OFFICIAL TRANSLATION OF

Fachspezifische Bestimmungen für den Studiengang Business Mathematics (M.Sc.)

vom 26. April 2023

(Amtliche Bekanntmachung Nr. 101 vom 23. November 2023)

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

Subject-Specific Provisions for the Master of Science (MSc) in Business Mathematics

dated 26 April 2023

On 19 September 2023 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 17 June 2021 (HmbGVBl. p. 468), the Executive University Board of Universität Hamburg ratified the Subject-Specific Provisions for the Master of Science (MSc) in Business Mathematics adopted by the Faculty Council from the Faculty of Mathematics, Informatics and Natural Sciences on 26 April 2023 in accordance with Section 91 subsection 2 number 1 HmbHG.

Preamble

These Subject-Specific Provisions supplement the Faculty of Mathematics, Informatics and Natural Sciences' examination regulations dated 26 October 2005, as amended, governing Master of Science (MSc) degree programs and provide a description of the modules for the Business Mathematics 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 Business Mathematics is geared toward research.
(2) The successful completion of the master's examination in Business Mathematics 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 contemplate complex issues and address them using scientific methods, even beyond the current state of knowledge.
(4) The program provides the subject-specific methods required for the challenges of a changing professional world and interdisciplinary applications and expands mathematics skills, economics skills, and knowledge to enable students to work scientifically, apply and critically evaluate scientific knowledge, and act responsibly.
(5) The Master of Science in Business Mathematics qualifies graduates for doctoral studies in mathematics and economics. The doctoral degree regulations provide detailed information.
(6) The degree program is conducted in English.

The degree program focuses predominantly on

(1) specialized knowledge oriented to current Business Mathematics research questions based on in-depth fundamental knowledge
(2) methodological and analytical skills that lead to independent expansion of scientific knowledge centered on research methods
(3) teaching core skills that are professionally relevant.

Section 1 subsection 4:

The degree program is conducted by the Faculty of Mathematics, Informatics and Natural Sciences in conjunction with the Faculty of Business Administration and the Faculty of Business, Economics and Social Sciences.

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

Section 4 subsection 2 and 3 modules and ECTS credits:

(1) The four-semester Master of Science in Business Mathematics consists of mathematics and economics components and may contain informatics components.

(2) Master of Science degree program is comprised of a required elective area (90 ECTS credits) and the master's thesis (30 ECTS credits). The required elective area must include at least 45 ECTS credits from the field of mathematics and at least 30 ECTS credits from the field of business economics, generally selected from the modules listed in the module catalog in Annex A to the Subject-Specific Provisions for the Master of Science in Business Mathematics. The remaining 15 ECTS credits may be selected from the modules available in the Masters of Science in Business Mathematics, Mathematics, Business Administration, Economics, and Informatics, and Information Systems but must be approved by the examinations board as part of the study plan. The content of the selected modules must be relevant to mathematics and may not significantly overlap with content from other selected modules.

(3) Students take one follow-up seminar in mathematics and one in economics. Potential mathematics specializations include applied mathematics and stochastics; potential economics specializations include economics; business analytics; financing, banks, and insurance; and operations and supply management. At least 30 ECTS credits must be completed within the mathematics specialization; at least 21 ECTS credits must be completed in the economics specialization.

(4) At least 2 lecture seminars of at least 6 ECTS credits each must be completed. Of that, at least one must be in the area of specialization in which the master's thesis will be written.

(5) A preparatory project in mathematics amounting to 15 ECTS credits may be completed in the third semester. This is particularly true when the master's thesis deals with a subject with only minimal in-person preparatory classes. The preparatory project will be credited with 15 ECTS credits for the relevant mathematics specialization.

(6) On reasoned application to the examinations board, modules amounting to a maximum of 15 ECTS credits may be completed in advanced mathematics or business mathematics modules from the bachelor's degree program. This rule is particularly aimed at students who did not have the opportunity to obtain relevant knowledge during their first degree, for example, due to changing degree program or university. These ECTS credit points do not count toward the minimum amounts listed in point 3 above. Similarly, master's modules already completed during the bachelor degree may be credited.

(7) On a case by case basis, the examinations board shall decide on whether work from a previous bachelor's degree program or a comparable master's degree program will be allowed credit. This decision is particularly based on whether prior work can be adapted to the qualification objectives of the master's degree program and must ensure students are unable to complete modules with the same or essentially identical content in a bachelor's degree program and then again in a master's degree program.

(8) To ensure a proper period of study, the module spectrum (study plan) must be approved by the examinations board after consultation with a subject advisor or university teacher from the Department of Mathematics.

