Universität Hamburg
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FAKULTÄT
FÜR MATHEMATIK, INFORMATIK
UND NATURWISSENSCHAFTEN

Master's Programme Mathematical Physics

Module Handbook

Valid from WS 2023/2024

As of: 13. February 2024

Module overview

List of Abbreviations

CP	Credit Points (german: Leistungspunkte)
S	Seminar
SWS	Hours per Week during the Semester (german: Semester-Wochen-Stunden)
Ü	Exercises (german: Übungen)
V	Lecture (german: Vorlesung)

Module descriptions

Modul title	**In-depth Course**	
Module number/abbreviation	V	
Applicability	M.Sc. Mathematical Physics: Elective Module Some of the courses in the module are also offered in the following degree programmes: M.Sc. Business Mathematics: Elective Module M.Sc. Industrial Mathematics: Elective Module M.Sc. Mathematics: Elective Module	
Requirements for participation	Mandatory: none Recommended: Prior knowledge to the extent of the Bachelor lectures of the subject area	
Person(s) responsible for the module	Prof. Dr. Ingo Runkel (as Chairman of the Examination Committee)	
Language	German or English, usually English	
Qualification goals	The students acquire deepened knowledge of the state of research in themes pertaining to the research areas of the Department of Mathematics and are then capable of applying advanced scientific methods relevant to the research areas. They study the specialized scientific literature and practice using it.	
Content	A thematic complex from a mathematical research area of the Departments of Mathematics	
Courses and teaching formats	6 CP Module a) Lecture (V) b) Exercises to the lecture (Ü) 12 CP Module a) Lecture (V) b) Exercises to the lecture (Ü)	 2 SWS 1 SWS 4 SWS 2 SWS
Credit points	Total: 6 CP or 12 CP depending on the module	
Workload	6 CP Module Attendance studies Self-study/exam preparation 12 CP Module Attendance studies Self-study/exam preparation	 42 Std. 138 Std. 84 Std. 276 Std.
Requirements for participation in and type of coursework and examinations	Prerequisites for the module examination: usually completion of the exercise Type of module examination: oral examination, alternatively written examination (graded) Language of examination: usually English	
Duration	1 semester	
Frequency of the course	Every semester	
Reference semester	1-2	

Modul title	**Physical in-depth Course**
Module number/abbreviation	M-PHYS
Applicability	M.Sc. Mathematical Physics: Elective Module
Requirements for participation	Mandatory: none Recommended: Prior knowledge to the extent of the Bachelor lectures of the subject area
Person(s) responsible for the module	Prof. Dr. Ingo Runkel (as Chairman of the Examination Committee)
Language	German or English, usually English
Qualification goals	The students acquire deepened knowledge of the state of research in themes pertaining to the theoretical research areas of physics and are then capable of applying advanced scientific methods relevant to the research areas. They take insight into the scientific literature and practice to handle it.
Content	A topic from a research area in Theoretical Physics of the Department of Physics
Courses and teaching formats	Variable: Lectures, exercises, seminars, practical courses
Credit points	Total: 2-9 CP
Workload	Prerequisites for the module examination: none Type of module examination: Presentation or oral examination or completion of practical courses or written examination or term papers or completion of projects (graded) (will be determined before the start of the module) Language of examination: usually English
Requirements for participation in and type of coursework and examinations	1 semester
Duration	Every semester
Frequency of the course	1-2

Module title	**Special Course**	
Module number/abbreviation	SP	
Applicability	M.Sc. Mathematical Physics: Elective Module Some of the courses in the module are also offered in the following degree programmes: M.Sc. Business Mathematics: Elective Module M.Sc. Industrial Mathematics: Elective Module M.Sc. Mathematics: Elective Module	
Requirements for participation	Mandatory: none Recommended: Prior knowledge to the extent of the Bachelor lectures of the subject area	
Person(s) responsible for the module	Prof. Dr. Ingo Runkel (as Chairman of the Examination Committee)	
Language	German or English, usually English	
Qualification goals	The students acquire a profound understanding of selected problems, methods and results of a research area of Mathematics or Theoretical Physics. They learn to master advanced techniques and develop the ability to conduct independent scientific work in the area.	
Content	Research-oriented study of selected topics pertaining to a research area of the Departments of Mathematics and Physics	
Courses and teaching formats	9 CP Module a) Lecture (V) b) Exercises to the lecture (Ü) 12 CP Module a) Lecture (V) b) Exercises to the lecture (Ü) 18 CP Module a) Lecture (V) b) Exercises to the lecture (Ü)	 2 SWS 1 SWS 2 SWS 2 SWS 4 SWS 2 SWS
Credit points	Total: 9 CP or 18 CP depending on the module	
Workload	9 CP Module Attendance studies Self-study/exam preparation 12 CP Module Attendance studies Self-study/exam preparation 18 CP Module Attendance studies Self-study/exam preparation	 42 hrs. 228 hrs. 56 hrs. 304 hrs. 84 hrs. 456 hrs.
Requirements for participation in and type of coursework and examinations	Prerequisites for the module examination: usually completion of the exercise Type of module examination: oral examination, alternatively written examination (graded) Language of examination: usually English	

