

Study Guide

Mathematics

Faculty of Mathematics and Physics
Gottfried Wilhelm Leibniz Universität Hannover



Faculty of Mathematics and Physics
Gottfried Wilhelm Leibniz Universität Hannover

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A Message from the Dean

Dear Students,

Welcome to our faculty in academic year 2018/19!

We are very pleased to welcome our new students, and wish you a smooth and successful start to your studies here at our faculty. We hope that with our support you will continue to develop your interests and skills in this area; career opportunities and prospects are excellent with a degree in one of the subjects offered at our faculty.

You have become familiar with mathematics as a school subject, where topics were developed step by step, accompanied by many often similar assignments. And it was solving somewhat tricky problems that you particularly enjoyed. For many people though, by the end of school education mathematics seems to be a completed field. They might ask: are there any open problems left? What research is done in mathematics today?

On the following pages, the Institutes of Mathematics and the Institute of Mathematics and Physics Education give a short introduction to the topics that the members of the faculty are investigating here in Hannover. They build bridges to applications, or describe a problem that seems elementary at a first glance, only to lead to as yet unsolved questions on closer inspection. Mathematics has many facets, which you will discover to varying degrees. It is a science that we are passionate about. Mathematical theories and arguments can be seen as elegant, and like works of art, beautiful. To be able to work mathematically and to appreciate good mathematics you need to learn the craft (or rather the creative way of thinking) of mathematical methods. It is then up to you whether you wish to contribute to the development of mathematics per se or to use it as a key technology and tool for applications in many areas – these can be fields of mathematics like insurance mathematics or computer science, neighbouring science fields such as physics or e.g. topics in economics. Mathematical modelling and the subsequent investigation of the mathematical models are sought after everywhere. If you have discovered mathematics at a high level and in great breadth, and have reflected on the problems of the mathematical way of thinking in the education courses, you will be equipped to teach this subject with enthusiasm in school.

How do you reach this point? The key lies in taking the initiative in your learning. By observing what others are doing you will perhaps learn a little, but you can really only develop your abilities when you become active yourself, not only by listening to lectures and taking notes (use as many different channels as you can!), but also by reviewing and in particular doing all

the assignments for the problem classes. The first semester topics in particular are concerned with the foundations of mathematics, with later courses building on them; it is therefore vital to understand these concepts. At this early stage you should also learn how to explain mathematical observations. This plays an important role for all of you, not only for those who wish to become teachers but also for those working together with others at a later stage, especially in teams whose members have a widely varying professional background.

In the first weeks of your studies, many of you are likely to find the transition from school to university challenging - take pleasure and pride in facing these challenges and do not let yourself be discouraged by difficulties (see above: practice makes perfect!). If you have left school with entirely different expectations of mathematics and begin to doubt in the first few months that it is the right subject for you, do speak to your lecturers or go to the subject guidance office. This study guide contains many useful tips on where to go with the many different questions that could arise in the course of your studies.

We hope that you share with us the enthusiasm for the subjects at our faculty, and that you take pleasure in following the path to a degree.

Your Dean

Prof. Dr. Roger Bielawski

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1 Overview of the Faculty

1.1 The Faculty

www.maphy.uni-hannover.de

The telephone numbers are 0511 - 762 - ****, whereby **** stands for the numbers given below.

The **Dean's Office** is the Management of the Faculty; its members are the Dean, the Dean of Studies and the Vice Dean of Studies under the presidency of the Dean.

Dean

Prof. Dr. Roger Bielawski *dekan@maphy.uni-hannover.de*
 Appelstraße 11A (Room A108) - 2315 / - 5499
 30167 Hannover

Vice Dean

Prof. Dr. Clemens Walther prodekan@maphy.uni-hannover.de
 Herrenhäuser Str. 2 (Room 023) - 3312 / - 5499
 30419 Hannover

Dean of Studies

Prof. Dr. Eric Jeckelmann *studiendekan@maphy.uni-hannover.de*
 Appelstraße 2 (Room 225) - 3661 / - 4466
 30167 Hannover

Vice Dean of Studies

Prof. Dr. Christoph Walker *studienprodekan@maphy.uni-hannover.de*
 Welfengarten 1 (Room e 340) - 17203 / -4466
 30167 Hannover

Degree Programme Coordination is the main port of call for matters regarding your studies. It acts as the interface between students and lecturers as far as both communication and organisation are concerned. Degree Programme Coordination is responsible for student guidance in particular.

Degree Programme Coordination

Dipl.-Ing. Axel Köhler (Room A121) - 5450
 Dr. Katrin Radatz (Room A122) - 14594
 Appelstraße 11A, 30167 Hannover *sgk@maphy.uni-hannover.de*

Office

Mariana Stateva-Andonova *studiensekretariat@maphy.uni-hannover.de*
 Appelstraße 11A (Room A120) - 4466
 30167 Hannover

1.2 Mathematical Institutes within the Faculty

www.maphy.uni-hannover.de/de/institute

The mathematical institutes are located in the main building of the university (Welfengarten 1, 30167 Hannover). The telephone numbers are 0511 - 762 - ****, whereby **** stands for the numbers given below.

The professors of the institutes and the offices are listed below.

Current office hours can usually be found on the institutes' websites. You may also make an appointment outside the official office hours by email or telephone.

