |

Partial differential equations and/or variational methods in the context of continuum mechanics.

Recommended previous knowledge:

Basic knowledge from the modules "Ordinary Differential Equations" and "Introduction to Partial Differential Equations" is recommended, as well as basic knowledge of functional analysis.

Intended learning outcomes

The student masters the mathematical methods in mathematical continuum mechanics and knows about their main fields of application.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

Language of assessment: German, English

Allocation of places

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Additional information

Workload

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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 with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | page 151 / 226 |
|--|---|----------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Master's degree (1 major) Mathematics (2012) Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | Abbreviation |
|---------------|----------------------|----------------------|--|-------------------|
| Mathematica | l Imaging | | | 10-M=VMBV-102-m01 |
| Module coord | linator | | Module offered by | |
| Dean of Studi | ies Mathematik (Math | nematics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 5 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | i | |
| 1 Semester | | | the lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a sturer will inform students about of the course. Registration for the n of will to seek admission to exter, the lecturer will put their resudents who meet all prerequisites urrent or in the subsequent semedents will have to obtain the qua- | |

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 camera 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 recommended.

Intended learning outcomes

The student masters the mathematical methods in the theory of image processing and knows about their main fields of application.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

| , 9 | |
|------------------------|--|
| Allocation of places | |
| | |
| Additional information | |
| | |
| Workload | |
| | |
| 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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | ! | | | Abbreviation |
|--|----------------------|--|--|-------------------|
| Selected Topics in Mathematical Physi | | Physics | - | 10-M=VMPH-102-m01 |
| Module coo | rdinator | | Module offered by | |
| Dean of Stu | dies Mathematik (Mat | hematics) | Institute of Mathem | natics |
| ECTS Met | hod of grading | Only after succ. con | npl. of module(s) | |
| 5 num | nerical grade | | | |
| Duration | Module level | Other prerequisites | 1 | |
| Duration 1 semester graduate Registration for the ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consessment. If studen assessment over the gistration for assessing will be admitted to a ster. For assessment | | or as announced by the ration deadlines. Ceresion to assessment (of exercises). The least the beginning of the sement into effect. Streament into effect. Streamsessment in the coassessment in the coassessme | the lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a sturer will inform students about of the course. Registration for the n of will to seek admission to aste qualification for admission to ester, the lecturer will put their resudents who meet all prerequisites urrent or in the subsequent semedents will have to obtain the qua- | |

Selected topics in mathematical physics (e. g. differential equations of mathematical physics, probability theory, hydrodynamics, hyperbolic conservation equations, mathematical materials science, quantum mechanics).

Recommended previous knowledge:

Depending on the content, basic and advanced knowledge from different areas of analysis is required. In case of doubt, it is recommended to consult the lecturer.

Intended learning outcomes

The student is acquainted with advanced results in a field in mathematical physics. He/She knows mathematical methods in mathematical physics and can apply them to solve problems in physics.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

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| Allocation of places |
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| Additional information |
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| Workload |
| |



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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | Abbreviation |
|---------------|-----------------------|--|---|---|
| Modul Theory | 1 | | | 10-M=VMTH-102-m01 |
| Module coord | linator | | Module offered by | |
| Dean of Studi | es Mathematik (Mather | matics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 5 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | | |
| 1 semester | graduate | ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consessment. If studen assessment over the gistration for assess will be admitted to a ster. For assessment | r as announced by the ration deadlines. Ceresion to assessment (of exercises). The lector is at the beginning of sidered a declaration its have obtained the ecourse of the sement into effect. Streassessment in the curses. | de via SB@home at the beginne lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a sturer will inform students about of the course. Registration for the n of will to seek admission to aster, the lecturer will put their residents who meet all prerequisites arrent or in the subsequent semedents will have to obtain the quanew. |

Basics in module theory: modules and module spaces, canonical decomposition and representations, simple, semi-simple and complex modules, module trees and their defibrations, distorsion theorems, reduction theorems.

Recommended previous knowledge:

Basic knowledge of algebra is assumed, such as can be acquired in the modules "Introduction to Algebra" and "Applied Algebra".

Intended learning outcomes

The student masters mathematical methods in module theory and is able to analyse their quality.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

| 7 0 |
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| Allocation of places |
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| Additional information |
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| Workload |
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| 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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation |
|---------------|-----------------------|--|---|---|
| Non-Linear A | nalysis | | | 10-M=VNAN-102-m01 |
| Module coord | linator | | Module offered by | |
| Dean of Studi | es Mathematik (Mathen | natics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 5 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | i | |
| 1 semester | graduate | ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consessment. If studen assessment over the gistration for assess will be admitted to a ster. For assessment | r as announced by the ration deadlines. Ceresion to assessment (of exercises). The least the beginning of sidered a declaration ts have obtained the ecourse of the sement into effect. Streassessment in the curses. | nde via SB@home at the begin- the lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a cturer will inform students about of the course. Registration for the en of will to seek admission to as- equalification for admission to ester, the lecturer will put their re- udents who meet all prerequisites urrent or in the subsequent seme- dents will have to obtain the qua- new. |

Methods in nonlinear analysis (e. g. topological methods, monotony and variational methods) with applications.

Recommended previous knowledge:

We recommend basic knowledge of functional analysis and partial differential equations, such as can be acquired in the modules "Introduction to Functional Analysis" and "Applied Analysis".

Intended learning outcomes

The student is acquainted with the concepts of non-linear analysis, can compare them and assess their applicability on practical problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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| | data record Master (120 ECTS) Mathematik - 2012 | |



Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | Abbreviation |
|---------------|--------------------------|--|---|---|
| Numeric of Pa | artial Differential Equa | ations | | 10-M=VNPE-102-m01 |
| Module coord | linator | | Module offered by | • |
| Dean of Studi | es Mathematik (Math | ematics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 10 nume | rical grade | | | |
| Duration | Module level | Other prerequisites | ; | |
| 1 semester | graduate | ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consessment. If studen assessment over the gistration for assess will be admitted to a ster. For assessment | or as announced by the ration deadlines. Ceresion to assessment (of exercises). The least the beginning of sidered a declaration its have obtained the ecourse of the sement into effect. Streassessment in the curses. | nde via SB@home at the begin- the lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a cturer will inform students about of the course. Registration for the n of will to seek admission to as- e qualification for admission to ester, the lecturer will put their re- udents who meet all prerequisites urrent or in the subsequent seme- dents will have to obtain the qua- new. |

Types of partial differential equations, qualitative properties, finite differences, finite elements, error estimates (numerical methods for elliptic, parabolic and hyperbolic partial differential equations; finite elements method, discontinuous Gelerkin finite elements method, finite differences and finite volume methods).

Recommended previous knowledge:

We recommend basic knowledge of functional analysis and partial differential equations, such as can be acquired in the modules "Introduction to Functional Analysis" and "Applied Analysis".

Intended learning outcomes

The student is acquainted with advanced methods for discretising partial differential equations.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

| Allocation of places | |
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| Additional information | |
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| Workload | |
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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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | , | | | Abbreviation |
|--------------|---------------------|--|---|-------------------|
| Selected Top | ics in Optimization | | | 10-M=VOPT-102-m01 |
| Module coord | dinator | | Module offered by | , |
| Dean of Stud | ies Mathematik (Ma | thematics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. cor | mpl. of module(s) | |
| 10 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | 5 | |
| 1 semester | graduate | ning of the course of the specified regist to qualify for admis certain percentage the respective deta exercise will be con sessment. If studer assessment over th gistration for asses will be admitted to | Other prerequisites Registration for the exercise must be made via SB@home at the beginning of the course or as announced by the lecturer in accordance with the specified registration deadlines. Certain prerequisites must be a to qualify for admission to assessment (e. g. successful completion certain percentage of exercises). The lecturer will inform students at the respective details at the beginning of the course. Registration for exercise will be considered a declaration of will to seek admission assessment. If students have obtained the qualification for admission assessment over the course of the semester, the lecturer will put the gistration for assessment into effect. Students who meet all prerequivalled be admitted to assessment in the current or in the subsequent ster. For assessment at a later date, students will have to obtain the | |

Selected topics in optimization, e. g. inner point methods, semidefinite programs, non-smooth optimization, game theory, optimization with differential equations.