Duration	1 semester
Frequency of the course	Every semester
Reference semester	1-2

Modul title	**Seminar**	
Module number/abbreviation	S	
Applicability	M.Sc. Mathematical Physics: Elective Module Some of the courses in the module are also offered in the following degree programmes: M.Sc. Business Mathematics: Elective Module M.Sc. Industrial Mathematics: Elective Module M.Sc. Mathematics: Elective Module	
Requirements for participation	Mandatory: none Recommended: Prior knowledge in the field of mathematics or theoretical physics as specified by the supervising university lecturer	
Person(s) responsible for the module	Prof. Dr. Ingo Runkel (as Chairman of the Examination Committee)	
Language	German or English, usually English	
Qualification goals	The students learn to familiarize themselves in an independent way with an advanced topic in Mathematics or Theoretical Physics, to present their results in a talk and to conduct scientific discussions.	
Content	Selected topics in Mathematics or Theoretical Physics pertaining to the research areas of the Departments of Mathematics and Physics.	
Courses and teaching formats	a) Seminar (S)	2 SWS
Credit points	Total: 6 CP	
Workload	Attendance studies Self-study/exam preparation	28 Std. 152 Std.
Requirements for participation in and type of coursework and examinations	Prerequisites for the module examination: none Type of module examination: Presentation (ungraded) Language of examination: usually English	
Duration	1 semester	
Frequency of the course	Every semester	
Reference semester	1-2	

Module title	**Research seminar**	
Module number/abbreviation	FS	
Applicability	M.Sc. Mathematical Physics: Elective Module Some of the courses in the module are also offered in the following degree programmes: M.Sc. Business Mathematics: Elective Module M.Sc. Industrial Mathematics: Elective Module M.Sc. Mathematics: Elective Module	
Requirements for participation	Mandatory: none Recommended: in-depth prior knowledge in the relevant field of mathematics or theoretical physics as specified by the university lecturers involved in the research seminar	
Person(s) responsible for the module	Prof. Dr. Ingo Runkel (as Chairman of the Examination Committee)	
Language	German or English, usually English	
Qualification goals	With increasing independence, the students are capable of participating in the research activities of a working group in Mathematics or Theoretical Physics. They learn to familiarize themselves with topics in Mathematics or Theoretical Physics of current interest and to deepen the state of knowledge of the scientific literature, if possible, by their own work. They can present results of current research and open problems in seminar talks and are able of conducting scientific discussions in the research group.	
Content	Research in a research area of the Departments of Mathematics and Physics.	
Courses and teaching formats	a) Research seminar (S)	2 SWS
Credit points	Total: 6 CP	
Workload	Attendance studies Self-study/exam preparation	28 Std. 152 Std.
Requirements for participation in and type of coursework and examinations	Prerequisites for the module examination: none Type of module examination: Presentation (ungraded) Language of examination: usually English	
Duration	1 semester	
Frequency of the course	Every semester	
Reference semester	1-2	

Modul title	**Guided self-study**
Module number/abbreviation	AS
Applicability	M.Sc. Mathematical Physics: Elective Module Some of the courses in the module are also offered in the following degree programmes: M.Sc. Business Mathematics: Elective Module M.Sc. Industrial Mathematics: Elective Module M.Sc. Mathematics: Elective Module
Requirements for participation	Mandatory: none Recommended: advanced knowledge in the area of guided self-study/ as specified by the university lecturer conducting the course
Person(s) responsible for the module	Prof. Dr. Ingo Runkel (as Chairman of the Examination Committee)
Language	German or English, usually English
Qualification goals	The students familiarize themselves with an advanced topic in mathematics or theoretical physics and learn special relevant techniques
Content	Supervised advanced studies in mathematics or theoretical physics
Credit points	Total: 2-9 CP (to be determined before the start of the module)
Requirements for participation in and type of coursework and examinations	Prerequisites for the module examination: none Type of module examination: Presentation or oral examination or completion of practical courses or term papers or completion of projects (graded) (will be determined before the start of the module) Language of examination: usually English
Duration	1 semester
Frequency of the course	Every semester
Reference semester	1-2

