

**Advice:**

The following English version of a curriculum is not legally binding and is for informational purposes only. The legally binding version has to be taken from the respective issues of the University of Innsbruck Bulletin.

**Original version**, announced in the University of Innsbruck Bulletin of April 23 2007, issue 29, no. 193.

**Correction**, announced in the University of Innsbruck Bulletin of June 6 2007, issue 55, no. 239.

**Correction**, announced in the University of Innsbruck Bulletin of October 15 2008, issue 2, no. 13 .

**Amendment**, announced in the University of Innsbruck Bulletin of May 15 2012, issue 27, no. 277.

**Curriculum for the Master Programme in Technical Mathematics**  
at the Faculty for Mathematics, Computer Science, and Physics  
of the University of Innsbruck

**§1 Qualification Profile**

The Master Programme in Technical 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 Programme in Technical Mathematics deepens and widens the abilities and the knowledge in the field of mathematics that have been acquired during the Bachelor Programme in Technical Mathematics. The graduates are qualified for innovative solutions of mathematical problems originating from science, engineering, economy, and medicine. Therefore, during the Master 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 Programme in Technical Mathematics is allocated to the group of engineering studies.

**§ 3 Length and scope**

The Master Programme in Technical Mathematics contains 120 ECTS credits (denoted below as ECTS-AP). 10 modules have to be completed successfully with a total of 92.5 ECTS-AP. The remaining 27.5 ECTS-AP are assigned to the master thesis. Altogether that corresponds to a study duration of 4 semesters.

## **§ 4 Admission**

- (1) Admission to the Master Programme in Technical 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 Programme.
- (2) The Bachelor Programme in Technical 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	SST	ECTS-AP
a.	VO Introduction to Higher Algebra and Discrete Mathematics	2	4
b.	PS Introduction to Higher Algebra and Discrete Mathematics	2	3,5
	<b>Sum</b>	<b>4</b>	<b>7,5</b>
<p><b>Objective of the module:</b>            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.</p>			
<p><b>Prerequisite/s for registration:</b> none</p>			

2.	Introduction to Higher Analysis	SST	ECTS-AP
a.	VO Introduction to Higher Analysis	2	4
b.	PS Introduction to Higher Analysis	2	3,5
	<b>Sum</b>	<b>4</b>	<b>7,5</b>
<p><b>Objective of the module:</b>            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.</p>			
<p><b>Prerequisite/s for registration:</b> none</p>			

3.	Introduction to Higher Numerical Mathematics	SST	ECTS-AP
a.	VO Introduction to Higher Numerical Mathematics	2	4
b.	PS Introduction to Higher Numerical Mathematics	2	3,5
	<b>Sum</b>	<b>4</b>	<b>7,5</b>
<p><b>Objective of the module:</b>            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.</p>			
<p><b>Prerequisite/s for registration:</b> none</p>			

4.	Introduction to Higher Stochastics	SST	ECTS-AP
a.	VO Introduction to Higher Stochastics	2	4
b.	PS Introduction to Higher Stochastics	2	3,5
	<b>Sum</b>	<b>4</b>	<b>7,5</b>
	<b>Objective of the module:</b> 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.		
	<b>Prerequisite/s for registration:</b> none		

5.	Subject-specific fundamentals and core competences	SST	ECTS-AP
a.	VU Subject-specific fundamentals and core competences 1	4	7,5
b.	VU Subject-specific fundamentals and core competences 2	4	7,5
	<b>Sum</b>	<b>8</b>	<b>15</b>
	<b>Objective of the module:</b> 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.		
	<b>Prerequisite/s for registration:</b> none		

6.	Advanced professional competences	SST	ECTS-AP
a.	VU Advanced professional competences 1	4	7,5
b.	VU Advanced professional competences 2	4	7,5
	<b>Sum</b>	<b>8</b>	<b>15</b>
	<b>Objective of the module:</b> 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.		
	<b>Prerequisite/s for registration:</b> none		

7.	Particular topics and methods	SST	ECTS-AP
a.	VU Particular topics and methods 1	4	7,5
b.	VU Particular topics and methods 2	4	7,5
	<b>Sum</b>	<b>8</b>	<b>15</b>
<p><b>Objective of the module:</b>  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.</p>			
<p><b>Prerequisite/s for registration:</b> none</p>			

8.	Research Seminars	SST	ECTS-AP
a.	SE Research Seminar	2	5
b.	SE Critical Research Analysis	2	5
	<b>Sum</b>	<b>4</b>	<b>10</b>
<p><b>Objective of the module:</b>  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.</p>			
<p><b>Prerequisite/s for registration:</b> none</p>			

9.	Interdisciplinary Qualifications	SST	ECTS-AP
Two of the following four courses are to be completed:			
	<b>VO History and philosophical aspects of mathematics</b>	2	2,5
	<b>UE Foreign language</b> A course from the offer of the International Language Centre	2	2,5
	<b>VO Gender aspects of engineering</b>	2	2,5
	<b>UE Social competences</b> One of the following courses offered by the Institute for Communication in the Professional Life and Psychotherapy: Team work, Optimising cooperation, Team building, Presentation,	2	2,5

	Moderation, Direction of meetings, Conflict management, Negotiation 2 (group discussion)		
	<b>Sum</b>	<b>4</b>	<b>5</b>
	<b>Objective of the module:</b> 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.		
	<b>Prerequisite/s for registration:</b> none		

<b>10.</b>	<b>Defense of the master thesis</b>	<b>SST</b>	<b>ECTS-AP</b>
	Defense of the master thesis finishing the studies	-	2,5
	<b>Sum</b>	-	<b>2,5</b>
	<b>Prerequisite/s for registration:</b> completion of all the other modules as well as a positive assessment of the master thesis		

### § 7 Master thesis

As a part of the Master Programme in Technical Mathematics a master thesis has to be written, to which 27.5 ECTS-AP are assigned. A master thesis is a scientific paper from a branch 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 Master Programme is completed by the defense 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 Programme in Technical Mathematics are awarded the academic degree “Diplom-Ingenieur” or “Diplom-Ingenieurin”, respectively. Abbreviations are: “DI” or “Dipl.-Ing.”

### § 11 Coming into effect

- (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.

### § 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 Programme in 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-AP	Curriculum 2012:	ECTS
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	10	Advanced Expertise 2	7,5

<p>or</p> <p>Inverse Problems and Imaging VO3+PS2 (is not yet allocated)</p>	10	Introduction to Advanced Stochastics PS2	3,5
<p>or</p> <p>Advanced Methods of Algebra VO3+PS2 (is not yet allocated)</p>	10		
<p>Theory of Partial Differential Equations VO3+PS2</p>	10	Specific Topics and Methods 1 VU4	7,5
<p>or</p> <p>Differential Geometry and Kinematics VO3+PS2</p>	10	Introduction to Advanced Algebra PS2	3,5
<p>or</p> <p>Advanced Methods of Algebra VO3+PS2 (is not yet allocated)</p>	10		
<p>Differential Geometry and Kinematics VO3+PS2 (is not yet allocated)</p>	10	Specific Topics and Methods 2 VU4	7,5
<p>or</p> <p>Inverse Problems and Imaging VO3+PS2 (is not yet allocated)</p>	10	Introduction to Advanced Numerical Analysis PS2	3,5
<p>or</p> <p>Advanced Methods of Algebra VO3+PS2 (is not yet allocated)</p>	10		



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:

<b>Examinations assessed as positive:</b>	<b>Recognized as:</b>
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 Probability 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