

OFFICIAL TRANSLATION OF

**Fachspezifische Bestimmungen für den Masterstudiengang
Mathematical Physics der Fakultät für Mathematik,
Informatik und Naturwissenschaften
(Amtliche Bekanntmachung Nr. 2 vom 11. Januar 2016)**

**THIS TRANSLATION IS FOR INFORMATION ONLY –
ONLY THE GERMAN VERSION SHALL BE LEGALLY
VALID AND ENFORCEABLE!**

**Subject-Specific Provisions for the Master of Science in
Mathematical Physics at the Faculty of Mathematics,
Informatics and Natural Sciences**

dated 6 May 2015

On 19 November 2015 in accordance with Section 108 subsection 1 of the Hamburg higher education act (Hamburgisches Hochschulgesetz, HmbHG) dated 18 July 2001 (HmbGVBl. p. 171) as amended on 4 December 2012, the Executive University Board of Universität Hamburg ratified the Subject-Specific Provisions for the Master of Science (MSc) in Mathematical Physics adopted by the Faculty Council from the Faculty of Mathematics, Informatics and Natural Sciences on 6 May 2015 in accordance with Section 91 subsection 2 no. 1 HmbHG.

Preamble

These Subject-Specific Provisions supplement the provisions of the Faculty of Mathematics, Informatics and Natural Sciences' Examination Regulations (Prüfungsordnungen MSc, PO MSc) dated 11 April and 4 July 2012, as amended, governing Master of Science (MSc) degree programs and provide a description of the modules for mathematical physics as a subject.

I. Supplemental provisions

Section 1

Program and examination objectives, academic degree, and implementation of the degree program

Section 1 subsection 1:

1. The Master of Science in Mathematical Physics is geared toward research.
2. The successful completion of the master's examination in mathematical physics is evidence of the mastery of an in-depth and research-focused academic education in a degree program that constitutes a professional qualification.
3. Students will gain the ability to address complex problems and solve them using current and future scientific methods.
4. Taking into consideration the requirements and changes in the working world and interdisciplinary relationships, the program teaches students the requisite technical methods, skills, and knowledge and enables them to work scientifically, to apply and critically classify scientific findings, and to act responsibly. In particular, students will be able to apply advanced mathematical methods to physical theories and phenomena and use methods of theoretical physics to produce mathematical structures and proof strategies.

Program objectives principally focus on:

1. specialized knowledge oriented to current research questions based on in-depth fundamental knowledge,
2. methodological and analytical competencies that enable students to independently expand scientific knowledge, with a primary focus on research methods,
3. teaching professional versatility and scientific depth in order to be able to analyze and solve previously unresolved problems in the research fields of mathematical physics and in doing so recognizing mathematical questions within the context of physical theories and the application of mathematical techniques,

4. enabling students to independently and responsibly analyze current research from the discipline of mathematical physics from an interdisciplinary perspective while focusing on the problem, and conclusively present results,
5. teaching core skills that are professionally relevant.

Section 4
Program and examination structure, modules,
and ECTS credits

Section 4 subsections 2 and 3:

1. The master's degree program is organized into two one-year long stages—the advanced phase and the research phase:
 - The one-year advanced phase allows students to develop advanced knowledge necessary for independent, productive work in mathematical physics. It consists of advanced modules (= required elective modules) that are geared toward the theoretically oriented research focus of the Department of Physics, as well as the research areas of the Department of Mathematics that deal with issues relevant to physics.

Modules totaling 60 ECTS credits must be successfully completed. For this, the following requirements must be satisfied:

1. At least 42 ECTS credits must be earned from graded modules in the advanced phase.
2. Master's degree students must select advanced modules totaling at least 8 ECTS credits from the range of courses offered by both the Department of Mathematics and the Department of Physics.
3. Students must also complete a presentation seminar (6 ECTS credits) in which they give a presentation.
4. Modules totaling a maximum of 6 ECTS credits may be freely selected from other programs offered at Universität Hamburg.
5. Moreover, a maximum of one module from the advanced modules that the Department of Mathematics and Department of Physics offer for bachelor's degree programs may be taken for credit, provided these were not already previously selected in undergraduate studies. Where the bachelor's degree module is graded, this grade is incorporated into the overall grade point average.

The following is recommended:

6. Students should select at least two advanced modules totaling at least 16 ECTS credits from the courses offered in the subject area in which the master's thesis will be written.
7. In doing so, at least one advanced module should be selected from the research area that will be the topic of the master's thesis.