Institute of Algebra, Number Theory und Discrete Mathematics

www.iazd.uni-hannover.de

E-mail ending: *math.uni-hannover.de*

Prof. Dr. Christine Bessenrodt	<i>bessen@</i>	- 3294	Room a 412
Prof. Dr. Ulrich Derenthal	<i>derenthal@</i>	-4478	Room a 413
Prof. Dr. Michael Cuntz	<i>cuntz@</i>	-4252	Room a 414
apl. Prof. Dr. Thorsten Holm	<i>holm@</i>	- 4484	Room c 402
Prof. Dr. Ghislain Fourier	<i>fourier@</i>	-7624495	Room c 413

Office

Hiltrud Trottenberg	<i>sekretariat-d@</i>	-3337	Room a 411
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Institute of Algebraic Geometry

www.iag.uni-hannover.de

E-mail ending: *math.uni-hannover.de*

Prof. Dr. Wolfgang Ebeling	<i>ebeling@</i>	-2248	Room g 316
apl. Prof. Dr. Anne Frühbis-Krüger	<i>fruehbis-krueger@</i>	-3592	Room g 319
Prof. Dr. Klaus Hulek	<i>hulek@</i>	-3205	Room g 315
Prof. Dr. Matthias Schütt	<i>schuett@</i>	-3593	Room g 131

Office

Ute Szameitat	<i>sekretariat-c@</i>	-3206	Room g 312
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Institute of Analysis

www.analysis.uni-hannover.de

E-mail ending: *math.uni-hannover.de*

Prof. Dr. Elmar Schrohe	<i>schrohe@</i>	- 3515	Room f 123
Prof. Dr. Wolfram Bauer	<i>bauer@</i>	-2361	Room f 125

Office

Susanne Rudolph	<i>sekretariat-b@</i>	-3563	Room f 124
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Institute of Applied Mathematics

www.ifam.uni-hannover.de

E-mail ending: *ifam.uni-hannover.de*

Prof. Dr. Joachim Escher	<i>escher@</i>	-4472	Room c 406
Prof. Dr. Marc Steinbach	<i>steinbach@</i>	-2359	Room e 336
Prof. Dr. Christoph Walker	<i>walker@</i>	- 17203	Room e 340

Offices

Carmen Gatzen	<i>gatzen@</i>	-2230	Room f 119
Antje Günther	<i>guenther@</i>	-3251	Room c 407
Natascha Krienen	<i>krienen@</i>	-19972	Room b 411

Mathematics Education

www.idmp.uni-hannover.de

E-mail ending: *idmp.uni-hannover.de*

Prof. Dr. Thomas Gawlick	<i>gawlick@</i>	- 19007	Room f 403
Prof. Dr. Reinhard Hochmuth	<i>hochmuth@</i>	- 4752	Room f 405

Office

Anja Krampe	<i>krampe@</i>	- 5952	Room f 402
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Institute of Differential Geometry

www.diffgeo.uni-hannover.de

E-mail ending: *math.uni-hannover.de*

Prof. Dr. Roger Bielawski	<i>bielawski@</i>	-2315	Room c 401
Prof. Dr. Knut Smoczyk	<i>smoczyk@</i>	- 4253	Room a 415
Prof. Dr. Lynn Heller	<i>lynn.heller@</i>	- 3897	Room b 408

Office

Melanie Eggert	<i>sekretariat-a@</i>	-2894	Room a 449
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Institute of Probability and Statistics

www.stochastik.uni-hannover.de

E-mail ending: *stochastik.uni-hannover.de*

Prof. Dr. Rudolf Grübel	<i>rgrubel@</i>	-4251	Room f 438
Prof. Dr. Stefan Tappe	<i>tappe@</i>	-3947	Room b 403
Prof. Dr. Stefan Weber	<i>sweber@</i>	-2312	Room f 440

Office

Sylvia Voß	<i>svoss@</i>	-4250	Room f 439
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1.3 Structure and Committees

The Faculty of Mathematics and Physics consists of thirteen institutes.

The Department of Mathematics is made up of six institutes (cf. 3) as well as the joint Institute of Mathematics and Physics Education. Each of the three major areas, pure mathematics, applied mathematics, and stochastics, is represented in Hannover through a broad spectrum of research areas and the respective courses. The institutes present their areas of research in chapter 3.

Faculty Committees

The current members of the following committees can be seen on the homepage of the Faculty of Mathematics and Physics (www.maphy.uni-hannover.de). The e-mail addresses of the student representatives are on the homepage of the Student Council of Mathematics and Physics.

Faculty Council

The Faculty Council decides on fundamental matters of research and teaching. It determines faculty regulations and in particular study and exam regulations. The Faculty Council consists of seven professors, two non-professorial academic staff, two students, two (non-voting) representatives of doctoral candidates and two members of the technical and administrative services (MTV group); it is chaired by the Dean. Meetings are to a large extent public and are held at roughly monthly intervals on Wednesdays during the lecture period.

Academic Commission

The Academic Commission is to be consulted before the Faculty Council takes decisions on all matters concerning teaching, studying and exams. The Faculty Council must respect the recommendations. Voting members of the Academic Commission are: two professors, one non-professorial academic and four students; it is chaired by the Dean of Studies. The Academic Commission usually meets two weeks before the Faculty Council.

Examining Committee

The Examining Committee for Mathematics is responsible for conducting the exams for the bachelor's and master's degrees in mathematics. It makes sure that the exam regulations are observed. The Examining Committee also decides on exam issues in cases of doubt.

Matters for the Examining Committee are usually directed to the president of the Examining Committee (cf. chapter 4.1.7).

For decisions concerning teacher training there are dedicated examining committees administered by the Leibniz School of Education (cf. chapter 4.2.3)

Faculty Student Council

The students at the Faculty of Mathematics and Physics constitute the joint Student Council for Mathematics and Physics. The open Student Council, in which all students may participate, represents the interests of the Student Council. The Student Council meets in the Student Council Room every Monday in the lecture period at 6.15pm.