Intended learning outcomes

The student is acquainted with advanced methods in continuous optimization. He gains the ability to work on contemporary research questions in continuous optimization.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English

Allocation of places

Additional information

Workload

Teaching cycle

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

Module appears in

Master's degree (1 major) Mathematics (2012)

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| | data record Master (120 ECTS) Mathematik - 2012 | |



Master's degree (1 major) Mathematics (2010) Master's degree (1 major) Economathematics (2011) Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | Abbreviation |
|---------------|-----------------------|--|--|---|
| Optimal Cont | rol | | | 10-M=VOST-102-m01 |
| Module coord | linator | | Module offered by | |
| Dean of Studi | es Mathematik (Mather | natics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 5 nume | rical grade | | | |
| Duration | Module level | Other prerequisites | | |
| 1 semester | graduate | ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consessment. If studen assessment over the gistration for assess will be admitted to a ster. For assessment | r as announced by the ration deadlines. Ceresion to assessment (of exercises). The lectles at the beginning of sidered a declaration its have obtained the ecourse of the sement into effect. Stuassessment in the curses. | de via SB@home at the beginne lecturer in accordance with tain prerequisites must be met e.g., successful completion of a turer will inform students about of the course. Registration for the nof will to seek admission to aster, the lecturer will put their readents who meet all prerequisites arrent or in the subsequent semedents will have to obtain the quanew. |

Basics in optimal control of ordinary and partial differential equations, theory of optimal control, conditions for optimality, methods for numerical solution.

Recommended previous knowledge:

We recommend basic knowledge of functional analysis and ordinary differential equations, such as can be acquired in the modules "Introduction to Functional Analysis" and "Ordinary Differential Equations". Knowledge of the contents of the module "Basics in Optimization" may also be useful.

Intended learning outcomes

The student is acquainted with advanced methods in optimal control. He gains the ability to work on contemporary research questions in continuous optimization.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

| Allocation of places | |
|------------------------|--|
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| Additional information | |
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| Vorkload | |
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| 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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | , | | | Abbreviation |
|--------------|-----------------------|--|--|---|
| Quantum Co | ntrol and Quantum Co | omputing | | 10-M=VQKC-102-m01 |
| Module coor | dinator | | Module offered by | |
| Dean of Stud | lies Mathematik (Matl | hematics) | Institute of Mathen | natics |
| ECTS Meth | nod of grading | Only after succ. cor | npl. of module(s) | |
| 5 num | erical grade | | | |
| Duration | Module level | Other prerequisites | ; | |
| 1 semester | graduate | ning of the course of the specified regist to qualify for admis certain percentage the respective detal exercise will be con sessment. If student assessment over the gistration for assess will be admitted to ster. For assessment | or as announced by the ration deadlines. Center sion to assessment to fexercises. The leading at the beginning of the sement into effect. Strassessment in the coassessment in the coasses | ade via SB@home at the beginhe lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a sturer will inform students about of the course. Registration for the n of will to seek admission to aste qualification for admission to ester, the lecturer will put their redents who meet all prerequisites urrent or in the subsequent semedents will have to obtain the quancew. |

Basics in dynamics of quantum-mechanical systems (e. g. density operators, observables, Schrödinger equation, Liouville-von-Neumann equation), bilinear control systems in quantum mechanics (e. g. finite-dimensional spin systems and/or infinite-dimensional Schrödinger equations with external control), applications (e. g. in quantum computing or magnetic resonance spectroscopy).

Intended learning outcomes

The student is acquainted with advanced methods in quantum-mechanical control systems. He gains the ability to work on contemporary research questions in and applications of control systems in quantum mechanics.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

Assessment offered: Assessment offered in the semester in which the course is offered and in the subsequent semester, course offered on demand or every four semesters.

| Allocation of places | |
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| Additional information | |
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| Norkload | |
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| Feaching 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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation |
|----------------|---------------------|---|--|---|
| Statistical An | alysis | | - | 10-M=VSTA-102-m01 |
| Module coord | linator | | Module offered by | |
| Dean of Stud | ies Mathematik (Mat | hematics) | Institute of Mather | natics |
| ECTS Meth | od of grading | Only after succ. co | mpl. of module(s) | |
| 10 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | Other prerequisites | |
| 1 semester | graduate | ning of the course of the specified regist to qualify for admis certain percentage the respective deta exercise will be con sessment. If studer assessment over th gistration for asses will be admitted to ster. For assessmen | or as announced by the ration deadlines. Center is significant to assessment of exercises). The least the beginning of the series of the semination of the s | ade via SB@home at the begin- the lecturer in accordance with rtain prerequisites must be met (e. g. successful completion of a cturer will inform students about of the course. Registration for the n of will to seek admission to as- e qualification for admission to ester, the lecturer will put their re- udents who meet all prerequisites urrent or in the subsequent seme- dents will have to obtain the qua- |

Contingency tables, categorical regression, one-factorial variance analysis, two-factorial variance analysis, discriminant function analysis, cluster analysis, principal component analysis, factor analysis.

Recommended 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.

Intended learning outcomes

The student is acquainted with the fundamental methods in statistical analysis and can apply them to practical problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

| Language of assessment: German, English |
|---|
| Allocation of places |
| |
| Additional information |
| |
| Workload |
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| 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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | | | | Abbreviation |
|---------------|---------------------|--|---|---|
| Insurance Ma | thematics 2 | | | 10-M=VVSM-102-m01 |
| Module coord | linator | | Module offered by | • |
| Dean of Studi | es Mathematik (Math | ematics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 10 nume | erical grade | | | |
| Duration | Module level | Other prerequisites | 1 | |
| 1 semester | graduate | ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consessment. If studen assessment over the gistration for assess will be admitted to a ster. For assessment | or as announced by the ration deadlines. Ceresion to assessment (of exercises). The least the beginning of sidered a declaration its have obtained the ecourse of the sement into effect. Streassessment in the curses. | nde via SB@home at the begin- the lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a cturer will inform students about of the course. Registration for the n of will to seek admission to as- e qualification for admission to ester, the lecturer will put their re- udents who meet all prerequisites urrent or in the subsequent seme- dents will have to obtain the qua- new. |

This module discusses modern valuation approaches and multiple decrement models regarding one life or two lives: modern valuation in life insurance mathematics, axiomatic derivation of the product measure approach, Markov chain models, Kolmogorov's differential equations, Thiele's differential equations, numerical applications, joint life policies.

Recommended previous knowledge:

Familiarity with the contents of the modules "Insurance Mathematics 1" and "Selected Topics in Financial Mathematics" is strongly recommended.

Intended learning outcomes

The student is acquainted with advanced methods in insurance mathematics. He gains the ability to work on contemporary research questions in insurance mathematics and can apply his/her skills to complex problems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

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| Allocation of places |
| - |
| Additional information |
| - |
| Workload |
| - |



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 (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Economathematics (2011)



| Module title | | | | Abbreviation |
|---------------|-----------------------|---|--|---|
| Networked Sy | stems | | | 10-M=VVSY-102-m01 |
| Module coord | linator | | Module offered by | |
| Dean of Studi | es Mathematik (Mathem | natics) | Institute of Mathem | natics |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 5 nume | rical grade | | | |
| Duration | Module level | Other prerequisites | | |
| 1 semester | graduate | ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consessment. If student assessment over the gistration for assess will be admitted to a ster. For assessment | r as announced by the ration deadlines. Ceresion to assessment (of exercises). The lector is at the beginning of sidered a declaration its have obtained the ecourse of the sement into effect. Studies assessment in the cures in the cures of the sement in the cure of the sement in the | nde via SB@home at the begin- the lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a cturer will inform students about of the course. Registration for the n of will to seek admission to as- e qualification for admission to ester, the lecturer will put their re- udents who meet all prerequisites urrent or in the subsequent seme- dents will have to obtain the qua- new. |

Contemporary topics in networked linear and non-linear dynamical systems (homogenous and non-homogenous systems); analysis of control-theoretical aspects (controllability, accessibility, etc.).

Recommended previous knowledge:

Basic knowledge of the contents of the module "Ordinary Differential Equations" is useful.

