



Universität Hamburg

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OFFICIAL TRANSLATION OF Fachspezifische Bestimmungen für den Studiengang „Mathematical Physics (M.Sc.)“

(Amtliche Bekanntmachung Nr. 85 vom 13. November 2025)

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ONLY THE GERMAN VERSION SHALL BE LEGALLY VALID AND
ENFORCEABLE!**

Subject-Specific Provisions for the Master of Science in Mathematical Physics (MSc)

dated 17 September 2025

On 21 October 2025 in accordance with Section 108 subsection 1 of the Hamburg higher education act (Hamburgisches Hochschulgesetz, HmbHG) dated 18 July 2001 (HmbGVBl. p. 171) and amended 19 February 2025 (HmbGVBl. p. 241), the Executive University Board of the University of Hamburg ratified the Subject-Specific Provisions for the Master of Science in Mathematical Physics in accordance with Section 91 subsection 2 no. 1 HmbHG.

Preamble

These Subject-Specific Provisions supplement the Faculty of Mathematics, Informatics and Natural Sciences' examination regulations dated 20 October 2021, as amended, governing Master of Science (MSc) degree programs and provide a description of the modules for the Mathematical Physics 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 are able to take up complex problems and solve them using scientific methods, even beyond the current state of knowledge.
- 4) Taking into account the requirements and changes in the professional world and interdisciplinary relationships, the degree program imparts the necessary technical methods, skills, and knowledge and enables students 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) specialist knowledge oriented towards current research questions on the basis of in-depth fundamental knowledge,
- 2) methodological and analytical skills that enable students to independently expand their scientific knowledge, with central importance placed 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) the teaching of key qualifications relevant to the profession.

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

Section 4 subsections 2 and 3:

- 1) The Master of Science in Mathematical Physics is divided into two one-year sections, the specialization phase and the research phase:
 1. 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:

- a) At least 42 ECTS credits must be earned from graded modules in the advanced phase.
- b) At least 8 ECTS credits must be chosen from the master's modules offered in the Physics specialization area. The corresponding modules are usually offered in English. In terms of content, topics from research fields of theoretical physics from the Department of Physics are covered. On completion of the respective module, students will have acquired in-depth knowledge of the current state of scientific knowledge in the research fields covered by the Department of Physics, and be able to apply advanced scientific methods from these fields. They gain an insight into the specialist literature and practice dealing with it. The modules can include lectures, exercises, seminars and/or internships and are credited with 2 to 9 ECTS credits depending on the workload. There are usually no prerequisites for participation in module examinations, the examination language is usually English, the examinations are graded and the type of module examination depends on the course type:
 - in the case of a seminar, a presentation or term paper
 - in the case of a lecture, an oral examination or written exam
 - in the case of an internship, a written report

To participate in the respective modules, prior knowledge of the bachelor's lectures in the subject area is recommended.

- c) At least 8 ECTS credits must be selected from all modules offered in the advanced module area of the Master of Science in Mathematics program. The corresponding modules are usually offered in English. The content covers topics from a research field of the Department of Mathematics. On completion of the respective module, students will have acquired in-depth knowledge of the current state of scientific knowledge in the research fields covered by the Department of Mathematics, and be able to apply advanced scientific methods from these fields. They gain an insight into the specialist literature and practice dealing with it. The modules each include lectures and exercises and are credited with 6 ECTS credits for lectures worth 2 credit hours per week and exercises for the lecture worth 1 credit hour or 12 ECTS credits for lectures worth 4 credit hours per week and exercises for the lecture worth 2 credit hours per week, depending on the workload. Eligibility to sit the final module examination generally requires successful completion of practical courses. Examinations are usually conducted in English, graded, and take the form of an oral or a written

examination. To participate in the respective modules, prior knowledge of the bachelor's lectures in the subject area is recommended.