The main duty of the Student Council is to represent student interests in the faculty committees. Through its student representatives it plays a part in e.g. drawing up study and exam regulations or deciding on the use of student fees, and participates in appointment committees in the hiring of new professors. Additionally, it takes part in interfaculty committees.

If you are interested in playing an active role in planning teaching and research – i.e. working in the committees – you are welcome to come to the Student Council.

Further activities of the Student Council are described in chapter 4.1.6.

Contact:

Student Council Mathematics/Physics

Welfengarten 1 (Room d 414)

30167 Hannover

fsr@fs-maphy.uni-hannover.de

Tel.: 0511-762-7405

www.fs-maphy.uni-hannover.de

2 Studies

2.1 Degree Courses

At our faculty, several different bachelor's (BA) and master's degrees (MA) in mathematics are offered:

- The Bachelor's and Master's Degree Programme in Mathematics is a specialist programme leading to an activity in mathematical research or in industry.
- Leibniz Universität runs an Interdisciplinary Bachelor's Degree course where the subject mathematics is combined with a second subject. Mathematics can be chosen either as a major (more hours) or minor (fewer hours) subject. This degree is aimed especially at students who wish to become grammar school teachers. In this case, the master's degree Teacher Training for Grammar Schools follows on from the BA; alternatively it is possible to change to the specialist master's degree course MA in Mathematics.
- Teacher Training for Vocational Schools is catered for in the consecutive Bachelor's and Master's in Technical Education. In this case, mathematics is studied in less detail ("teaching subject") in combination with a vocational subject such as electrical or civil engineering.

Mathematics may also be chosen as a teaching subject in the Bachelor's and Master's Degree Programme in Special Needs Education, and studied alongside special needs education. The mathematics modules to be taken here make up only one fifth of the programme.

A broad spectrum of courses from each of the three major areas, pure mathematics, applied mathematics, and stochastics, is offered – from foundation courses and advanced theories to a wide variety of applied fields. This wide variety is reflected in a comprehensive range of courses, which students can use to set their own profile, particularly in the specialisation modules in the higher semesters of the bachelor's degree and in the master's phase.

What are the aims of the individual study programmes?

Intended Career in Research or in Industry

The bachelor's degrees serve mainly as research-oriented foundation courses. They provide an introduction to the basics of mathematics. With this in mind, the bachelor's degree course in mathematics provides an overview of the whole spectrum of mathematics.

The main aim of the consecutive master's degree course is to enable students to work efficiently and independently at the current state of research, in innovative areas of technology and industry, and in all responsible positions of state and society. This requires not only a specialisation in the subject but also an introduction to independent academic working practices. The master's degree thus features a specialisation phase and a research phase. Studying for a master's degree at Leibniz Universität thus also provides the opportunity to pursue individual interests.

What are the career options after studying?

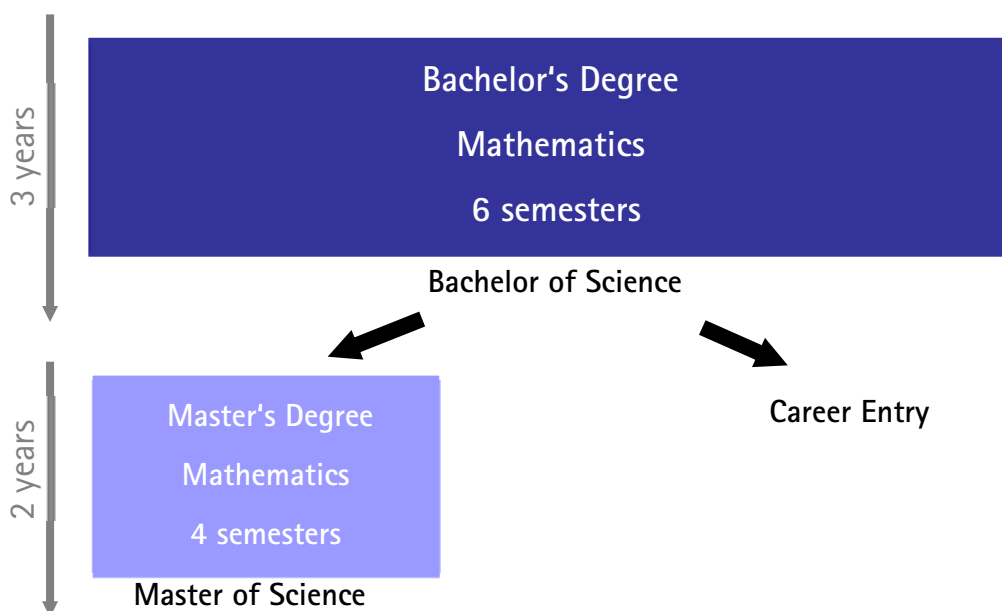
The **bachelor's degrees** can serve as an entrance qualification for a master's degree in mathematics or another discipline. They are also **professional qualifications** for certain fields of activity.

Potential fields of activity are for instance special trainee programmes tailored to a company's needs and building on a sound knowledge of basic mathematics. Companies may also employ graduates with a BA in mathematics for tasks requiring analytic skills and an ability to think in an abstract way, but for which an extensive scientific qualification such as a master's degree is not absolutely necessary. Examples here could be marketing and sales, or project management.

The **consecutive master's degree course** is research-oriented. A successful master's degree is also a requirement for taking a **doctoral degree** in the course of subsequent professional and research activity.

In view of this wealth of essential skills, mathematicians can work in publicly sponsored or industrial research laboratories. Typical areas are also banks and insurance companies. Mathematicians are also sought after outside the narrow definition of the subject e.g. in IT or consultancy. They work in a wide range of areas for which they were not specifically trained in their studies, and are to be found in rapidly changing environments where complex problems have to be dealt with in a structured way, and where flexible creative problem solvers are required.