Intended learning outcomes

The student is acquainted with advanced methods in the field of networked systems. He gains the ability to work on contemporary research questions in networked systems.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (60 to 90 minutes), b) oral examination of one candidate each (approx. 15 minutes), c) oral examination in groups (groups of 2, approx. 20 minutes)

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | |
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| | data record Master (120 ECTS) Mathematik - 2012 | |



Module appears in

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Mathematical Physics (2012)



| Module title | • | | | Abbreviation | |
|--------------|-----------------------|--|--|---|--|
| Time Series | Analysis 2 | | | 10-M=VZRA-102-m01 | |
| Module coo | rdinator | | Module offered by | | |
| Dean of Stu | dies Mathematik (Math | nematics) | Institute of Mathem | natics | |
| ECTS Met | hod of grading | Only after succ. con | npl. of module(s) | | |
| 10 nun | nerical grade | | | | |
| Duration | Module level | Other prerequisites | Other prerequisites | | |
| 1 semester | graduate | ning of the course of the specified registre to qualify for admission certain percentage of the respective detail exercise will be consessment. If studen assessment over the gistration for assess will be admitted to ster. For assessment | or as announced by the ration deadlines. Certain to assessment (of exercises). The least the beginning of sidered a declaration its have obtained the ecourse of the sement into effect. Strassessment in the cuassessment in the cuasses in the cuasing t | de via SB@home at the begin- he lecturer in accordance with tain prerequisites must be met (e. g. successful completion of a cturer will inform students about of the course. Registration for the n of will to seek admission to as- e qualification for admission to ester, the lecturer will put their re- udents who meet all prerequisites urrent or in the subsequent seme- dents will have to obtain the qua- new. | |

State-space models, Kalman filter, frequency spaces, Fourier analysis, periodograms, characterisation of autocovariance functions.

Intended learning outcomes

The student is acquainted with advanced methods in time series analysis. He gains the ability to work on contemporary research questions in this field.

 $\textbf{Courses} \ (\textbf{type}, \textbf{number of weekly contact hours, language} - \textbf{if other than German})$

V + Ü (no information on SWS (weekly contact hours) and course language available)

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)

At the beginning of the course, the lecturer will choose one of the following methods of assessment: a) written examination (90 to 120 minutes), b) oral examination of one candidate each (approx. 20 minutes), c) oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English

Allocation of places

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Additional information

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Workload

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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 (2012)

| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | |
|--|---|--|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Master's degree (1 major) Mathematics (2010) Master's degree (1 major) Economathematics (2011)



| Module title | | | | Abbreviation | |
|--|---------------|---|--|---------------|--|
| Astrophysics | | | | 11-A4-072-m01 | |
| Module coord | linator | | Module offered by | | |
| Managing Director of the Institute of Theoretical Physics and Astrophysics | | of Theoretical Physics | Theoretical Physics Faculty of Physics and Astronomy | | |
| ECTS Meth | od of grading | Only after succ. cor | npl. of module(s) | | |
| 6 nume | erical grade | | | | |
| Duration | Module level | Other prerequisites | Other prerequisites | | |
| 1 semester | undergraduate | Admission prerequisite to assessment: successful completion of appro 50% of exercises. Certain prerequisites must be met to qualify for admi sion to assessment. The lecturer will inform students about the respect ve details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew. | | | |

History of astronomy, coordinates and time measurement, the solar system, size scales in outer space, telescopes and detectors, stellar structure, stellar atmospheres, stellar evolution, final stages of stellar evolution, interstellar medium, structure of the Milky Way, local universe, expanding space-time, galaxies, active galactic nuclei, large-scale structure of the universe, Friedmann World Models, thermodynamics of the early universe, primordial nucleosynthesis, cosmic microwave background radiation, structure formation, inflation

Intended learning outcomes

The students are familiar with the modern world view of Astrophysics. They know methods and tools for astrophysical observations and evaluations. They are able to use these methods to plan and analyse own observations. They know the structure of the universe, e.g. of stars and galaxies and understand the process of their development.

Courses (type, number of weekly contact hours, language — if other than German)

V + S (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 120 minutes)

Allocation of places

Only as part of pool of general key skills (ASQ): 15 places. Places will be allocated by lot.

Additional information

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Workload

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Teaching cycle

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

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Module appears in



Bachelor' degree (1 major) Physics (2007)

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2009)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Physics (2008)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)

Bachelor's degree (1 major, 1 minor) Physics (Minor, 2008)

Bachelor's degree (1 major, 1 minor) Physics (Minor, 2010)



| Module title | | | Abbreviation |
|------------------------------|---------------|---|---|
| Cosmology | Cosmology | | 11-AKM-092-m01 |
| Module coor | dinator | | Module offered by |
| Managing Dir and Astrophy | | of Theoretical Physics Faculty of Physics and Astronomy | |
| ECTS Meth | od of grading | Only after succ. cor | mpl. of module(s) |
| 6 nume | erical grade | | |
| Duration | Module level | Other prerequisites | 5 |
| 1 semester | graduate | sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effect ted to assessment in | es must be met to qualify for admission to as- urer will inform students about the respective details the course. Registration for the course will be con- on of will to seek admission to assessment. If stu- ed the qualification for admission to assessment over emester, the lecturer will put their registration for as- ct. Students who meet all prerequisites will be admit- in the current or in the subsequent semester. For as- e date, students will have to obtain the qualification for essment anew. |

Expanding space-time, Friedmannian cosmology, basics of general relativity, the early universe, inflation, dark matter, primordial nucleosynthesis, cosmic microwave background, structure formation, supercluster, galaxies and galaxy clusters, intergalactic medium, cosmological parameters

Intended learning outcomes

The students have basic knowledge of cosmology. They know the theoretical methods of cosmology and are able to relate them to observations. They have gained insights into current research topics and are able to work on scientific questions.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

| Language of assessment: German, English |
|---|
| Allocation of places |
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| Additional information |
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| Workload |
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| Teaching cycle |
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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)



| Module title | | | | Abbreviation |
|--|---------------|---|----------------------------------|--|
| Plasma-Astrophysics | | | | 11-APL-092-m01 |
| Module coord | linator | | Module offered by | |
| Managing Director of the Institute of Th and Astrophysics | | Theoretical Physics | Faculty of Physics and Astronomy | |
| ECTS Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 6 nume | rical grade | | | |
| Duration | Module level | Other prerequisites | } | |
| 1 semester | graduate | Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective at the beginning of the course. Registration for the course will be sidered a declaration of will to seek admission to assessment. If dents have obtained the qualification for admission to assessment the course of the semester, the lecturer will put their registration sessment into effect. Students who meet all prerequisites will be ted to assessment in the current or in the subsequent semester. sessment at a later date, students will have to obtain the qualifical admission to assessment anew. | | nts about the respective details ion for the course will be connission to assessment. If stural admission to assessment over will put their registration for astall prerequisites will be admites subsequent semester. For as- |

Plasma Astrophysics: Dynamics of charged particles in electric and magnetic fields. Transport equations for energetic particles. Properties of magnetic turbulence. Propagation of solar particles within the solar wind. Particle acceleration via shock waves and via interaction with plasma turbulence. Particle acceleration and transport in galaxies and other cosmic objects.