The mathematical specialization area also includes elective specialization modules which can be selected to round out the specialization. The corresponding modules are usually offered in English. The content covers research-oriented studies of selected topics in a research field of the Department of Mathematics. With the completion of each module, students acquire an in-depth understanding of selected problems, methods and results in a field of mathematics. They will have learned to master advanced techniques and developed the ability to carry out independent scientific work in the field. The modules each include lectures and exercises and are credited with 9 ECTS credits for lectures worth 2 credit hours per week and exercises for the lecture worth 1 credit hour per week, 12 ECTS credits for lectures worth 2 credit hours per week and exercises for the lecture worth 2 credit hours or 18 ECTS credits for lectures worth 4 credit hours per week and exercises for the lecture worth 2 credit hours per week, depending on the workload. Eligibility to sit the final module examination generally requires successful completion of practical courses. Examinations are usually conducted in English, graded, and take the form of an oral or a written examination. To participate in the respective modules, prior knowledge of the master's lectures in the subject area is recommended.

- d) As part of the physics or mathematics specialization area, guided self-study courses can generally be taken in English. The content covers advanced studies in mathematics or theoretical physics conducted under supervision. On completion of each module, students will have familiarized themselves with a special topic in mathematics or theoretical physics and learned the relevant specific techniques. Depending on the workload, the guided self-study is credited with 2 to 9 ECTS credits, determined before the start. There are generally no prerequisites for participation in module examinations, which are usually conducted in English, graded, and take the form of an oral examination, a presentation, or completion of a project. Advanced knowledge in the area of guided self-study as specified by the university lecturer conducting the course is recommended for participation.
- e) A seminar or research seminar from the area of presentation seminars must be completed with their own presentation. The presentation seminar is usually offered in English. The content covers selected mathematical or physical topics from the research fields of the Departments of Mathematics and Physics. On the completion of a seminar module, students will have learned to work independently on an advanced topic in mathematics, to present their results in a presentation, and to lead technical discussions. On completion of a research seminar module, students are able to participate with increasing independence in the research activities of a mathematics working group and have learned to familiarize themselves with topics of current interest in mathematics or theoretical physics within the framework of a working group and, where possible, conduct their own work to expand the current state of knowledge presented in research literature. They are able to introduce current research results and open questions in lectures and lead scientific discussions in the working group. The lecture seminar is credited with 6 ECTS credits for a workload of 2 credit hours per week. There are generally no prerequisites for participation in module examinations, which are usually conducted in English, not graded, and take the form of a presentation. In-depth prior knowledge of the fields of mathematics and theoretical physics as

specified by the university lecturers involved in the research seminar, is recommended for participation in the respective lecture seminar.

- f) Modules totaling a maximum of 6 ECTS credits may be freely selected from other programs offered at the University of Hamburg.
- g) 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:

- a) 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.
 - a) 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.
2. 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. These provide the student with knowledge of current research and special methods from the master's thesis subject area. 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 the University of Hamburg or at a nonuniversity research institution (e.g., DESY or Helmholtz-Zentrum Hereon). 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.

- 2) Detailed descriptions of all required modules for are listed in II. Module descriptions

3)

Subject semester	Study phase	Areas of specialization / modules	Type	ECTS credits
1	Specialist advanced phase	Advanced physics	Required elective	60
2		Advanced mathematics		
		Specialization in mathematics		
		Presentation seminars		
		Guided Independent Study		
3	Research phase	Introductory 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

In Section 5 subsection 1:

All types of courses according to Section 5 of the Examination Regulations for Master of Science 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, the examinations board may, at the request of a student, determine a different type of examination as a final examination attempt replace a failed module examination or partial examination.

Section 13 Completed coursework and module examinations

In 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, duration, and 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 10:

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 acquired at least 72 ECTS credits may be admitted to 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 is 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

1. 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
2. seminars, the introductory project module, and modules of the free elective module area are not taken into account.

Section 15 subsection 3 sentence 10:

For the introductory 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.