Structure of the Specialist Degree Courses

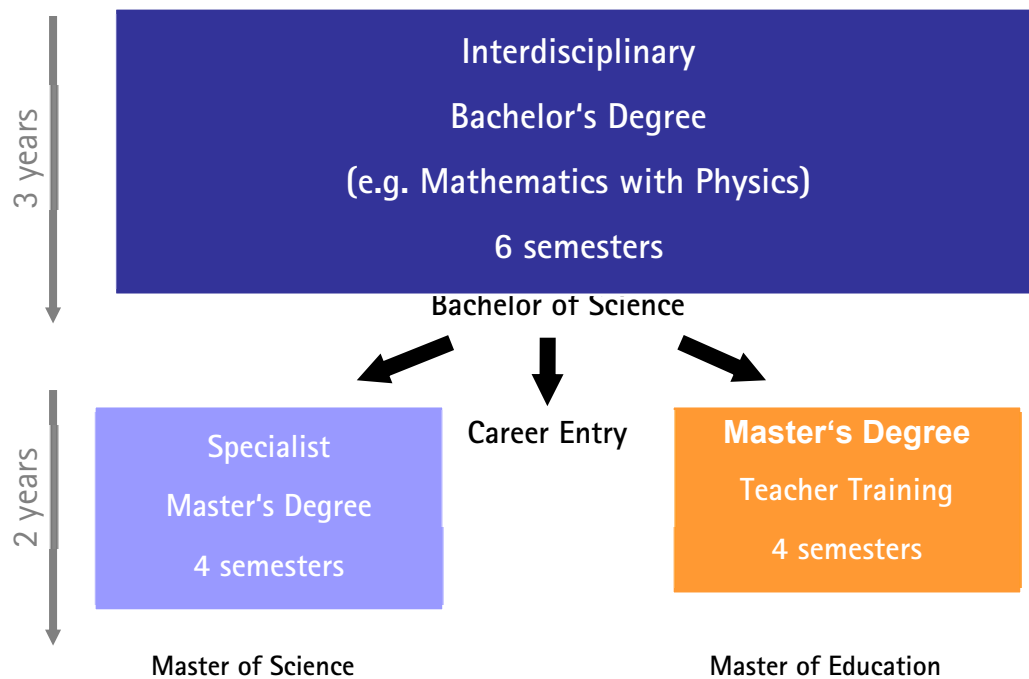


Intended Career in Teaching

One special feature is the **Interdisciplinary Bachelor's Degree**: these courses are on the one hand foundation courses for the **consecutive master's degree: Teacher Training for Grammar Schools**, providing an introduction to teacher training. On the other hand, the interdisciplinary bachelor's degree is also a first professional qualification and can lead to a specialist master's degree course

if the relevant entrance requirements are met. Admittance to a specialist master's degree course in mathematics is usually unproblematic, if mathematics has been chosen as a major in the Interdisciplinary Bachelor's Degree course in mathematics (see below).

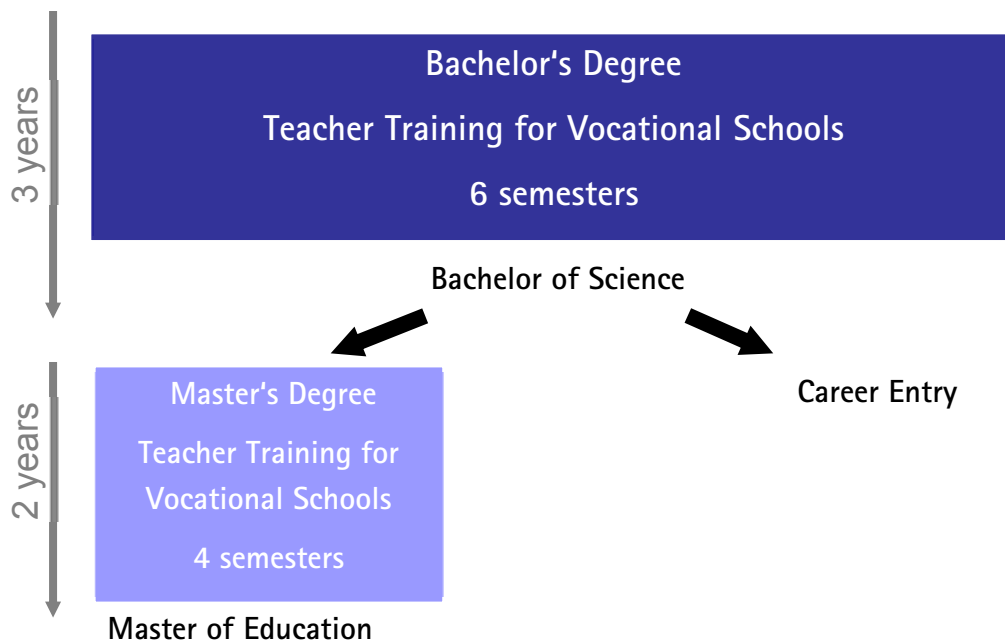
Structure of the Interdisciplinary Bachelor's Degree Course in Mathematics



An introduction to **Teacher Training for Vocational Schools** is offered in the degree course **Bachelor of Technical Education**. It caters for prospective students interested in the technologies, materials and creative possibilities of a trade or industry who wish to work with mainly young adults in the area of tension between operational requirements and social expectations.

The degree programmes in Technical Education also offer the advantage of a first professional qualification after only 6 semesters. Graduates with a Bachelor of Technical Education can take up a career in vocational training in the private sector, or continue their studies in a **Master's Degree course: Teacher Training for Vocational Schools**

Structure of the Courses in Teacher Training for Vocational Schools



2.2 Course Structures

Please note that the legally binding text for all exam regulations is always the one published in the official university bulletin.