Intended learning outcomes

The students have basic knowledge of Plasma Astrophysics. They have mastered the theoretical description of motion and acceleration of charged particles in space, they know corresponding measuring methods and can compare and evaluate theory and experiments.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

| Language of assessment: German, English |
|---|
| Allocation of places |
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| Additional information |
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| Workload |
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| Teaching cycle |
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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Modul | e title | | | | Abbreviation |
|---|-------------------------------|---------------|---------------------|--|----------------|
| Introd | Introduction to Space Physics | | | | 11-ASP-092-m01 |
| Modul | e coord | linator | | Module offered by | |
| Managing Director of the Institute of Theoretical Physics Faculty of Physics and Astronomy and Astrophysics | | and Astronomy | | | |
| ECTS | Meth | od of grading | Only after succ. co | mpl. of module(s) | |
| 6 | nume | rical grade | | | |
| Durati | on | Module level | Other prerequisites | 5 | |
| 1 seme | ester | | | ents about the respective details tion for the course will be connission to assessment. If stubra admission to assessment over will put their registration for astet all prerequisites will be admitted subsequent semester. For as- | |

- 1. Overview
- 2. Dynamics of charged particles in magnetic and electric fields
- 3. Elements of space physics
- 4. The sun and heliosphere
- 5. Acceleration and transport of energetic particles in the heliosphere
- 6. Instruments to measure energetic particles in extraterrestrial space

Intended learning outcomes

The students have basic knowledge of Space Physics, in particular of the characterisation of the dynamics of charged particles in space and in the heliosphere. They know relevant parameters, theoretical concepts and measuring methods.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Allocation of places --Additional information --Workload ---



Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Module title | ; | | Abbreviation |
|------------------------------|----------------|---|-------------------|
| Atmosphere and Space Physics | | | 11-AWP-092-m01 |
| Module coo | rdinator | | Module offered by |
| Managing D and Astroph | | e of Theoretical Physics Faculty of Physics and Astronomy | |
| ECTS Met | hod of grading | Only after succ. cor | mpl. of module(s) |
| 6 nun | nerical grade | | |
| Duration | Module level | Other prerequisites | S |
| 1 semester | graduate | Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective dat the beginning of the course. Registration for the course will be disidered a declaration of will to seek admission to assessment. If sidents have obtained the qualification for admission to assessment the course of the semester, the lecturer will put their registration for sessment into effect. Students who meet all prerequisites will be a ted to assessment in the current or in the subsequent semester. For sessment at a later date, students will have to obtain the qualification admission to assessment anew. | |

Structure of planetary atmospheres. Interaction of planetary atmospheres with the Sun. Physics of clouds. Planetary magnetospheres and interplanetary medium. (Micro) meteorites, asteroids, planetary rings. Atmospheres of exoplanets.

Intended learning outcomes

The students have knowledge of the physics of planetary atmospheres, especially of the atmosphere of the Earth and near-Earth space. They are able to apply the acquired knowledge to the solution of problems of interplanetary space missions.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German or English

| Language of assessment. German of English |
|---|
| Allocation of places |
| |
| Additional information |
| |
| Workload |
| |
| Teaching cycle |
| |
| Referred to in LPO I (examination regulations for teaching-degree programmes) |
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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Aerospace Computer Science (2009)

Bachelor' degree (1 major) Aerospace Computer Science (2011)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| | Abbreviation | | |
|--|---|--|--|
| to Plasmaphysics | | 11-EPP-092-m01 | |
| dinator | | Module offered by | |
| Managing Director of the Institute of The and Astrophysics | | Faculty of Physics and Astronomy | |
| od of grading | Only after succ. cor | mpl. of module(s) | |
| erical grade | | | |
| on Module level Other prerequisites | | 5 | |
| graduate Certain prerequisites must be met to qualify for admission to sessment. The lecturer will inform students about the respect at the beginning of the course. Registration for the course will sidered a declaration of will to seek admission to assessment dents have obtained the qualification for admission to assess the course of the semester, the lecturer will put their registrated to assessment into effect. Students who meet all prerequisites will ted to assessment in the current or in the subsequent semesters admission to assessment at a later date, students will have to obtain the qualification for admission to assessment anew. | | urer will inform students about the respective details the course. Registration for the course will be conon of will to seek admission to assessment. If students are the qualification for admission to assessment over emester, the lecturer will put their registration for asta. Students who meet all prerequisites will be admitted in the current or in the subsequent semester. For astale, students will have to obtain the qualification for | |
| | dinator rector of the Institute rsics rod of grading erical grade Module level | dinator rector of the Institute of Theoretical Physics rics rod of grading orical grade Module level graduate Other prerequisites sessment. The lectuat the beginning of sidered a declaration dents have obtained the course of the sessment into effect ted to assessment at a later | |

Plasma Astrophysics: Dynamics of charged particles in electric and magnetic fields, Magnetohydrodynamics, Transport equations for energetic particles, Properties of magnetic turbulence, Propagation of solar particles within the solar wind, Particle acceleration via shock waves and via interaction with plasma turbulence, Particle acceleration and transport in galaxies and other astrophysical objects, Cosmic radiation.

Intended learning outcomes

The students know the principles of Plasma Physics, especially the description of transport phenomena in plasma. They are able to solve basic problems of Plasma Physics and to apply this knowledge to Astrophysics.

Courses (type, number of weekly contact hours, language — if other than German)

V + R (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and vamination regulations) 2000

| examination regulations) 2009. |
|---|
| Language of assessment: German, English |
| Allocation of places |
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| Additional information |
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| Workload |
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| Teaching cycle |
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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Module title |) | | | Abbreviation | |
|-----------------------|--------------------------|--|--|----------------|--|
| Solid State Physics 2 | | | | 11-FK2-092-m01 | |
| Module coo | rdinator | | Module offered by | | |
| Managing D | irector of the Institute | of Applied Physics | Faculty of Physics a | and Astronomy | |
| ECTS Met | hod of grading | Only after succ. co | ompl. of module(s) | | |
| 8 nun | nerical grade | | | | |
| Duration | Module level | Other prerequisit | Other prerequisites | | |
| 1 semester | graduate | sessment. The lect at the beginning of sidered a declarate dents have obtain the course of the sessment into effected to assessment. | Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective de at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment the course of the semester, the lecturer will put their registration for sessment into effect. Students who meet all prerequisites will be a ted to assessment in the current or in the subsequent semester. For sessment at a later date, students will have to obtain the qualificat | | |

Advanced Solid-State Physics. Electrons in periodic potential - the band structure. Dynamics in the semi-classical model. Dielectric properties and ferroelectrics. Semiconductors. Magnetism. Superconductivity. Coupled excitations and optical properties [optional]

Intended learning outcomes

The students have specific and advanced knowledge in the field of Solid-State Physics. They are theoretically able to specialise in a sub-discipline of Solid-State Physics.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Module appears in

Allocation of places --Additional information --Workload --Teaching cycle --Referred to in LPO I (examination regulations for teaching-degree programmes)

| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | page 189 / 226 |
|--|---|----------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Module title | | | , | Abbreviation |
|--------------------------|-------------------------|--|---|----------------|
| Solid State Spectroscopy | | | | 11-FKS-092-m01 |
| Module coor | dinator | | Module offered by | |
| Managing Di | rector of the Institute | of Applied Physics | Faculty of Physics a | and Astronomy |
| ECTS Meth | od of grading | Only after succ. co | ompl. of module(s) | |
| 6 num | erical grade | | | |
| Duration | Module level | Other prerequisit | es | |
| 1 semester | graduate | sessment. The lect at the beginning of sidered a declarate dents have obtain the course of the sessment into effected to assessment. | Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective at the beginning of the course. Registration for the course will be sidered a declaration of will to seek admission to assessment. If dents have obtained the qualification for admission to assessment the course of the semester, the lecturer will put their registration sessment into effect. Students who meet all prerequisites will be ted to assessment in the current or in the subsequent semester, sessment at a later date, students will have to obtain the qualification. | |

Single- and many-particle picture of electrons in solids. Light-matter interaction. Optical spectroscopy. Electron spectroscopy. X-ray spectroscopies.

Intended learning outcomes

The students have specific and advanced knowledge in the field of solid-state spectroscopy. They know different types of spectroscopy and their fields of application. They understand the theoretical principles and the current developments in research.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

Module appears in

Allocation of places --Additional information --Workload --Teaching cycle --Referred to in LPO I (examination regulations for teaching-degree programmes) ---

| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | page 191 / 226 |
|--|---|----------------|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Nanostructure Technology (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Module title | | | | Abbreviation |
|------------------------------|----------------|---|----------------------|---|
| Group Theory | | | | 11-GRT-092-m01 |
| Module coord | linator | | Module offered by | |
| Managing Dir and Astrophy | | e of Theoretical Physics | Faculty of Physics a | and Astronomy |
| ECTS Meth | od of grading | Only after succ. cor | npl. of module(s) | |
| 6 nume | umerical grade | | | |
| Duration | Module level | Other prerequisites | 3 | |
| 1 semester | graduate | Certain prerequisites must be met to qualify for admission to a sessment. The lecturer will inform students about the respectivat the beginning of the course. Registration for the course will sidered a declaration of will to seek admission to assessment. dents have obtained the qualification for admission to assess the course of the semester, the lecturer will put their registratives sessment into effect. Students who meet all prerequisites will ted to assessment in the current or in the subsequent semester sessment at a later date, students will have to obtain the quality admission to assessment anew. | | nts about the respective details ion for the course will be connission to assessment. If stubradmission to assessment over will put their registration for astall prerequisites will be admite subsequent semester. For as- |

Group theory. Finite groups. Lie groups. Lie algebra. Depiction. Tensors. Classification theorem. Applications.