- The one-year research phase is comprised of three modules and must be viewed as one inseparable component. The three modules of the research phase must be part of one field of research. The induction project and the preparatory project each encompass 15 ECTS credits and are component parts of the third subject semester. The projects will familiarize students with the current status of research and special methods in the field from which the topic for the master's thesis will be selected. Subsequently in the fourth subject semester, the master's thesis, which is worth 30 ECTS credits, to be written over a period of six months. Students must demonstrate with this work that under guidance they are capable of handling a specified issue from the field of mathematical physics in accordance with scientific methods. They must also show that they can logically and comprehensibly present and interpret the problem, means of solution, and solution. The beginning of the research phase must be noted in the student's academic file and include the start date, field of research, and supervisor.

It is possible to switch supervisors within the first six weeks upon mutual agreement between the supervisor and the student. Disagreements or subsequent changes are decided by the Examinations Board.

The research phase may be completed in a research group from the Department of Physics, the Department of Mathematics, or upon request, in another department at Universität Hamburg or at a non-university research institution (e.g., DESY or Helmholtz-Zentrum Geesthacht (Centre for Materials and Coastal Research, HZG)). Important here is that the methods of mathematical physics are applied to a significant extent. The research phase may only first commence once the Examinations Board has consented and a university teacher with examination authorization pursuant to Section 14 subsection 9 commits to prepare the second written assessment of the master's thesis.

1. Detailed descriptions of all required modules, required elective modules, and elective modules can be found in Appendix A to these Subject-Specific Provisions as well as in the module handbook for the Master of Science in Mathematical Physics.

Subject Semester	Study Phase	Modules	Type	CP
1	Advanced specialization phase	Advanced physics	Required elective	60
2		Advanced mathematics		

		Specialization in mathematics		
		Seminars		
		Research seminars		
		Guided independent study		
3	Research phase	Induction project	Required	15
		Preparatory project		15
4		Master's thesis		30

Section 4 subsection 4:

The master's degree program commences on the first day lectures are held.

**Section 5
Course types**

Section 5 sentence 2:

All course types pursuant to Section 5 of the Examination Regulations for Master of Science degree programs may be implemented. Usually, this constitutes a combination of lectures and small group work such as practical courses and presentation seminars in the advanced phase, and research-related seminars in the research phase. Another type of course is guided independent study working on an individual problem.

Courses are held in English. Courses in modules from the required elective area may also be taught in German. The ability to complete the program completely in English is guaranteed.

**Section 10
Retaking module examinations**

Section 10 subsection 1:

In justified exceptional cases, on request, the Examinations Board may prescribe a different type of examination for a student's second attempt at passing an examination or course examination that has not been previously passed.

**Section 13
Completed coursework and module examinations**

Section 13 subsection 4:

(1) An academic debate in combination with a presentation, where appropriate, may be used as an additional type of examination.

(2) The specific type and duration or scope of the examination will be announced at the beginning of the course.

(3) Oral examinations may be used as an alternative to written examinations for module examinations. Written examinations may be used as an alternative to oral examinations for module examinations. The Examinations Board responsible must approve other alternative forms of examination.

Section 13 subsection 6:

Examinations will be taken in English and where required, in German in required elective areas. As a rule, examinations are held in the language in which the course was conducted. If the examiner and the student agree, the examination may also be taken in a language other than the language of instruction.

**Section 14
Master's thesis**

Section 14 subsection 1:

A mandatory component of the master's thesis is a colloquium consisting of a presentation and an academic discussion about the subject matter of the thesis. The colloquium is not be graded.

Section 14 subsection 2 sentence 1:

Students who have earned at least 72 ECTS credits in total may be allowed to commence work on the master's thesis.

Section 14 subsection 4:

The master's thesis may be written in either English or German, as agreed between the student and the supervisor.

Section 14 subsection 5:

The workload for the master's thesis amounts to 30 ECTS credits. The master's thesis must be completed within six months.

**Section 15
Evaluation of examinations**

Section 15 subsection 3 sentence 5:

If a module examination is comprised of several course examinations, then the module grade is calculated by averaging the grades from each course examination.

Section 15 subsection 3 sentence 9:

The overall final grade for the master's degree program is calculated by averaging the grades from the modules weighted according to the ECTS credits assigned to each,

- whereby only the 42 ECTS credits with the highest grades that satisfy the requirements from Section 5 subsection 1 from the advanced phase will be taken into account; and
- seminars, the induction project module, the ungraded alternative of the guided independent study module, and elective modules shall not be taken into account.

Section 15 subsection 3 sentence 10:

The following applies to the induction project module and the seminars: examination grades are not differentiated. examination performance is not used to calculate the overall final grade.

Section 15 subsection 4:

The overall final grade “with distinction” will be awarded if a grade of 1.0 is earned for the master’s thesis and the average grade from all module examinations is not less than 1.3.

Section 23

Effective date / transitional provisions

(1) These Subject-Specific Provisions become effective on the day following official publication by Universität Hamburg. They first apply to students commencing their studies in Summer Semester 2015.