(9) Detailed descriptions for all modules can be found in Annex A of the Subject-Specific Provisions for the Master of Science in Business Mathematics and the Module Handbook for the master's degree program. The examination board for the Master of Science in Business Mathematics or another faculty committee with duties in regard to examination regulations and study reform in mathematics decides on the admissibility of additional required elective modules.

Section 4 subsection 4:
The topic of the master's thesis may be in either the field of mathematics or economics. Joint supervision by one supervisor from the Department of Mathematics and one from the Department of Business Administration or Department of Economics is permitted. The master's thesis should draw on both mathematics and economics and should be written in one of the selected areas of specialization.

Section 4 subsection 5 Part-time study:
The Master of Science in Business Mathematics may be completed on a part-time basis. Students can apply for part-time status through the Campus Center. The decision about whether to approve a part-time-student enrollment application must be made in accordance with the legal provisions set forth in Universität Hamburg's enrollment regulations, as amended. Part-time students must inform the academic office without delay of any changes to their student status (written confirmation from the Campus Center). The academic office will note the change of status in the file. Part-time students must create an individualized study plan together with a subject advisor in consultation with the examinations board.

Section 4 subsection 6 Commencement of studies:
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. Additional course types include the following:

a) Guided independent study is an individual assignment completed under guidance.
b) Interactive courses are courses that:
   i. consist predominately of lectures
   ii. require independent preparation and follow-up, for example, in the form of independent reading
   iii. require and promote a high degree of subject-specific interaction during classes
   iv. require regular preparatory and follow-up work, including short essays and practice exercises
   v. support the development of academic debate, for example, through brief presentations, discussions, or the discussion of practice exercises

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 6
Limiting attendance for specific individual courses

The number of participants in individual courses may be limited to ensure proper execution. Limitations and criteria for selecting participants will be announced in the module handbook or through other appropriate means.

Section 10
Deadlines for module examinations and retaking module examinations

Section 10 subsection 6 Retaking module examinations

In justified exceptional cases, on request, the examinations board may prescribe a different type of examination for a student's second attempt at passing a failed examination or course examination.

Section 13
Completed coursework and module examinations

Section 13 subsection 4:

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 5:
Examinations shall be held in English. If the examiner and the student agree, the examination may also be taken in a language that is different from the language of the module.

Section 14
Master's thesis

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 6 sentence 2:
The master's thesis may be written in either German or English, as agreed between the student and the supervisor.

Section 14 subsection 7 sentence 1:
The master's thesis is awarded 30 ECTS credits. It must be completed within a maximum of six months.

Section 15
Evaluation of examinations

Section 15 subsection 3 sentence 5:
Where not otherwise provided, the module grade is calculated by averaging the grades from each course examination.

Section 15 subsection 3 sentence 9:
The total grade for the master's degree program is calculated by weighted average of the grades of the final module examinations and the master's thesis, whereby the master's thesis is given double weight and seminars are not taken into account.

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. Given the lack of comparability, ungraded modules such as those graded as "passed" will not be counted toward the calculation of the overall final grade.

II. Module descriptions

Descriptions of all of the modules can be found in Appendix A to these Subject-Specific Provisions and in the module course catalog.

Section 23
Effective date

These Subject-Specific Provisions become effective on the day after they are ratified by the Executive University Board. They first apply to students commencing their studies in Winter Semester 2023/24.

Hamburg, 23 November 2023
Universität Hamburg

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

							Courses					Examinations		
Recommended semester	**Frequency**	**Duration (One or two semesters)**	**Reference semester**	**Module type: Required (Req.) or required elective**	**Module number/code**	**Module prerequisites**	**Module**	**Course title**	**Course type**	**Credit hours per week**	**Examination prerequisites**	**Type of examination**	**Graded**	**ECTS credits**
General mathematics modules and master's thesis														
From first	Winter semester / summer semester	1	-	RE	S		**Seminar**					Presentation	No	6
								Seminar	S	2				
Learning objectives: Students are able to independently address an advanced mathematical topic, present their results in a presentation, and lead a technical discussion.														

