Note:
The following curriculum is a consolidated version. It is legally non-binding and for informational purposes only.
The legally binding versions are found in the University of Innsbruck Bulletins (in German).

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Complete version as of 1 October 2019

Curriculum for the
Master's Programme Mathematics
at the Faculty for Mathematics, Computer Science, and Physics of
the University of Innsbruck

§1 Qualification Profile

The Master's Programme Mathematics prepares for a highly qualified occupation as a mathematician in industry and in commerce as well as for the PhD Programme. Occupational areas of the graduates are in particular the high-tech industry, the field of telecommunication and information technology, the field of logistics, banks, insurance companies, and statistical offices.

The Master's Programme Mathematics deepens and widens the abilities and the knowledge in the field of mathematics that have been acquired during the Bachelor's Programme Mathematics. The graduates are qualified for innovative solutions of mathematical problems originating from science, engineering, economy, and medicine. Therefore, during the Master's Programme the knowledge of both the foundations and the methods and algorithms of application-oriented branches of mathematics are deepened. An increased offer of research-guided courses stimulates in particular creative thinking and establishes a basis for the PhD Programme.

The graduates are able to communicate their conclusions, the underlying knowledge, principles, clearly and unambiguously, to both experts and laymen. In particular, they are fit to develop materials that are able to communicate those matters or facilitate their communication, respectively. They dispose of learning strategies enabling them to continue their studies autonomously for the most part.

§ 2 Classification

The Master's Programme Mathematics is allocated to the group of engineering studies.

§ 3 Length and scope

The Master's Programme Mathematics covers 120 ECTS credits (denoted below as ECTS-AP). Eleven modules covering altogether 100 ECTS-Credits must be passed. The Master's Thesis corresponds to 20 ECTS-Credits. Altogether, this corresponds to a duration of the study programme of four semesters.

§3a Language of Instruction:

The Master's Programme Mathematics is offered in English. In justified exceptional cases, examinations and the Master's Thesis may be passed and written in German respectively.

§ 4 Admission

(1) Admission to the Master's Programme Mathematics requires completion of a relevant bachelor Programme, or a relevant bachelor programme from a college of higher education, or a comparable programme at an acknowledged domestic or international post-secondary educational institution. If equality is fundamentally given and only specific additions are missing to establish full equality, the Rectorate is empowered to link the establishment of equality to the condition of taking additional exams which have to be taken during the Master's Programme.

(2) The Bachelor's Programme Mathematics at the University of Innsbruck in any case fulfils the requirement of being a relevant programme as stated in paragraph 1.

§ 5 Types of courses and maximum number of participants

(1) **Lecture (VO)**

Lectures introduce, in a didactically well-designed manner, central concepts, results and methods of the respective field of activity.

Purpose: raise interest and to facilitate well-structured knowledge and basic understanding of a field of activity in a relatively short period of time.

(2) **Proseminar (PS)**

A Proseminar, which means introductory seminar, is mostly in a close connection with a lecture as far as the content is concerned. The students get problems to be solved and the solutions are discussed in the Proseminar. If the Proseminar is connected with a lecture the matters of that lecture are repeated and practised

Purpose: practice in solving problems autonomously, practice in methodical working, practice in presenting subject matters, and scientific deepening of learned matters.

Continuous assessment, maximum number of participants: 25.

(3) **Lecture-Tutorial (VU)**

Courses of the VU type are a combination of a lecture and an exercise course. The percentages of the lecture and the exercise course may vary as to meet the requirements of the contents to be communicated.

Purpose: stimulating interest and imparting well-structured knowledge and basic comprehension of a subject area, practice in solving problems autonomously, practice in methodical working, practice in presenting subject matters, and scientific deepening of learned matters.

Continuous assessment, maximum number of participants: 25.

(4) **Seminar (SE)**

A seminar serves the scientific examination of contents and methods of a subject through presentations, written assignments and discussions. Students learn the written (assignment) and oral (seminar presentation) demonstration of scientific findings.

Purpose: autonomous development of current research topics, presentation and scientific discussion of developed contents, scientific deepening in a selected field of technical mathematics.

Continuous assessment, maximum number of participants: 15.