Intended learning outcomes

Module appears in

The students know the basics of group theory, especially of Lie groups. They are able to identify problems of group theory and to solve them by using the acquired methods. They are able to apply group theory to the formulation and processing of physical problems.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English Allocation of places **Additional information** Workload Teaching cycle **Referred to in LPO I** (examination regulations for teaching-degree programmes)

| Master's with 1 major Mathematics (2012) | JMU Würzburg • generated 26-Aug-2024 • exam. reg. | |
|--|---|--|
| | data record Master (120 ECTS) Mathematik - 2012 | |



Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Module t | itle | | | | Abbreviation |
|--|--------|--------------------------|---|--|---------------|
| Semiconductor Lasers - Principles and Current Research | | | | 11-HLF-092-m01 | |
| Module o | oordi | inator | | Module offered by | |
| Managin | g Dire | ector of the Institute o | f Applied Physics | Faculty of Physics a | and Astronomy |
| ECTS N | Netho | od of grading | Only after succ. co | ompl. of module(s) | |
| 6 r | numei | rical grade | | | |
| Duration | | Module level | Other prerequisite | es | |
| 1 semest | er | graduate | sessment. The lect at the beginning of sidered a declarate dents have obtain the course of the sessment into effected to assessment at a late | Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification admission to assessment anew. | |

This lecture discusses the principles of laser physics, based on the example of semiconductor lasers, and current developments regarding components. The principles of lasers are described on the basis of a general laser model, which will then be extended to special aspects of semiconductor lasers. Basic concepts such as threshold condition, characteristic curve and laser efficiency are derived from coupled rate equations for charge carriers and photons. Other topics of the lecture are optical processes in semiconductors, layer and ridge waveguides, laser resonators, mode selection, dynamic properties as well as technology for the generation of semiconductor lasers. The lecture closes with current topics of laser research such as quantum dot lasers, quantum cascade lasers, terahertz lasers or high-performance lasers.

Intended learning outcomes

The students have advanced knowledge of the principles of semiconductor-laser physics. They can apply their knowledge to modern questions and know the applications in the current development of components.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

| llocation of places |
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| |
| dditional information |
| |
| Vorkload |
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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Nanostructure Technology (2010)

Bachelor' degree (1 major) Nanostructure Technology (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)

Master's degree (1 major) Functional Materials (2012)



| Module ti | tle | | Abbreviation | |
|-----------|-----------------------|--|---|--|
| Semicond | luctor Physics | | 11-HLP-092-m01 | |
| Module co | oordinator | | Module offered by | |
| Managing | Director of the Insti | tute of Applied Physics | Faculty of Physics and Astronomy | |
| ECTS M | ethod of grading | Only after succ. co | ompl. of module(s) | |
| 6 n | umerical grade | | | |
| Duration | Module level | Other prerequisite | es | |
| 1 semeste | er graduate | sessment. The lect at the beginning of sidered a declarate dents have obtain the course of the sessment into effected to assessment sessment at a late | Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective detain at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification admission to assessment anew. | |

Advanced examination of crystal bonding and the electronic band structure of semiconductors. Optical excitations and their coupling effects. Electron-phonon coupling. Temperature-dependent transport properties. Quantisation effects of semiconductors with reduced dimensions. (Semi-)magnetic semiconductors.

Intended learning outcomes

The students have specific and advanced knowledge in the field of Semiconductor Physics. They know the physical principles of semiconductors and have gained an overview of the important characteristics of semiconductor materials.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

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| Allocation of places |
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| Additional information |
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| Workload |
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| Teaching cycle |
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| Referred to in LPO I (examination regulations for teaching-degree programmes) |
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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Nanostructure Technology (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)

Master's degree (1 major) Functional Materials (2012)



| Module | title | | | | Abbreviation |
|---------|---------|--------------------------|--|---|----------------|
| Semico | nducto | or Nanostructures | | | 11-HNS-092-m01 |
| Module | coord | inator | | Module offered by | |
| Managi | ng Dire | ector of the Institute o | of Applied Physics | Faculty of Physics | and Astronomy |
| ECTS | Metho | od of grading | Only after succ. co | ompl. of module(s) | |
| 6 | nume | rical grade | | | |
| Duratio | n | Module level | Other prerequisit | es | |
| 1 semes | ster | graduate | sessment. The lect at the beginning of sidered a declarate dents have obtain the course of the sessment into effected to assessment at a later | Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective deta at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment of the course of the semester, the lecturer will put their registration for a sessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For a sessment at a later date, students will have to obtain the qualification admission to assessment anew. | |

Semiconductor nanostructures are frequently referred to as "artificial materials". In contrast to atoms, molecules or macroscopic crystals, their electronic, optical and magnetic properties can be systematically tailored by changing their size. The lecture addresses technological challenges in the preparation of semiconductor nanostructures of varying dimensions (2D, 1D, oD). It provides the basic theoretical concepts to describe their properties, with a focus on optical properties and light-matter coupling. Moreover, it discusses the challenges and concepts of novel optoelectronic and quantum photonic devices based on such nanostructures, including building blocks for quantum communication and quantum computing architectures.

Intended learning outcomes

The students know the theoretical principles and characteristics of semiconductor nanostructures. They have knowledge of the technological methods to fabricate such structures, and of their applications to novel photonic devices. They are able to apply their knowledge to problems in this field of research.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

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| Allocation of places |
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| Additional information |
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| Workload |
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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Nanostructure Technology (2010)

Bachelor' degree (1 major) Nanostructure Technology (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Technology of Functional Materials (2010)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)

Master's degree (1 major) Functional Materials (2012)



| Module title | | | Abbreviation |
|---|----------------|--|-------------------|
| Computational Astrophysics | | | 11-NMA-111-mo1 |
| Module coor | dinator | | Module offered by |
| Managing Director of the Institute of Theoretical Physics Faculty of Physics and Astronomy and Astrophysics | | Faculty of Physics and Astronomy | |
| ECTS Meth | nod of grading | Only after succ. cor | npl. of module(s) |
| 6 num | erical grade | | |
| Duration | Module level | Other prerequisites | 5 |
| 1 semester graduate Certain prerequisites must be met to qualify for admission to a sessment. The lecturer will inform students about the respective at the beginning of the course. Registration for the course will be sidered a declaration of will to seek admission to assessment. In dents have obtained the qualification for admission to assess the course of the semester, the lecturer will put their registration sessment into effect. Students who meet all prerequisites will be ted to assessment in the current or in the subsequent semester sessment at a later date, students will have to obtain the qualification to assessment anew. | | urer will inform students about the respective details the course. Registration for the course will be conon of will to seek admission to assessment. If students are the qualification for admission to assessment over emester, the lecturer will put their registration for asta. Students who meet all prerequisites will be admitted in the current or in the subsequent semester. For astale, students will have to obtain the qualification for | |

Various methods used in astrophysical simulations with special emphasis on their applications. N-body algorithms (tree- and polynomial codes). Particle-mesh methods (particle-in-cell methods). Vlasow methods (e.g., Lattice-Boltzmann). Hyperbolic conservation laws (fluid dynamics, finite difference method, Riemann solver, ENO). Methods of high-performance computing. Message-passing interface (MPI). GPGPU programming (Open-

Intended learning outcomes

The students are able to solve typical problems and equations of Astrophysics and other subdisciplines of Physics with the help of numerical simulations. They are especially capable of choosing adequate strategies to approach such problems and of validating the results.