Third	Winter semester / summer semester	1	-	RE	L		**Preparatory Project**					Presentation, oral examination, or project completion	Yes	15
								Preparatory project	GIS/ L/PC/S					
Learning objectives: Students work on preparatory tasks to develop the specific methods and knowledge for the master's thesis field and can successfully apply these to the topic. They plan and structure the planned research project and are involved in an academic research group. By involving an academic research group, students learn group work and the optimal use of related informal knowledge.														
Fourth	Winter semester / summer semester	6 months	4	Req.	MA	Only students who have earned at least 72 ECTS credits in total may commence work on the master's thesis.	**Master's Thesis**					See section 14	Yes	30
								Master's thesis						
Learning objectives: Through the master's thesis, students demonstrate they 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.														
From first	Winter semester / summer semester	1	-	RE	GIS		**Guided Independent Study**					Presentation, oral examination, or conclusion of the project	Yes	2–9

								Guided independent study	GIS					
Learning objectives: Students work on a specialized mathematics topic and learn special mathematical techniques.														
Advanced modules in mathematics														
Advanced applied mathematics modules														
From first	Winter semester / summer semester	1	-	RE	PDGL		**Partial Differential Equations**				Successfully completed exercises	Oral examination	Yes	12
								Lecture	L	4				
								Exercise	U	2				
Learning objectives: Students possess advanced knowledge of the current state of scientific research in fields of partial differential equations research and are able to employ advanced scientific methods used in these areas of research. They have experience and practice in dealing with technical literature.														
From first	Winter semester / summer semester	1	-	RE	VDGL		**Advanced Differential Equations**				Successfully completed exercises	Oral examination	Yes	12
								Lecture	L	4				
								Exercise	U	2				or
							or	Lecture	L	2			Yes	6
								Exercise	U	1				

Learning objectives: Students have advanced knowledge of the issues and findings in a selected subfield of differential equations and master the methods of the field. They are able to utilize advanced research methods used in the field of research. They have experience and practice in dealing with technical literature.														
From second	Winter semester / summer semester	1	-	RE	DGLAT		**Selected Topics in Differential Equations**					Successfully completed exercises	Oral examination	Yes	18
								Lecture	L	4				
								Exercise	U	2				or
							or	Lecture	L	2				Yes	9
								Exercise	U	1				
Learning objectives: Students have a good understanding of the issues and findings of modern optimization and approximation methods. They master advanced techniques in the field and have the ability to produce independent scientific work.														
From first	Winter semester / summer semester	1	-	RE	VMMOA		**Modern Methods of Optimization and Approximation**					Successfully completed exercises	Oral examination	Yes	12
								Lecture	L	4				
								Exercise	U	2				or
							or	Lecture	L	2				Yes	6
								Exercise	U	1				
Learning objectives: Students have a good understanding of the issues and findings of modern optimization and approximation methods. They are able to utilize advanced research methods used in the field of research. They have experience and practice in dealing with technical literature.														

From second	Winter semester / summer semester	1	-	RE	MMOAAT		**Selected Topics in Modern Methods in Optimization and Approximation**				Successfully completed exercises	Oral examination	Yes	9
								Lecture	L	2				
								Exercise	U	1				
Learning objectives: Students have an advanced understanding of the issues and findings in a selected subfield of modern optimization and approximation methods. They master advanced techniques in the field and have the ability to produce independent scientific work.														
From first	Winter semester / summer semester	1	-	RE	RP		**Scientific Computing**				Successfully completed exercises	Oral examination	Yes	12
								Lecture	L	4				
								Exercise	U	2				or
							or	Lecture	L	2			Yes	6
								Exercise	U	1				
Learning objectives: The students are prepared to conduct independent research in scientific computing. They are able to utilize advanced research methods used in the field of research. They have experience and practice in dealing with technical literature.														

From first	Winter semester / summer semester	1	-	RE	VDM		**Advanced Discrete Mathematics**			Successfully completed exercises	Oral examination	Yes	6	
								Lecture	L	2				
								Exercise	U	1				
Learning objectives: Students are prepared to conduct independent research in discrete mathematics. They are able to utilize advanced research methods used in the field of research. They have experience and practice in dealing with technical literature.														
From first	Winter semester / summer semester	1	-	RE	VGT		**Advanced Graph Theory**			Successfully completed exercises	Oral examination	Yes	12	
								Lecture	L	4				
								Exercise	U	2				or
							or	Lecture	L	2			Yes	6
								Exercise	U	1				
Learning objectives: Students are prepared to conduct independent research in graph theory. They are able to utilize advanced research methods used in the field of research. They have experience and practice in dealing with technical literature.														

From second	Winter semester / summer semester	1	-	RE	GTAT		**Selected Topics in Graph Theory and Combinatorics**				Successfully completed exercises	Oral examination	Yes	18
								Lecture	L	4				
								Exercise	PC	2				or
							or	Lecture	L	2			Yes	9
								Exercise	PC	1				
Learning objectives: Students have advanced knowledge of selected problems, methods, and findings in graph theory and combinatorics. The master advanced methods in graph theory or combinatorics and are able to conduct independent work in the field.														
Advanced stochastics modules														
From first	Winter semester / summer semester	1	-	RE	VMS		**Advanced Mathematical Statistics**				Successfully completed exercises	Oral examination	Yes	6
								Lecture	L	2				
								Exercise	U	1				
Learning objectives: Students have advanced knowledge of the issues, fundamental principles, and findings of a subfield of mathematical statistics and master statistical methods used in it. They have experience and practice in dealing with technical literature.														