§ 6 Modules

1.	Introduction to Higher Algebra and Discrete Mathematics	h	ECTS-Credits
a.	**VO Introduction to Higher Algebra and Discrete Mathematics**	2	4
b.	**PS Introduction to Higher Algebra and Discrete Mathematics**	2	3.5
	Total	**4**	**7.5**
	Learning Outcomes: Students who have completed that module have gained an overall view over some current questions of higher algebra and discrete mathematics and the methods to treat these questions. Moreover they have acquired a deepened understanding of the field of algebra and discrete mathematics and are able to analyse and solve typical problems of those areas.		
	Prerequisites: none		

2.	Introduction to Higher Analysis	h	ECTS-Credits
a.	**VO Introduction to Higher Analysis**	2	4
b.	**PS Introduction to Higher Analysis**	2	3.5
	Total	**4**	**7.5**
	Learning Outcomes: Students who have completed that module have gained an overall view over some current questions of higher analysis and the methods to treat those questions. Moreover they have acquired a deepened understanding of the field of analysis and are able to analyse and solve typical problems of that domain.		
	Prerequisites: none		

3.	Introduction to Higher Numerical Mathematics	h	ECTS-Credits
a.	**VO Introduction to Higher Numerical Mathematics**	2	4
b.	**PS Introduction to Higher Numerical Mathematics**	2	3.5
	Total	**4**	**7.5**
	Learning Outcomes: Students who have completed that module have gained an overall view over some current questions of higher numerical analysis and the methods to treat those questions. Moreover they have acquired a deepened understanding of the field of numerical analysis and are able to analyse and solve typical problems of that domain.		
	Prerequisites: none		

4.	Introduction to Higher Stochastics	h	ECTS-Credits
a.	**VO Introduction to Higher Stochastics**	2	4
b.	**PS Introduction to Higher Stochastics**	2	3.5
	Total	**4**	**7.5**

	Learning Outcomes: Students who have completed that module have gained an overall view over some current questions of higher stochastics and the methods to treat those questions. Moreover they have acquired a deepened understanding of the field of stochastics and are able to analyse and solve typical problems of that domain.
	Prerequisites: none

5.	**Subject-Specific Fundamentals and Core Competences**	**h**	**ECTS-Credits**
a.	**VU Subject-specific fundamentals and core competences 1**	4	7.5
b.	**VU Subject-specific fundamentals and core competences 2**	4	7.5
	Total	**8**	**15**
	Learning Outcomes: Students who have completed that module have acquired advanced knowledge of selected topics in higher mathematics. They are able to use that knowledge in order to analyse current problems which are associated with the discussed matters and to develop solutions for them.		
	Prerequisites: none		

6.	**Advanced Professional Competences**	**h**	**ECTS-Credits**
a.	**VU Advanced professional competences 1**	4	7.5
b.	**VU Advanced professional competences 2**	4	7.5
	Total	**8**	**15**
	Learning Outcomes: Students who have completed that module have, based on module 5, acquired deepened knowledge of one or more branches of higher mathematics. They have got to know further current problems and methods for their solution. They are able to develop innovative solutions for problems of those branches of mathematics.		
	Prerequisites: none		

7.	**Particular Topics and Methods**	**h**	**ECTS-Credits**
a.	**VU Particular topics and methods 1**	4	7.5
b.	**VU Particular topics and methods 2**	4	7.5
	Total	**8**	**15**
	Learning Outcomes: Students who have completed that module have acquired particular knowledge of one or more branches of higher mathematics. They are able to develop innovative solutions for current problems of those branches of mathematics as well as to judge different approaches critically. As a result they have developed learning strategies that enable them to acquire further mathematical matters autonomously.		
	Prerequisites: none		

8.	Research Seminars	h	ECTS-Credits
a.	**SE Research Seminar**	2	5
b.	**SE Critical Research Analysis**	2	5
	Total	**4**	**10**
	Learning Outcomes: Students who have completed that module have acquired a deepened knowledge of a branch of higher mathematics by autonomous studies. Moreover they are familiar with relevant mathematical literature and can judge its mathematical content. They are able to examine problems of higher mathematics in a creative and methodically correct manner and to present the result of those examinations in written form and orally as to be understood well by experts. The contents of the seminars are oriented on current research topics.		
	Prerequisites: none		

9.	Interdisciplinary Qualifications	h	ECTS-Credits
	Two of the following four courses are to be completed: **VO History and Philosophical Aspects of Mathematics (2h, 2.5 ECTS-Credits)** **UE Foreign Language (2h, 2.5 ECTS-Credits)** A course from the offer of the International Language Centre **VO Gender Aspects of Engineering (2h, 2.5 ECTS-Credits)** **UE Social Competences (2h, 2.5 ECTS-Credits)** One of the following courses offered by the Institute for Communication in the Professional Life and Psychotherapy: Team work, Optimising cooperation, Team building, Presentation, Moderation, Direction of meetings, Conflict management, Negotiation 2 (group discussion)		
	Total	**4**	**5**
	Learning Outcomes: Graduates of that module dispose of theoretical and practical knowledge and skills that in excess of their subject-specific competences help them to prove their value in their future fields of activity. The graduates of the module have gained historical- philosophical knowledge or linguistic and/or social competences, respectively.		
	Prerequisites: none		