(2) They also apply effective as of Summer Semester 2015 to students who began a degree program before the effective date of these Subject-Specific Provisions. Provisions of these Subject-Specific Provisions that impair the legal rights of students who began their studies prior to the effective date of these Subject-Specific Provisions do not apply. Students may submit applications to have the Subject-Specific Provisions from 8 April 2009 and 6 May 2015 continue to apply.

Hamburg, 19 November 2015

Universität Hamburg

Appendix A to the Subject-Specific Provisions for the Master of Science (MSc) in Mathematical Physics—Module Table

						Courses				Examinations			
Recom- mended Semest- er	Frequency	Dura- tion (1 or 2 seme- sters)	Module type: Required (Req), Required Elective (RE), or Elective (E)	Module Number/ Code	Module prerequisites	Mod- ule	Course title	Type of Course	C- re- di- t H- o- u- r- s p- e- r W- e- e- k	Examina- tion Prerequisi- tes	Type of Examina- tion	Grade	ECTS Credits
From the first	Summer Semester/W inter Semester	1 or 2	RE	M-MATH	-	Advanced mathematics				In accordance with the module description	Oral examina- tion	Yes	12
							Lecture	L	4				
							Practical courses related to lecture	PC	2				
						or	Lecture	L	2			or	6
							Practical courses related to lecture	PC	1				

Learning objectives: Students develop advanced knowledge of the scientific status of research in the subject areas from the Department of Mathematics' fields of research where methods of mathematical physics are predominantly applied and will be able to employ advanced scientific methods used in these areas of research. They will have gained experience and practice using technical literature.

From the second	Summer Semester/ Winter Semester	1	RE	M-SPEZ	-	Specialization in mathematics				In accordance with the module description	Oral examination	Yes	18
							Lecture	L	4				
							Practical courses related to lecture	PC	2				
						or	Lecture	L	2			or	9
							Practical courses related to lecture	PC	1				

Learning objectives: Students will have an in-depth understanding of selected problems, methods, and findings in selected topics of research in the field of mathematics, where methods of mathematical physics are predominantly applied. They will master advanced techniques from the field and develop the ability to produce independent scientific work in the field.

From the second	Summer Semester/ Winter Semester	1	RE	M-VS	-	Presentation seminar					Presentation	No	6
							Seminar	S	2				

Learning objectives: Students will be able to independently address an advanced mathematical topic, present their results in a presentation, and lead a technical discussion.												
From the first	Summer Semester/ Winter Semester	1	RE	GIS	-	Guided independent study				Dependent on the formulation of the problem, a type of examination pursuant to Section 13 subsection 4 of the RPO	yes/no	2-9
						Guided independent study	GIS					
Learning objectives: Students work through a specific mathematical topic, gaining mastery of specialized mathematical techniques												
third	Summer Semester/ Winter Semester	1	Req.	IP	Advanced knowledge of mathematics and physics demonstrated by successful participation in the modules of the first two	Induction project				Dependent on the formulation of the problem, a type of examination pursuant to	No	15

					semesters of the master's degree program to the extent that the completion of the advanced phase can be expected at least within the time frame for the regular period of study as well as passing at least one induction-project module.						Section 13 subsection 4 of the RPO		
						Induction project	GIS/L/PC/Sem./RS						
<p>Learning objectives: The induction project provides students with a deeper understanding of a modern area of research from which the topic of the master's thesis should be derived, and also introduces students to the most current scientific literature. Students learn to independently collect requisite background information and address a specialized topic. Students must join a research group for this module. As part of a research group, students learn teamwork and the optimal use of related informal knowledge.</p>													
third	Summer Semester/ Winter Semester	1	Req.	PP	Participation induction project	Preparatory project					Dependent on the formulation of the problem, a type of	Yes	15

											examination pursuant to Section 13 subsection 4 of the RPO			
							Preparatory project	GIS/L/PC/Sem./RS						
<p>Learning objectives: In solving preparatory problems, students develop special methods and knowledge of an area to such an extent that they are able to successfully apply these to solving problems in the area from which the topic of the master's thesis should be derived. Planning and structuring the intended research project. Students must join a research group for this module. As part of a research group, students learn teamwork and how to optimally use related informal knowledge.</p>														
fourth	Summer Semester/ Winter Semester	6 months	Req.	master's thesis	Only students who have earned at least 72 ECTS credits in total may commence work on the master's thesis.		Master's thesis					Master's thesis	Yes	30
							Master's thesis							
<p>Learning objectives: The master's thesis should demonstrate that candidates are able to address a current research issue from the discipline within the prescribed time frame, apply appropriate scientific methods with increasing independence, and present the findings in a suitable academic form.</p>														