 $\textbf{Courses} \ (\textbf{type}, \textbf{number of weekly contact hours, language} - \textbf{if other than German})$

V + R (no information on SWS (weekly contact hours) and course language available)

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. 120 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

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| Language of assessment: German, English |
| Allocation of places |
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| Additional information |
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| Workload |
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| Teaching cycle |
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Module appears in

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics (2011)



| Module | e title | | | | Abbreviation |
|--|---------|---|--|-------------------|----------------|
| Quantum Mechanics II | | | | | 11-QM2-092-m01 |
| Module | e coord | inator | | Module offered by | |
| Managing Director of the Institute of Theoretica and Astrophysics | | Theoretical Physics | eoretical Physics Faculty of Physics and Astronomy | | |
| ECTS | Meth | od of grading | Only after succ. con | npl. of module(s) | |
| 8 | nume | rical grade | | | |
| Duratio | n | Module level | Other prerequisites | 3 | |
| 1 semester undergraduate Certain prerequisites must be met to qualify for admission to sessment. The lecturer will inform students about the respectant the beginning of the course. Registration for the course wisidered a declaration of will to seek admission to assessment dents have obtained the qualification for admission to assess the course of the semester, the lecturer will put their registrated to assessment into effect. Students who meet all prerequisites with ted to assessment in the current or in the subsequent semester sessment at a later date, students will have to obtain the quadmission to assessment anew. | | ents about the respective details cion for the course will be connission to assessment. If stubracer admission to assessment over will put their registration for asset all prerequisites will be admites subsequent semester. For assets | | | |

- "Quantum mechanics II" constitutes the central theoretical course of the international Master's program in Physics. It builds upon basics which are acquired in the lecture "Quantum mechanics I" of the Bachelor's degree. While the specific emphasis can be adjusted individually, the core topics that are supposed to be covered should include:
- 1. Second quantisation: Fermions and bosons
- 2. Band structures of particles in a crystal
- 3. Angular momentum, symmetry operators, Lie Algebras
- 4. Scattering theory: Potential scattering, partial wave expansion
- 5. Relativistic quantum mechanics: Klein-Gordon equation, Dirac equation, Loretz group, fine structure splitting of atomic spectra
- 6. Quantum entanglement
- 7. Canonical formalism

Intended learning outcomes

The students acquire in-depth knowledge of advanced quantum mechanics and have a thorough understanding of the mathematical and theoretical concepts of the listed topics. They are able to describe or model problems of modern theoretical Quantum Physics mathematically, to solve problems analytically, to use approximation methods and to interpret the results physically. The course is pivotal to subsequent theory courses in Astrophysics, High-Energy Physics and Condensed Matter/Solid-State Physics. The course is mandatory for all Master's students.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English



Allocation of places

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Additional information

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Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Nanostructure Technology (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Module title | | | Abbreviation | |
|---|----------------|---|----------------------------------|--|
| Renormalization Theory | | | 11-RNT-092-m01 | |
| Module coor | rdinator | | Module offered by | |
| Managing Director of the Institute of Theoretic and Astrophysics | | of Theoretical Physics | Faculty of Physics and Astronomy | |
| ECTS Met | hod of grading | Only after succ. cor | mpl. of module(s) | |
| 6 num | nerical grade | | | |
| Duration | Module level | Other prerequisites | 5 | |
| 1 semester graduate Certain prerequisites must be met to qualify for admission to sessment. The lecturer will inform students about the respect at the beginning of the course. Registration for the course wi sidered a declaration of will to seek admission to assessment dents have obtained the qualification for admission to assess the course of the semester, the lecturer will put their registral sessment into effect. Students who meet all prerequisites will ted to assessment in the current or in the subsequent semester sessment at a later date, students will have to obtain the qualification to assessment anew. | | urer will inform students about the respective deta the course. Registration for the course will be con on of will to seek admission to assessment. If stu- ed the qualification for admission to assessment of emester, the lecturer will put their registration for a ct. Students who meet all prerequisites will be admin the current or in the subsequent semester. For a date, students will have to obtain the qualification | n- over as- mit- as- | |

Renormalisation group methods for Hamiltonian systems. Partial non-linear differential equations with scaling behaviour for dynamics beyond the equilibrium. Classical-critical and quantum-critical phenomena and their relevance for phase diagrams in cryogenic temperatures. Instability of statistical and dynamic mean-field solutions. Stochastic non-linear partial differential equations. Construction of generating functionals. Halperin-Hohenberg-Ma differential equations. Symmetries, e.g. in the stochastic Burgers' equation (KPZ equation). Introduction and comparison of different RG methods.

Intended learning outcomes

The students have gained an overview of renormalisation group methods for non-linear partial differential equations. They know important examples and corresponding solving methods and are able to apply them to specific tasks.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

| Allocation of places |
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| Additional information |
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| Workload |
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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Module title | | | | Abbreviation | |
|------------------------------------|------------------------------|--|---|---|--|
| Relativistical Quantumfield Theory | | | | 11-RQFT-092-m01 | |
| Module coord | inator | | Module offered by | | |
| Managing Dire | ector of the Institute of Th | neoretical Physics | Faculty of Physics a | and Astronomy | |
| ECTS Metho | od of grading | Only after succ. con | Only after succ. compl. of module(s) | | |
| 8 numerical grade | | ` | | | |
| Duration | Module level | Other prerequisites | | | |
| 1 semester graduate | | sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effect ted to assessment i | trer will inform stude the course. Registrat on of will to seek adm d the qualification fo mester, the lecturer t. Students who mee n the current or in th date, students will h | alify for admission to as- nts about the respective details ion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for | |

Symmetries. Lagrange formalism for fields. Field quantisation. Gauge principle and interaction. Perturbation theory. Feynman rules. Quantum electrodynamic processes in Born approximation. Radiative corrections and renormalisation.

Intended learning outcomes

The students have mastered the principles and underlying mathematics of relativistic quantum field theories. They know how to use perturbation theory and how to apply Feynman rules. They are able to calculate basics processes in the framework of quantum electrodynamics in leading order. Moreover, they have a basic understanding of radiative corrections and renormalisation.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

| Language of assessment: German, English |
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| Allocation of places |
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| Additional information |
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| Workload |
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| Teaching cycle |
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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Module title | | | | Abbreviation | |
|------------------------------|---------------|--|---|---|--|
| Theory of Rel | ativity | | | 11-RTT-092-m01 | |
| Module coord | dinator | | Module offered by | | |
| Managing Dir and Astrophy | | of Theoretical Physics | eoretical Physics Faculty of Physics and Astronomy | | |
| ECTS Meth | od of grading | Only after succ. cor | mpl. of module(s) | | |
| 6 nume | erical grade | | | | |
| Duration Module level | | Other prerequisites | Other prerequisites | | |
| 1 semester graduate | | sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effect ted to assessment | urer will inform studen the course. Registration on of will to seek admed the qualification for emester, the lecturer was t. Students who meet in the current or in the date, students will ha | alify for admission to as- ints about the respective details ion for the course will be con- ission to assessment. If stu- r admission to assessment over will put their registration for as- t all prerequisites will be admit- e subsequent semester. For as- ave to obtain the qualification for | |

Mathematical foundations of the theory of relativity; differential forms; brief summary of special relativity; elements of differential geometry; electrodynamics as an example of a relativistic gauge theory; field equations of general relativity; stellar models; introduction to cosmology; Hamiltonian formulation

Intended learning outcomes

The students are familiar with the basic physical and mathematical concepts of general relativity. They have a mathematical understanding of the formulation of general relativity on the basis of differential forms. They are able to apply the acquired knowledge to problems of Astrophysics and cosmology.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

| Language of assessment: German, English |
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| Allocation of places |
| |
| Additional information |
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| Workload |
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| Teaching cycle |
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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