10.	Preparation of the Master's Thesis	h	ECTS-Credits
	Agreement on the topic, the scope and the form of the Master's Thesis on the basis of a brief summary of the contents (abstract) as well as agreement on the work processes and the study progress. Planning of an appropriate time frame for the completion of the Master's Thesis.	-	7.5
	Total	-	7.5

	Learning Outcomes: After successful completion of this module, the students will be able to write a brief summary of the content of the planned Master's Thesis (abstract), to outline an anticipated schedule and to conclude a written Master's Thesis agreement.		
	Prerequisites: none		

11.	**Defence of the Master's Thesis**	**h**	**ECTS-Credits**
	Defence of the master thesis finishing the studies	-	2.5
	Total	**-**	**2.5**
	Prerequisites: completion of all the other modules as well as a positive assessment of the master thesis		

§ 7 Master's Thesis

In the Master's Programme Mathematics a Master's Thesis corresponding to 20 ECTS-Credits must be written. The Master's Thesis is a scientific paper on a topic from a subarea of mathematics.

§ 8 Procedure for the assignment of places in courses where the number of participants is limited

For courses with a limit on the number of participants the places are assigned as follows:

1. Students who would face an extension of their study time due to the non-assignment of a place have to be treated preferentially.
2. If criteria § 8.1 does not suffice for the regulation of access to a course then students who would take this course as a compulsory module have to be given priority over those students taking this course as an elective module.
3. If criteria § 8.1 and § 8.2 do not suffice for the regulation of access to a course then the available places have to be assigned via a drawing.

§ 9 Examination regulations

(1) An examination has to be taken for each lecture (VO) of a module. Before the beginning of the course the lecturer announces whether the examination will be oral or written.

(2) In seminars the continuous work, one talk, and the seminar paper are assessed.

(3) In all other courses with continuous assessment steady work is a constitutive prerequisite for a positive assessment. Further assessment criteria are announced by the lecturer before the start of the course.

(4) A module is completed by the positive assessment of its course components.

(5) The compulsory module "Preparation of the Master's Thesis" is evaluated by the supervisor of the Master's Thesis based on an abstract. Positive evaluation reads "successfully completed", negative evaluation "unsuccessfully completed".

(6) The Master's Programme is completed by the defence of the master thesis. 2.5 ECTS-AP are assigned to that finishing examination. The exam lasts 60 minutes approx. and starts with a 30-minute public talk about the master thesis. Subsequently it is possible to discuss the talk publicly. Questions of the members of the examination board about the master thesis conclude the exam.

§ 10 Academic degree

Students who have completed the Master's Programme Mathematics are awarded the academic degree "Diplom-Ingenieur" or "Diplom-Ingenieurin", respectively. Abbreviations are: "DI" or "Dipl.-Ing."

§ 11 Coming into force

(1) This curriculum becomes effective on 1 October 2007.

(2) The amendment of the curriculum in the version of the University of Innsbruck Bulletin of 15 May 2012, issue 27, no. 277 becomes effective on 1 October 2012.

(3) The changes of the curriculum in the version of the University of Innsbruck Bulletin of 24 May 2019, Issue 49, No. 475 come into effect as of 1 October 2019 and are to be applied to all students.

(4) The changes of the curriculum acc. to the version of the University of Innsbruck Bulletin of 28 June 2019, Issue 66, No. 586 come into effect on 1 October 2019 and are to be applied to all students.

§ 12 Transitional regulations

(1) An acknowledgement of examinations according to § 78, clause 1 of the University Organisation Act 2002 has been laid down in Appendix 1 of this curriculum.