Modul title	**Introductory project**	
Module number/abbreviation	E	
Applicability	M.Sc. Mathematical Physics: Compulsory module M.Sc. Mathematics: Compulsory module The module forms an inseparable unit with the subsequent modules Preparatory Project and Master's Thesis and must therefore be taken in the same research field in which the Master's thesis is to be written.	
Requirements for participation	Mandatory: none Recommended: Prior knowledge in the relevant field of mathematics or theoretical physics as specified by the supervising university lecturer	
Person(s) responsible for the module	Prof. Dr. Ingo Runkel (as Chairman of the Examination Committee)	
Language	German or English, usually English	
Qualification goals	The students dedicate themselves to the deepened study of a modern research area, in which the topic of the Master's thesis is embedded. The aim of this study is to gain acquaintance with the up-to-date scientific literature. The student learns to gather the necessary information and background knowledge in and independent manner and gains acquaintance with a specialised topic. For this module, the student is integrated in a scientific research group. By the embedding in a research group they learn to do collaborative work and find out how to use close range informal knowledge in an optimal way.	
Content	Introduction to the specialised research area, in which the Master's thesis will be written	
Courses and teaching formats	Variable: Lectures, exercises, seminars, research seminars, guided self-study	
Credit points	Total: 15 CP	
Workload	Attendance studies + self-study/exam preparation	450 hrs.
Requirements for participation in and type of coursework and examinations	Prerequisites for the module examination: none Type of module examination: Depending on the task: Presentation or oral examination or completion of practical courses or written examination or term papers or completion of projects (ungraded) (will be determined before the start of the module) Language of examination: usually English	
Duration	1 semester	
Frequency of the course	Every semester	
Reference semester	3	

Modul title	**Preparatory project**	
Module number/abbreviation	V	
Applicability	M.Sc. Mathematical Physics: Compulsory module M.Sc. Mathematics: Compulsory module The module forms an inseparable unit with the preceding module Introductory Project and the subsequent module Master's Thesis and must therefore be taken in the same research field in which the Master's thesis is to be written.	
Requirements for participation	Mandatory: Participation in Introductory project Recommended: Prior knowledge in the relevant field of mathematics and/or theoretical physics as specified by the supervising university lecturer	
Person(s) responsible for the module	Prof. Dr. Ingo Runkel (as Chairman of the Examination Committee)	
Language	German or English, usually English	
Qualification goals	The student will -acquire the special methods and knowledge of the area as much as necessary to apply them to problems and questions relevant to the topic of the Master's thesis (this will be done through the processing of preliminary tasks) -plan and structure the envisaged research project -learn to do collaborative work and to use close range informal knowledge in an optimal way, thanks to the embedding in a research group	
Content	-introduction to scientific work and to the professional and methodological foundations for the Master's thesis -planning of the research project to be conducted as part of the thesis work	
Courses and teaching formats	Variable: Lectures, exercises, seminars, research seminars, guided self-study	
Credit points	Total: 15 CP	
Workload	Attendance studies + self-study/exam preparation	450 hrs.
Requirements for participation in and type of coursework and examinations	Prerequisites for the module examination: none Type of module examination: Depending on the task: Presentation or oral examination or completion of practical courses or written examination or term papers or completion of projects (graded) (will be determined before the start of the module) Language of examination: usually English	
Duration	1 semester	
Frequency of the course	Every semester	
Reference semester	3	

Module title	**Master's thesis**
Module number/abbreviation	MA
Applicability	M.Sc. Mathematical Physics: Compulsory module
Requirements for participation	Mandatory: Students can only be admitted to the Master's thesis if they have earned at least 72 credit points.
Person(s) responsible for the module	Prof. Dr. Ingo Runkel (as Chairman of the Examination Committee)
Language	German or English, usually English
Qualification goals	The candidate is capable of comprehending an up-to-date research problem within the given time frame, of applying the pertinent scientific methods in an increasingly independent way and of presenting the results in a scientifically appropriate form.
Content	-Conducting of a research project -Evaluation and processing of the results as well as written exposition -oral presentation and discussion of the results The Master's thesis constitutes the concluding module of the Master's study program. Its results will contribute to the advancement of the scientific knowledge.
Credit points	Total: 30 CP
Requirements for participation in and type of coursework and examinations	Prerequisites for the module examination: none Type of module examination: Master's thesis (graded) (will be determined before the start of the module) Language of examination: usually English
Duration	1 semester
Frequency of the course	Every semester
Reference semester	4