Admission requirements for exams

All bachelor's degree courses at our faculty have free admission. I.e. the general university entrance qualification is all that is required for taking up your studies. This is usually in the form of the Abitur. (For teacher training programmes, however, admission to a second subject area might be required. Please enquire at the Leibniz School of Education.) Apart from the general university entrance qualification, there are further admission options – e.g. the subject-specific university entrance exam after vocational training. This university entrance exam is often chosen by applicants for the vocational teacher training course Bachelor of Technical Education. Further information on studying without Abitur can be found on the university homepage:

www.uni-hannover.de/hochschulzugang

The master's degree courses have restricted admission. The precise rules (including exceptions) are in the relevant admission regulations:

www.uni-hannover.de/de/studium/immatriculation/bewerbung/zugangsordnung

The deadline for applications for a master's degree course is 15th July in the winter semester and 15th January in the summer semester.

Studies

Course content is divided into **modules**. A module focuses on one particular topic and can thus consist of more than one class/lecture. As well as lectures, usually accompanied by exercise classes, seminars are part of the course. To gain a degree, learning achievements in the form of coursework and exam performance in the individual modules are required.

In the case of coursework, a minimum number of points are usually required. Scores in coursework are not part of the final mark.

The content of a module is tested usually concurrently through an oral or written exam (exam performance).

According to the estimated workload, **credit points** are awarded for each module. After producing the required coursework and exam performance, students accumulate the credit points allocated to the module.

Credit points complying with the *European Credit Transfer and Accumulation System* (ECTS) describe the workload required to acquire the competence taught in a module. One credit point (CP) corresponds to the estimated workload of 30 hours. Some 30 credit points are to be accumulated per semester.

In the **bachelor's degree courses** a minimum of **180 credit points** are to be accumulated, in the **master's degree courses** **120**. The modules take one to two semesters: As a rule, a workload of between 150 and 300 hours is required, corresponding to 5 to 10 CPs. A workload exceeding this is required in particular for the modules concerning the theses and the modules in the research phase of the master's degree.

The **final mark** is calculated as a weighted average of the exam marks.

For information on which modules are required for your degree course and which weighting is attached to these modules please consult the exam regulations for your course.

Registration for and conducting of the module exams:

For each exam, registration with the Examination Office is required within a fixed registration period. If you do not pass the exam, you may repeat twice. Exceptions are the bachelor's and master's theses. They may be repeated once, with a different topic.

Registration and exam dates can be found on the webpage of the Examination Office:

www.uni-hannover.de/pruefungsamt

2.3 Bachelor's Degree Courses

2.3.1 Preliminary remark on the course sequence plans

In the following sections you will find among other matters precise **course sequence plans** for the mathematics degrees at Leibniz University Hannover. Please note that these course sequence plans are merely **suggestions** on how you might structure your studies. The sequence is not in any way prescribed. With the Interdisciplinary BA in particular, it is not always possible to avoid clashes with individual classes, so that you might find it necessary to adjust your personal course planning. Please note however that particularly the basic lectures largely build on one another and should therefore be attended in the given order. If you have any questions, the degree programme coordinators and subject advisers will be pleased to help you.

Bachelor of Science in Mathematics

Semester / Area	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	CP
Foundation Courses	Analysis I Lin. Alg. I 20 CP	Analysis II Lin. Alg. II 20 CP	Analysis III o. Algebra I Num. Analysis I Program- ming 24 CP	Math. Stochas- tics I 10 CP	Analysis III or Algebra I 10 CP		84
Key Skills			Seminar 5 CP				5
Introductory Seminar			Intro. Seminar 5 CP				5
Electives				Lectures amounting to 40 CP			40
IT			Founda- tions of Theor.IT 5 CP		Data Structures & Algorithms 5 CP		10
Application Subject	Application subjects are: Business Admin, IT, Geodesy, Philosophy, Physics, Economics						18

	Further subjects on request						
Seminar					Seminar 5 CP		5
Bachelor's Thesis						Bachelor's Thesis 13 CP	13

Prescribed period of study: 6 Semester (a total of 180 CP)

Core Elective Modules:

In the second part of your studies, core elective modules amounting to 40 credit points are selected. Advanced modules are divided into the following areas of specialisation:

Pure Mathematics: Geometry Analysis Algebra/Number Theory Discrete Mathematics

Applied Mathematics: Stochastics Numerical Analysis

Please note that there are restrictions to your free choice. You must gain at least 10 CP in both pure and applied mathematics. In addition, a foundation module and also a specialisation module must be taken in one of these areas. For details see the exam regulations.

Bachelor's Thesis:

The *bachelor's thesis* is meant to show that you are able to work on a problem independently and in a given period of time according to scientific methods. The time allotted for this is three months. Accompanying the bachelor's thesis is a seminar, which you should take in the fifth semester. The topic of your bachelor's thesis will usually come from this seminar. Speak to the lecturers in mathematics and ask for suitable topics. In addition to this, the faculty has an annual information event where you can find out about possible topics.

Admission Requirements: To register for the bachelor's thesis 120 credit points are required. All further formalities concerning the bachelor's thesis can be found in the exam regulations.

Application Subject:

In the application subject students become familiar with the formulation of problems and the methodology of other subject areas. The total number of credit points attained is 18. The application subject is usually studied from the 3rd semester. Variations are possible, depending on your personal course planning.

Standard subjects are: Business Administration, IT, Geodesy, Philosophy, Physics, and Economics. For these application subjects, the faculty coordinates course schedules with representatives of these subjects.