From second	Winter semester / summer semester	1	-	RE	MSAT		**Selected Topics in Mathematical Statistics**					Successfully completed exercises	Oral examination	Yes	9
								Lecture	L	2				
								Exercise	U	1				or
							or	Lecture	L	2			Yes	6
Learning objectives: Students have a very good understanding of research oriented issues and findings in a selected subfield of mathematical statistics. They master the current methods used in the field and have the ability to conduct independent scientific work in the field of mathematical statistics.															
From first	Winter semester / summer semester	1	-	RE	VSP		**Advanced Stochastic Processes**					Successfully completed exercises	Oral examination	Yes	6
								Lecture	L	2				
								Exercises	U	1				
Learning objectives: Students have advanced knowledge of the issues, fundamental principles, and findings of a subfield of stochastic process theory and master the methods used in it. They have experience and practice in dealing with technical literature.															
From second	Winter semester / summer semester	1	-	RE	SPAT		**Selected Topics in Stochastic Processes**					Successfully completed exercises	Oral examination	Yes	9

								Lecture	L	2					
								Exercises	U	1					or
							or	Lecture	L	2				Yes	6
Learning objectives: Students have a very good understanding of research-oriented issues and findings in a selected subfield of stochastic processes. They master the current methods used in the field and have the ability to conduct independent scientific work on the theory of stochastic processes.															
From first	Winter semester / summer semester	1	-	RE	VVF		**Advanced Insurance and Finance Mathematics**				Successfully completed exercises	Oral examination		Yes	6
								Lecture	L	2					
								Exercises	U	1					
Learning objectives: Students have advanced knowledge of the issues, fundamental principles, and findings of a subfield of insurance and finance mathematics and master the methods used in it. They have experience and practice in dealing with technical literature.															
From second	Winter semester / summer semester	1	-	RE	VFAT		**Selected Topics in Insurance and Finance Mathematics**				Successfully completed exercises	Oral examination		Yes	9
								Lecture	L	2					
								Exercises	U	1					or
							or	Lecture	L	2				Yes	6
Learning objectives: Students have a very good understanding of research oriented issues and findings in a selected subfield of insurance and finance mathematics. They master the current methods used in the field and have the ability to conduct independent scientific work in the field of insurance and finance mathematics.															

Advanced modules in economics													
From first	Winter semester / summer semester	1–2	-	RE		See the Subject-Specific Provisions and the Module Handbook for the Master of Science in Economics in the Faculty of Business, Economics and Social Sciences	**Advanced economics modules** **In contrast to the Advanced Microeconomics module offered in the Master of Science in Economics, students on this degree program may only select the Individual Decisions, Games and Markets module, which is worth 8 ECTS credits.**			As per the relevant module description for the Master of Science in Economics of the Faculty of Business, Economics and Social Sciences	As per the relevant module description for the Master of Science in Economics of the Faculty of Business, Economics and Social Sciences		
From first	Winter semester / summer semester	1–2	-	RE		See the Subject-Specific Provisions and the Module Handbook for the Master of Science in Business Administration of the Faculty of Business Administration	**Modules in Advanced Business Analytics**			As per the relevant module descriptions in the Module Handbook for the Master of Science in Business Administration of the Faculty of Business Administration	As per the relevant module descriptions for the Master of Science in Business Administration of the Faculty of Business Administration		

From first	Winter semester / summer semester	1–2	-	RE		See the Subject-Specific Provisions and the Module Handbook for the Master of Science in Business Administration of the Faculty of Business Administration	**Advanced Modules in Finance, Banking and Insurance**			As per the relevant module descriptions in the Module Handbook for the Master of Science in Business Administration of the Faculty of Business Administration	As per the relevant module descriptions for the Master of Science in Business Administration of the Faculty of Business Administration		
From first	Winter semester / summer semester	1–2	-	RE		See the Subject-Specific Provisions and the Module Handbook for the Master of Science in Business Administration of the Faculty of Business Administration	**Advanced Modules in Operations and Supply Chain Management**			As per the relevant module descriptions in the Module Handbook for the Master of Science in Business Administration	As per the relevant module descriptions for the Master of Science in Business Administration of the Faculty of Business Administration		

										of the Faculty of Business Administration			