Master's with 1 major Mathematics (2012)

| Modul | | | | | Abbreviation |
|---|--|--|--|--|---|
| | | ta Analysis and Comp | outer Physics | | 11-SDC-092-m01 |
| Modul | e coord | linator | | Module offered by | · |
| Manag | ing Dir | ector of the Institute o | of Applied Physics | Faculty of Physics and Astronomy | |
| ECTS | | od of grading | Only after succ. con | npl. of module(s) | |
| 4 | nume | rical grade | | | |
| Duration Module level Other prerequisites | | | | | |
| Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective d at the beginning of the course. Registration for the course will be a sidered a declaration of will to seek admission to assessment. If sidents have obtained the qualification for admission to assessment the course of the semester, the lecturer will put their registration for | | | | ents about the respective details tion for the course will be con- mission to assessment. If stu- or admission to assessment over | |
| the course of the semester, the lecturer will put their registration for sessment into effect. Students who meet all prerequisites will be ad ted to assessment in the current or in the subsequent semester. For sessment at a later date, students will have to obtain the qualificati admission to assessment anew. | | | | | |
| Conter | nts | | | | |
| Statist | ics, dat | ta analysis and compu | ıter physics. | | |
| Intend | ed lear | ning outcomes | | | |
| The stu Physic | | have specific and adv | anced knowledge in the | field of statistics, d | ata analysis and Computational |
| Course | es (type | , number of weekly co | ontact hours, language – | - if other than Germa | an) |
| R + V (1 | no info | rmation on SWS (weel | kly contact hours) and co | ourse language avai | lable) |
| | | | e, language — if other th le can be chosen to earn | | ation offered — if not every seme- |
| groups project (appro Assess and wi examir | s (appro t report x. 30 m sment o Il be ar nation r | ox. 30 minutes per car (approx. 8 to 10 page linutes) offered: When and hov | ndidate, for modules with s, time to complete: 1 to woften assessment will under observance of Sec | h less than 4 ECTS c 4 weeks) or d) pres be offered depends | idate each or oral examination in redits approx. 20 minutes) or c) entation/seminar presentation on the method of assessment 3 ASPO (general academic and |
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| | | r Mathematics (2012) | | • generated 26-Aug-2024 • | 0V2m rog |

JMU Würzburg • generated 26-Aug-2024 • exam. reg. data record Master (120 ECTS) Mathematik - 2012

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Bachelor' degree (1 major) Nanostructure Technology (2010)

Bachelor' degree (1 major) Nanostructure Technology (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Module title | | | | | Abbreviation | |
|--|-------|--|--|---|----------------|--|
| Semiconductor Physics and Devices | | | es | | 11-SPD-102-m01 | |
| Module coordinator | | | | Module offered by | | |
| Managing Director of the Institute of Ap | | | of Applied Physics | Faculty of Physics a | and Astronomy | |
| ECTS | Metho | od of grading | Only after succ. co | ly after succ. compl. of module(s) | | |
| 6 | nume | rical grade | | - | | |
| Duratio | n | Module level | Other prerequisite | Other prerequisites | | |
| 1 semester graduate | | sessment. The lect at the beginning o sidered a declarat dents have obtain the course of the s sessment into effected to assessment | turer will inform stude of the course. Registration of will to seek adm ed the qualification for emester, the lecturer ect. Students who mee in the current or in the | alify for admission to as- ents about the respective details tion for the course will be con- nission to assessment. If stu- or admission to assessment over will put their registration for as- et all prerequisites will be admit- ne subsequent semester. For as- eave to obtain the qualification for | | |

Principles of Semiconductor Physics. Introduction to key theories on semiconductors. Components from the areas of electronics and photonics.

Intended learning outcomes

The students are familiar with the properties of semiconductors, they have gained an overview of the electronic and phononic band structures of important semiconductors and the resulting electronic, optical and thermal properties. They know the principles of charge transport and are able to apply Poisson, Boltzmann and continuity equations to the solution of questions. They have gained insights into the methods of semiconductor production and are familiar with the methods of planar technology and current developments in this sector, they have a basic understanding of component production. They understand the structure and function of the main components of electronics (diodes, transistor, FET, thyristor, diac, triac), microwave applications (tunnel, impatt, baritt and Gunn diode) and optoelectronics (photo diode, solar cell, light-emitting diode, semiconductor injection laser). They know the realisation possibilities of low-dimensional charge carrier systems on the basis of semiconductors and their technological importance. They are familiar with current developments in the field of components.

Courses (type, number of weekly contact hours, language — if other than German)

V + R (no information on SWS (weekly contact hours) and course language available)

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)

written examination (approx. 90 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

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| Allocation of places |
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| Additional information |
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Workload

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Teaching cycle

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

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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Nanostructure Technology (2010)

Bachelor' degree (1 major) Nanostructure Technology (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)

Master's degree (1 major) Functional Materials (2012)



| | | Abbreviation | | |
|----------------------------------|--|--|--|--|
| etry I and II | | 11-SUS-092-m01 | | |
| dinator | | Module offered by | | |
| rector of the Institute vsics | of Theoretical Physics | Faculty of Physics and Astronomy | | |
| od of grading | Only after succ. cor | npl. of module(s) | | |
| erical grade | | | | |
| Module level | Other prerequisites | Other prerequisites | | |
| 1 semester graduate | | es must be met to qualify for admission to as- urer will inform students about the respective details the course. Registration for the course will be con- on of will to seek admission to assessment. If stu- d the qualification for admission to assessment over emester, the lecturer will put their registration for as- ct. Students who meet all prerequisites will be admit- in the current or in the subsequent semester. For as- date, students will have to obtain the qualification for sment anew. | | |
| | dinator rector of the Institute rsics rod of grading erical grade Module level | dinator rector of the Institute of Theoretical Physics rsics od of grading Only after succ. corerical grade Module level graduate Other prerequisites sessment. The lectuat the beginning of sidered a declaration dents have obtaine the course of the sessment into effect ted to assessment i | | |

Supersymmetry I: Grassmann variable. Coleman-Mandula theorem and Haag-Lopuszanski-Sohnius theorem. Supersymmetry: Algebra and multiplets. Superfield formalism. Breaking of supersymmetry. Supersymmetry II: Minimal supersymmetric standard model. Higgs sector. The spectrum of supersymmetric par-

ticles. Phenomenology of LEP, Tevatron and LHC, supersymmetric neutrino mass models. Violation of R-parity.

Intended learning outcomes

The students have knowledge of the mathematical and physical principles of supersymmetry and supersymmetric models. They understand the theory's formalism and recognise its connections to other models as well as its importance for phenomenology of elementary particles.

Courses (type, number of weekly contact hours, language — if other than German)

V + R (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

| Language of assessment: German, English |
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| Allocation of places |
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| Additional information |
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| Workload |
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| Teaching cycle |
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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)

Master's degree (1 major) Computational Mathematics (2012)

Master's degree (1 major) FOKUS Physics (2006)



| Theoretical Elementary Particle Physics Module coordinator Managing Director of the Institute of Theoretical Physics and Astronomy Faculty of Physics and Astronomy Faculty of Physics and Astronomy Theoretical Physics Faculty of Physics and Astronomy Faculty of Physics and Astronomy Theoretical Physics Faculty of Physics Faculty of Physics Theoretical Physics Faculty of Physics Facult | Module title | le | | | Abbreviation | |
|--|-------------------|-------------------------------|---|---|--|--|
| Managing Director of the Institute of Theoretical Physics and Astrophysics Faculty of Physics and Astronomy | Theoretical E | al Elementary Particle Physic | :S | | 11-TEP-092-m01 | |
| and Astrophysics ECTS Method of grading Only after succ. compl. of module(s) 8 numerical grade Duration Module level Other prerequisites 1 semester graduate Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective detain at the beginning of the course. Registration for the course will be con- | Module coor | ordinator | | Module offered by | | |
| 8 numerical grade Duration Module level Other prerequisites 1 semester graduate Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective deta at the beginning of the course. Registration for the course will be con- | | | neoretical Physics | Faculty of Physics a | and Astronomy | |
| Duration Module level Other prerequisites 1 semester graduate Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective deta at the beginning of the course. Registration for the course will be con- | ECTS Meth | ethod of grading | Only after succ. con | Only after succ. compl. of module(s) | | |
| 1 semester graduate Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective deta at the beginning of the course. Registration for the course will be con- | 8 numerical grade | | | | | |
| sessment. The lecturer will inform students about the respective deta at the beginning of the course. Registration for the course will be con- | Duration | Module level | Other prerequisites | | | |
| dents have obtained the qualification for admission to assessment of the course of the semester, the lecturer will put their registration for a sessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For a sessment at a later date, students will have to obtain the qualification admission to assessment anew. | | | sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effect ted to assessment it sessment at a later | trer will inform stude the course. Registrat on of will to seek adm d the qualification fo mester, the lecturer t. Students who mee n the current or in th date, students will h | nts about the respective details ion for the course will be connission to assessment. If stural admission to assessment over will put their registration for astall prerequisites will be admites subsequent semester. For as- | |

Fundamental forces and particles. Groups and symmetries. Quark model. Principles of quantum field theory. Gauge theories. Spontaneous symmetry breaking. Electroweak standard model. Quantum chrome dynamics. Extensions of the standard model.