Students wishing to choose an application subject not listed here should draw up a course schedule with a representative of the subject in question, and submit this to the examining committee together with an application for admission to another application subject.

2.3.2 Interdisciplinary Bachelor's Degree (FüBA)

Sample Course Schedules:

The recommended course sequence schedules for the Interdisciplinary Bachelor's Degree in Mathematics are presented below. They vary according to whether mathematics is chosen as a major or minor subject. As an example, the course sequence plans for the combination of mathematics and physics are given.

First Subject Mathematics

Semester / Area	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	CP
Mathematics	Analysis I Lin. Alg. I 20 CP	Analysis II 10 CP	Algebra I I 10 CP	Geometry for Teachers Math. Stochastics I 20 CP	Algorithmic Mathematics Core Elective Module 20 CP		80
Teaching Methodology Mathematics	Introduction to Maths TM. – part1 2 CP	Introduction to Maths TM. – part2 2 CP	IV Maths TM. for Sec I 3 CP	Seminar on Maths TM. 3 CP			10
Bachelor's Thesis					Seminar on Bachelor's Thesis 3 CP	Bachelor's Thesis 7 CP	10

Second Subject Mathematics

Semester / Area	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	CP
Mathematics	Analysis I Lin. Alg. I 20 CP	Analysis II 10 CP	Algebra I I 10 CP	Geometry for Teachers 10 CP			50
Teaching Methodology Mathematics	Introduction to Maths TM. – part 1, 2 CP	Introduction to Maths TM. – part 2, 2 CP	IV Maths TM. for Sec I 3 CP	Seminar on Maths TM. 3 CP			10

Subject Combinations:

Subject combinations are chosen in the proportion 2:1 between the first and second subject, whereby in the degree programme Teacher Training for Grammar Schools the second subject is to be studied in more detail during the master's degree course. In the case of a transfer to the specialist master's degree, the first subject remains the main subject. Career Orientation is a further part of the course, comprising educational and communication science topics as well as a four-week internship in a school and a second four-week internship in a company.

Bachelor's Thesis

The bachelor's thesis is meant to show that you are able to work on a problem from the major subject independently and in a given period of time according to scientific methods. The time allotted for this is eight weeks. Accompanying the bachelor's thesis is a seminar, which you should take in the fifth semester. The topic of your bachelor's thesis will usually come from this seminar. Speak to the lecturers in mathematics and ask for suitable topics. In addition to this, the faculty has an annual information event where you can find out about possible topics.

Sample Combination First Subject Mathematics – Second Subject Physics

Semester / Area	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	CP
Mathematics	Analysis I Lin. Alg. I 20 CP	Analysis II 10 CP	Algebra I 10 CP	Math. Stochastic s I 10 CP	Algorith- mic Mathemati cs Core Elective Module 20 CP	Geometry for Teachers 10 CP	80
Teaching Methodology Mathematics	Introducti on to TM – part 1 2 CP	Introducti on to TM – part 2 2 CP	IV TM Sec. I 3 CP	Seminar TM 3 CP			10
Physics	Mechanics & Relativity 6 CP	Electricity Basic Practical Work I 12 CP	Optics, Nuclear Physics, Quantum Pheno- mena Basic Practical Work II	Molecules, Nuclei, Particles, Solids Basic Practical Work III Theore- tical			50

			Math. Methods in Physics 16 CP	Electrodynamics 16 CP			
Teaching Methodology Physics				Intro. Physics Teaching Methodology 4 CP	Learning Physics Teaching Physics 6 CP		10
Career Orientation	School Internship; Business Internship; Education Science; Key Skills						20
Bachelor's Thesis					Seminar on Bachelor's Thesis 3 CP	Bachelor's Thesis 7 CP	10

Sample Combination First Subject Physics – Second Subject Mathematics

Semester / Area	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	CP
Mathematics	Analysis I 10 CP	Analysis II 10 CP	Lin. Alg. I 10 CP	Geometry for Teachers 10 CP	Algebra I 10 CP		50
Teaching Methodology Mathematics	Introduction to TM – part 1 2 CP	Introduction to TM – part 2 2 CP	IV TM Sec I 3 CP	Seminar TM 3 CP			10
Physics		Electricity Basic Practical Work I Theoretical	Optics, Nuclear Physics, Quantum Phenomena	Molecules, Nuclei, Particles, Solids	Theoretical Physics for Teachers	Two Advanced Physics Lectures	80

		Electrodynamics 19 CP	Basic Practical Work II 9 CP	Basic Practical Work III Presenting Physics 13 CP	10 CP	8 CP each	
Teaching Methodology Physics				Intro. Teaching Methodology Physics 4 CP	Learning Physics Teaching Physics 6 CP		10
Career Orientation	School Internship; Business Internship; Education Science; Key Skills						20
Bachelor's Thesis					Seminar BA 3 CP	Bachelor's Thesis 7 CP	10

2.3.3 Bachelor of Technical Education

Sample Course Schedule for the Teaching Subject Mathematics

It is possible to start with the Teaching Subject Mathematics in either the first or the third semester, depending on the professional specialisation. Below we make suggestions on how you might structure your studies of mathematics. These plans serve merely as an orientation; they are in no way binding or necessarily optimal for your own planning. In particular, your personal course planning will depend on the choice of your professional specialisation.