II. Module descriptions

Module title	Introductory project
Module abbreviation:	Ma-M-EP
Learning outcomes	Students devote themselves to the in-depth study of a modern field of research, from which the topic of the master's thesis should originate, with the aim of familiarizing themselves with the most current scientific literature. Students are able to independently gather necessary information, establish background information, and grasp a specific topic. 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.
Contents	Familiarization with the specific subject area in which the master's thesis is to be written
Classes and types of instruction	Variable: lectures, exercises, seminars, research seminars, guided self-study
Language	German or English, usually English
Prerequisites	Mandatory: none Recommended: Prior knowledge in the relevant field of mathematics or theoretical physics as specified by the supervising university lecturer
Module applicability	MSc Mathematical Physics Required module MSc Mathematics Required module The module forms an inseparable unit with the subsequent preparatory project and master's thesis modules and must therefore be taken in the same research field in which the master's thesis is to be written.
Module completion	Prerequisites for admission to the module examination: none Type of module examination depending on the course type: presentation or term paper for seminars, completion of practical courses, oral or written examinations for lectures, project completion for projects (ungraded, to be determined at the beginning of the module) Examination language: usually English
Workload	Classroom study + self-study/exam preparation: 450 hrs
ECTS credits	Total: 15 ECTS credits
Module duration	1 semester
Module frequency	Each semester
Reference semester	3

Module title	Preparatory project
Module abbreviation:	Ma-M-VP
Learning outcomes	<p>The student should</p> <ul style="list-style-type: none"> • develop special methods and knowledge of an area when solving preparatory problems, to such an extent that the student is able to successfully apply these methods to solving problems in the area of the master's thesis topic; • be able to plan and structure the intended research project; and • learn teamwork as part of a research group, and how to optimally use related informal knowledge in a close environment.
Contents	<ul style="list-style-type: none"> • Introduction to scientific work and the technical and methodological basis for the master's thesis • Planning the research project to be worked on in the master's thesis
Classes and types of instruction	Variable: lectures, exercises, seminars, research seminars, guided self-study
Language	German or English, usually English
Prerequisites	<p>Mandatory: Participation in the introductory project</p> <p>Recommended: Prior knowledge in the relevant field of mathematics and/or theoretical physics as specified by the supervising university lecturer</p>
Module applicability	<p>MSc Mathematics Required module</p> <p>MSc Mathematical Physics Required module</p> <p>The module forms an inseparable unit with the preceding introductory project module and the subsequent master's thesis module and must therefore be taken in the same research field in which the master's thesis is to be written.</p>
Module completion	<p>Prerequisites for admission to the module examination: none</p> <p>Type of module examination depending on the course type: presentation or term paper for seminars, completion of practical courses, oral or written examinations for lectures, project completion for projects (graded, to be determined at the beginning of the module)</p> <p>Examination language: usually English</p>
Workload	Classroom study + self-study / exam preparation: 450 hrs
ECTS credits	Total: 15 ECTS credits
Module duration	1 semester
Module frequency	Each semester
Reference semester	3

Module title	Master's thesis
Module abbreviation:	MaPhy-MSc
Learning outcomes	Candidates are able to familiarize themselves with an issue taken from current research, apply appropriate scientific methods with increasing independence, and present the results in an academically appropriate form.
Contents	<ul style="list-style-type: none"> • Implementation of a research project • Evaluation and processing of the results as well as written elaboration • oral presentation and discussion of research results <p>The master's thesis concludes the master's degree program. The results should contribute to scientific knowledge.</p>
Language	German or English, usually English
Prerequisites	Mandatory: Only students who have earned at least 72 ECTS credits in total may commence work on the master's thesis.
Module applicability	MSc Mathematical Physics Required module
Module completion	<p>Prerequisites for admission to the module examination: none</p> <p>Examination type: Master's thesis (graded, usually no more than 200 pages)</p> <p>Examination language: usually English</p>
ECTS credits	Total: 30 ECTS credits
Module duration	1 semester
Module frequency	Each semester
Reference semester	4

Section 23 Effective date

These Subject-Specific Provisions become effective on the day following official publication by the University of Hamburg.

Hamburg, 13 November 2025
University of Hamburg