Intended learning outcomes

The students are familiar with the mathematical methods of Elementary Particle Physics. They understand the structure of the standard model based on symmetry principles and experimental observations. They know calculation methods for the processing of simple problems and processes of Elementary Particle Physics. Furthermore, they know the tests and limits of the standard model and the basics of extended theories.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

| Language of assessment: German, English |
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| Allocation of places |
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| Additional information |
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| Workload |
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| Teaching cycle |
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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Theoretical Solid State Physics Module coordinator Module offered by Managing Director of the Institute of Theoretical Physics and Astronomy and Astrophysics Faculty of Physics and Astronomy Faculty of Physics and Astronomy Only after succ. compl. of module(s) numerical grade Duration Module level Other prerequisites 1 semester graduate Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective deta | Module title | | | | | Abbreviation | |
|---|---------------------------------|------|--|---|---|----------------|--|
| Managing Director of the Institute of Theoretical Physics Faculty of Physics and Astronomy and Astrophysics ECTS Method of grading Only after succ. compl. of module(s) 8 numerical grade Duration Module level Other prerequisites 1 semester graduate Certain prerequisites must be met to qualify for admission to as- | Theoretical Solid State Physics | | | | | 11-TFK-092-m01 | |
| and Astrophysics ECTS Method of grading Only after succ. compl. of module(s) 8 numerical grade Duration Module level Other prerequisites 1 semester graduate Certain prerequisites must be met to qualify for admission to as- | Module coordinator | | | | Module offered by | | |
| 8 numerical grade Duration Module level Other prerequisites 1 semester graduate Certain prerequisites must be met to qualify for admission to as- | | | | Theoretical Physics | eoretical Physics Faculty of Physics and Astronomy | | |
| Duration Module level Other prerequisites 1 semester graduate Certain prerequisites must be met to qualify for admission to as- | ECTS | Meth | od of grading | Only after succ. cor | Only after succ. compl. of module(s) | | |
| 1 semester graduate Certain prerequisites must be met to qualify for admission to as- | 8 | nume | erical grade | | | | |
| | Duratio | on | Module level | Other prerequisites | Other prerequisites | | |
| at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment on the course of the semester, the lecturer will put their registration for a sessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For a sessment at a later date, students will have to obtain the qualification admission to assessment anew. | | | sessment. The lectuat the beginning of sidered a declaration dents have obtained the course of the sessment into effected to assessment at a later | urer will inform stude the course. Registrat on of will to seek adm d the qualification for emester, the lecturer et. Students who mee in the current or in th date, students will h | ents about the respective details cion for the course will be connission to assessment. If stubra admission to assessment over will put their registration for astall prerequisites will be admite subsequent semester. For as- | | |

Principles of Theoretical Solid-State Physics. Fermi liquid theory. Electron-electron interaction. Variational methods. Magnetism. Superconductivity.

Intended learning outcomes

The students have basic knowledge of the theoretical description of solid-state phenomena. They know the corresponding mathematical or theoretical methods and are able to apply them to basic problems of solid-state theory and to understand the connections to experimental results. The individual students have elaborated on an advanced topic of solid-state theory and have discussed this topic in a seminar presentation.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

| Language of assessment: German, English |
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| Allocation of places |
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| Additional information |
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| Workload |
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| Teaching cycle |
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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Module title | | | | | Abbreviation | |
|--|------|--|--|--------------------------------------|----------------|--|
| Experimental Particle Physics | | | | | 11-TPE-092-m01 | |
| Module coordinator | | | | Module offered by | | |
| Managing Director of the Institute of Applied Ph | | | of Applied Physics | Faculty of Physics and Astronomy | | |
| ECTS | Meth | od of grading | Only after succ. co | Only after succ. compl. of module(s) | | |
| 4 | nume | rical grade | | | | |
| Duration Module level | | Other prerequisites | Other prerequisites | | | |
| 1 semester graduate Cer ses at t sid der the ses ted ses | | sessment. The lectuat the beginning of sidered a declaration dents have obtained the course of the sessment into effect ted to assessment at a later | Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew. | | | |

Physics with modern particle detectors at the LHC and at the Tevatron. Discovery of the Higgs boson. Search for supersymmetry and other physics beyond the standard model. Determination of the top quark mass and W mass as well as other parameters of the standard model. Introduction to modern methods of analysis and assessment of systematic errors.

Intended learning outcomes

The students are familiar with the principles of modern particle detector physics, especially with currently open questions of Particle Physics, which are examined by using these detectors. They know modern methods of analysis and are able to put results into context and to assess their systematic uncertainties.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

| Language of assessment: German, English |
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| Allocation of places |
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| Additional information |
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| Workload |
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| Teaching cycle |
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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Module title | | | | Abbreviation | |
|---|---------------|--|----------------------------------|----------------|--|
| Particle Physics (Standard Model) | | | | 11-TPS-092-m01 | |
| Module coord | linator | | Module offered by | | |
| Managing Directors of the Institute of Applied Physics at the Institute of Theoretical Physics and Astrophysics | | , , | Faculty of Physics and Astronomy | | |
| ECTS Meth | od of grading | Only after succ. compl. of module(s) | | | |
| 8 nume | rical grade | | | | |
| Duration | Module level | Other prerequisites | | | |
| 1 semester graduate | | Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew. | | | |

Introduction to the theory of electroweak interaction and spontaneous symmetry breaking. Experiments on the standard model and determination of model parameters.

Intended learning outcomes

The students know the theoretical fundamental laws of the standard model of Particle Physics and the key experiments that have established and confirmed the standard model. They are able to interpret experimental or theoretical results in the framework of the standard model and know its validity and limits.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

Language of assessment: German, English

| Allocation of places |
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| Additional information |
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| Workload |
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| Teaching cycle |
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| Referred to in LPO I (examination regulations for teaching-degree programmes) |
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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)



| Module titl | e | | | Abbreviation | |
|--|-----------------|---|---|----------------|--|
| Theory of S | uperconduction | | | 11-TSL-092-m01 | |
| Module coordinator | | | Module offered by | | |
| Managing Director of the Institute of Theoretical Phys and Astrophysics | | e of Theoretical Physics | Faculty of Physics and Astronomy | | |
| ECTS Me | thod of grading | Only after succ. cor | Only after succ. compl. of module(s) | | |
| 5 nur | nerical grade | | | | |
| Duration | Module level | Other prerequisites | Other prerequisites | | |
| 1 semester | graduate | sessment. The lecturation at the beginning of sidered a declaration dents have obtained the course of the sessment into effect ted to assessment at a later | Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective det at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment the course of the semester, the lecturer will put their registration for sessment into effect. Students who meet all prerequisites will be ad ted to assessment in the current or in the subsequent semester. For sessment at a later date, students will have to obtain the qualification admission to assessment anew. | | |

Introduction to the phenomenom of superconductivity. Microscopic theory of superconductivity (BCS theory). Phenomenological theory of superconductivity (Ginzburg-Landau theory). Mesoscopic aspects of superconductivity (Andreev scattering, Bobolioubov-de Gennes equation, SQUIDS). Quantum computing with superconductive elements.

Intended learning outcomes

The students have basic knowledge of the theoretical models for the description of superconductivity. They know the properties and application areas of these models and are able to apply calculation methods to simple problems.

Courses (type, number of weekly contact hours, language — if other than German)

R + V (no information on SWS (weekly contact hours) and course language available)

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 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

| Language of assessment: German, English |
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| Allocation of places |
| |
| Additional information |
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| Workload |
| |
| Teaching cycle |
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Module appears in

Bachelor' degree (1 major) Physics (2010)

Bachelor' degree (1 major) Physics (2012)

Bachelor' degree (1 major) Mathematical Physics (2009)

Bachelor' degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) Mathematics (2012)

Master's degree (1 major) Mathematics (2010)

Master's degree (1 major) Physics (2010)

Master's degree (1 major) Physics (2011)

Master's degree (1 major) Nanostructure Technology (2011)

Master's degree (1 major) Nanostructure Technology (2010)

Master's degree (1 major) Mathematical Physics (2012)

Master's degree (1 major) FOKUS Physics - Nanostructuring Technology (2010)

Master's degree (1 major) FOKUS Physics (2010)

Master's degree (1 major) FOKUS Physics (2011)