Starting Mathematics in the First Semester

Semester/ Area	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	CP
Analysis	Analysis A 6.5 CP	Analysis B 6.5 CP					13
Algebraic Methods	Lin. Algebra A 5 CP	Lin. Algebra B 5 CP					10
Stochastics					Stochastics A 5 CP	Stochastics B 5 CP	10
Elementary Algebra						Elementa ry Algebra 5 CP	5
Teaching Methodo- logy Mathe- matics	Introduc- tion to TM – part 1 2 CP	Introduc- tion to TM – part 2 2 CP	IV TM for Sec I 3 CP	Seminar on TM 3 CP			10
Bachelor's Thesis						Bachelor's Thesis	15

Starting Mathematics in the Third Semester

Semester/ Area	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	CP
Analysis			Analysis A 6.5 CP	Analysis B 6.5 CP			13
Algebraic Methods			Lin. Algebra A 5 CP	Lin. Algebra B 5 CP			10
Stochastics					Stochasti cs A 5 CP	Stochasti cs B 5 CP	10
Elementary Algebra						Elementa ry Algebra 5 CP	5
Teaching Methodo- logy Mathe- matics	Introduct ion to TM – part 1 2 CP	Introduct ion to TM – part 2 2 CP	IV TM for Sec I 3 CP	Seminar on TM 3 CP			10
Bachelor's Thesis						Bachelor's Thesis	15

Subject Combinations:

The Bachelor's Degree in Technical Education is divided into the professional specialisation (92 CP), the teaching subject mathematics (48 CP), vocational and business education (15 CP), modules on key skills (10 CP) and the bachelor's thesis (15 CP).

2.4 Master's Degree Courses

2.4.1 Master of Science in Mathematics

The exam regulations (see appendix) for the degrees of Bachelor of Science in Mathematics and Master of Science in Mathematics as well as admission requirements for a Master's degree in Mathematics are to be found on the Leibniz University homepage:

www.uni-hannover.de/de/studium/studiengaenge/mathe

Course Structure: Master of Science in Mathematics

The master's degree course consists of the specialist elective modules, the key skills module, the application subject and the master's thesis.

In the elective area, mathematics lectures can be chosen according to your inclinations, whereby there are some restrictions: at least 20 CP of the 60 CP must come from pure mathematics and 20 CP from applied mathematics. At least one module and one seminar should be chosen from the area in which the master's thesis is written.

There is a wide range of choice. For this reason the information on any one semester may vary widely from the suggested course sequence schedules.

Semester / Area	1st Semester	2nd Semester	3rd Semester	4th Semester	CP
Elective Module 1	4L+2P				10
Elective Module 2	4L+2P				10
Elective Module 3		4L+2P			10
Elective Module 4		4L+2P			10
Elective Module 5			4L+2P		10
Elective Module 6			4L+2P		10
Key Skills		Seminar	Seminar		10
Application Subject	Application subjects are: Business Admin, Geodesy, IT, Philosophy, Physics, Economics Further subjects on request				20
Master's Thesis				Master's Thesis	30

4L+2P = Lectures of 4 hours per semester week and the accompanying problem classes of 2 hours per semester week.

2.4.2 Mathematics: Teacher Training for Grammar Schools

The master's degree course: Teacher Training for Grammar Schools focuses on teaching methodology and teaching practice. You are recommended to contact the lecturers at the Institute of Mathematics and Physics Education in good time to coordinate the organisation of your school internship and teacher training. Recommended course sequence schedules for the subject mathematics in the master's degree course: Teacher Training for Grammar Schools are presented below.

First Subject Mathematics

Semester / Area	1st Semester	2nd Semester	3rd Semester	4th Semester	CP
Mathematics	Advanced Maths Course, e.g. Stochastics for Teachers or Complex Analysis for Teachers 5 CP				5
Teaching Methodology Mathematics	Lecture 5 CP	Seminar 3 CP			8
Career Orientation			School Internship Seminar 7 CP		7
Master's Thesis				Master's Thesis 25 CP	25

Second Subject Mathematics

Semester / Area	1st Semester	2nd Semester	3rd Semester	4th Semester	CP
Mathematics	Algorithmic Mathematics 10 CP	Math. Stochastics 10 CP	Advanced Math. Methods A <u>or</u> B, e.g. Algebra I or Analysis III <u>or</u> Numerical Analysis II or Stochastics 10 CP		30
Teaching Methodology Mathematics	Lecture 5 CP	Seminar 3 CP			8
Career Orientation			School Internship Seminar 7 CP		7

Master's Thesis Module

The master's thesis module consists of the master's thesis and an oral exam. The master's thesis is meant to show that the candidate is able to work independently according to scientific methods and in a given period of time on a problem from the specialist subject or from education science. The master's thesis can be written in the first or second subject or in education science. The time allotted for this is four months.

2.4.3 Mathematics: Teacher Training for Vocational Schools

A recommended course sequence schedule for the subject mathematics in the master's degree course: Teacher Training for Vocational Schools is presented below. Please note that this plan serves merely as an orientation and is in no way binding. Variations will be necessary according to your chosen professional direction.

Master's Thesis Module

The master's thesis module consists of the master's thesis and an oral exam. The master's thesis is meant to show that the candidate is able to work independently according to scientific methods and in a given period of time. The master's thesis can be written on a problem from the chosen professional direction or from the chosen school subject or from education science and vocational and business education. The time allotted for this is eight months.

Semester / Area	1st Semester	2nd Semester	3rd Semester	4th Semester	CP
Mathematics	Applied Programming 5 CP	Geometry for Teachers 10 CP	Numerical Analysis A 5 CP		20
Teaching Methodology Mathematics		Lecture 4 CP			4
Career Orientation	School Internship Seminar 4 CP				4

3 Course Information, Guidance, and Other Services

The answers to many questions can be found by reading this guide. But there are other questions that are best addressed one-to-one. The following persons and facilities are available for such cases.

In this section further institutions and facilities serving the needs of students at Leibniz University Hannover are also presented.