(2) The course examinations according to the curriculum for the Master's Programme Technical Mathematics, announced in the University of Innsbruck Bulletin of 15 October 2009, issue 2, no. 13, corrected in the University of Innsbruck Bulletin of 15 October 2009, issue 2, no. 13, are equivalent to the course examinations of the curriculum in the version of the University of Innsbruck Bulletin of 15. May 2012, issue 27, no. 277, as follows:

Curriculum 2007:	**ECTS-Credits**	**Curriculum 2012:**	**ECTS-Credits**
Functional Analysis VO3+PS2	10	Subject-specific Basics and Core Competencies 1 VU4 Interdisciplinary Skills	7.5 2.5
Numerical Analysis of Partial Differential Equations VO3+PS2	10	Subject-specific Basics and Core Competencies 2 VU4 Interdisciplinary Skills	7.5 2.5
Computer Algebra VO3+PS2 or Advanced Methods of Algebra VO3+PS2 or Inverse Problems, Imaging and Kinematics VO3+PS2	10 10 10	Advanced Expertise 1 VU4 Introduction to Advanced Algebra and Discrete Mathematics PS 2	7.5 3.5
Stochastic Analysis VO3+PS2 or	10	Advanced Expertise 2 Introduction to Advanced Stochastics	7.5 3.5

Inverse Problems and Imaging VO3+PS2 (is not yet allocated) or Advanced Methods of Algebra VO3+PS2 (is not yet allocated)	10 10	PS2	
Theory of Partial Differential Equations VO3+PS2 or Differential Geometry and Kinematics VO3+PS2 or Advanced Methods of Algebra VO3+PS2 (is not yet allocated)	10 10 10	Specific Topics and Methods 1 VU4 Introduction to Advanced Algebra PS2	7.5 3.5
Differential Geometry and Kinematics VO3+PS2 (is not yet allocated) or Inverse Problems and Imaging VO3+PS2 (is not yet allocated) or Advanced Methods of Algebra VO3+PS2 (is not yet allocated)	10 10 10	Specific Topics and Methods 2 VU4 Introduction to Advanced Numerical Analysis PS2	7.5 3.5
Courses with a total of 4 ECTS credits with one of the additions AD, AN or IB must be passed.	4	Introduction to Advanced Numerical Analysis VO2	4
Courses with a total of 4 ECTS credits with one of the additions AD, AN or IB which are not yet allocated must be passed.	4	Introduction to Advanced Algebra VO2	4
Courses with a total of 4 ECTS credits with one of the additions AD, AN or IB which are not yet allocated must be passed.	4	Introduction to Advanced Numerical Analysis VO2	4
Courses with a total of 4 ECTS credits with one of the additions AD, AN or IB which are not yet allocated must be passed.	4	Introduction to Advanced Stochastics VO2	4

Seminar 1 with one of the additions AD, AN, IB	5	Research Seminar SE2	5
Seminar 2 with one of the additions AD, AN, IB	5	Critical Research Analysis SE2	5

Appendix 1: Approval of examinations

Under § 78, clause 1 of the University Organisation Act, the following examinations, passed within the framework of the Diploma Programme in Technical Mathematics, the Teaching Profession Programme in Mathematics, or of another programme of the University of Innsbruck and assessed as positive, will be recognized for the Master Programme in Technical Mathematics as follows:

Examinations assessed as positive:	**Recognized as:**
Functional Analysis, VO4	Functional Analysis, VO3
Functional Analysis, PS2	Functional Analysis, PS2
Partial Differential Equations, VO4	Theory of Partial Differential Equations, VO3
Partial Differential Equations, PS2	Theory of Partial Differential Equations, PS2
Algebraic Equations, VO2 und PS1	Computer Algebra, VO3
Symbolic Computation, PR2	Computer Algebra, PS2
Advanced Numerical Analysis1 and 2, VO2 and PS1	Numerical Analysis of Partial Differential Equations, VO3 und PS2
Measure and Probality Theory, VO3	Stochastic Analysis, VO3
Practical Exercises in Statistics, PR2	Stochastic Analysis, PS2
Computer Graphics, VU3	Courses with a total of 5 ECTS credits must be passed of the elective modules Applicable Algebra and Discrete Mathematics
Linear Optimisation, VO2+PS1	Courses with a total of 5 ECTS credits must be passed of the elective modules Applicable Algebra and Discrete Mathematics
Applied Statistics 1, VO2+PS1	Courses with a total of 5 ECTS credits must be passed of the elective modules Applicable Algebra and Discrete Mathematics
Applied Statistics 2, VO2+PS1	Courses with a total of 5 ECTS credits must be passed of the elective modules Applicable Algebra and Discrete Mathematics
Courses with a total of *s* semester hours of the elective module Algebra and Discrete Mathematics must be passed.	Courses with a total of 1.5 ECTS credits must be passed of the elective modules Applicable Algebra and Discrete Mathematics