3.1 Contacts within the Faculty

3.1.1 Organisation of Degree Courses

Information on organising your studies can be found in this prospectus, in the current exam regulations and at www.maphy.uni-hannover.de/de/studieren

If you have individual questions or problems you may also contact the Degree Programme Coordination Office.

Degree Programme Coordination

Dipl.-Ing. Axel Köhler

Dr. Katrin Radatz

sgk@maphy.uni-hannover.de

Appelstr. 11A (Room A121 und A122)
30167 Hannover

Tel.: 0511-762-5450 und -14594

3.1.2 Subject Guidance

Individual subject guidance is offered by all professors. In addition, the central subject adviser Prof. Ebeling will be pleased to help. Subject guidance should be sought particularly in the following cases:

- Before selecting areas of specialisation, exam subjects and subject areas for the bachelor's and master's thesis
- After failing an exam
- When changing subject, degree course or university
- When planning a period of study abroad

Current office hours of the advisers are usually posted on the internet, or you can enquire by phone, mail or e-mail.

Prof. Dr. Wolfgang Ebeling

ebeling@maphy.uni-hannover.de

Welfengarten 1 (Room g 316) Tel.: 0511-762-2248
30167 Hannover

3.1.3 Subject Advisers Teacher Training (Interdisciplinary Bachelor's (FüBA) /Bachelor's Technical Education / Master's Teacher Training for Vocational Schools)

Teacher training combines subject-specific and teaching methodology content. To do justice to both areas in individual course guidance, two advisers are available.

Teacher Training: Special Needs Education

gawlick@idmp.uni-hannover.de

Prof. Dr. Thomas Gawlick

Welfengarten 1 (Room f 403) Tel.: 0511-762-19007
30167 Hannover

Teacher Training for Grammar Schools, Teacher Training for Vocational Schools

Prof. Dr. R. Hochmuth

hochmuth@idmp.uni-hannover.de

Welfengarten 1 (Room f 405) Tel.: 0511-762-4752
30167 Hannover

3.1.4 Coordinators for Internships/Teaching Practice

As part of the teacher training programmes, school and non-school internships are to be absolved. For questions concerning school internships please contact the lecturers in the Institute of Mathematics and Physics Education. For questions concerning non-school internships please contact the Teacher Training Coordinator

Prof. Dr. Wolfgang Ebeling

ebeling@maphy.uni-hannover.de

Welfengarten 1 (Room g 316) Tel.: 0511-762-2248
30167 Hannover

3.1.5 Student Council Mathematics and Physics

www.fs-maphy.uni-hannover.de

Experience shows that the fastest way for students to get information is from fellow students in higher semesters. The Student Council helps you to get in touch with contacts who – especially due to their own experience as students - are in most cases able to deal with questions or point out where you can get advice. An up-to-date list of contacts is posted on the internet. The main duty of the Student Council is to represent student interests in the faculty committees. Via the student representatives it participates e.g. in drawing up the exam regulations and can play a role on appointment committees hiring new professors. It is also active on interfaculty committees.

In addition to this, the Student Council also offers the following:

- Orientation sessions and joint breakfast for all new students in the week before lectures begin in the winter semester

- Getting -to-know-you weekend for first semester students
- Guidance on mathematics, physics and meteorology courses
- Help with problems concerning studies / lecturers / structure of lectures
- Work rooms with a small collection of textbooks
- Free internet access via the Student Council's computer
- A collection of past exam papers
- Several files with questions from oral exams; a collection of examiners' reports and exam papers are mainly online
- The Student Council magazine Phÿsemathenten
- The mailing list Studilist, which gives students not only up to date info on their studies but also other items of interest concerning the faculty.
- A football team, which all interested students in the faculty are invited to join
- The annual faculty barbecue
- Zahlendre3her parties

Student Council Mathematics and Physics fsr@fs-maphy.uni-hannover.de

Welfengarten 1 (Room d 414)

Tel.: 0511-762-7405

30167 Hannover

Anyone wishing to act as a contact person is warmly invited by the Student Council to come to a Student Council meeting. The Student Council meets in the Student Council Room every Monday in the lecture period at 6.15pm. As the Student Council is open to all, every student in the faculty is entitled to vote in the meetings. This is valid for all votes that are not concerned with finance or changing the statutes.

3.1.6 Examination Board

Procedures concerning your studies, and in particular the credits required, are governed by the relevant exam regulations (see appendix): The Examination Board ensures that the exam regulations are observed. It decides on questions of credit recognition and also in appeal proceedings. Cases for the Examination Board are usually directed to the chair of the Examination Board

Prof. Dr. Elmar Schrohe (Chairman)

schrohe@math.uni-hannover.de

Welfengarten 1 (Room f 123) Tel.: 0511-762-3505

30167 Hannover

Responsibility for decisions concerning teacher training programmes lies with dedicated examination boards supervised by the Leibniz School of Education. (cf section 4.2.3)

3.2 Central Contacts

3.2.1 ServiceCenter

www.uni-hannover.de/servicecenter

The ServiceCenter of Leibniz University Hannover is the main point of contact for students and prospective students. Staff from various central facilities are here to answer questions concerning your studies and provides a first orientation at Leibniz University Hannover. The ServiceCenter is the first port of call for many questions concerning your studies. During the opening hours, staff are available from the following areas:

- Academic Examination Office
- BAföG Advice
- International Office
- Registration Office (I-Amt)
- Psychological-Therapeutic Counselling (PTB)
- Student Advice Office (ZSB)

ServiceCenter

studium@uni-hannover.de

Leibniz University Hannover

Welfengarten 1

Tel.: 0511-762-2020

30167 Hannover

Fax: 0511-762-19385

Opening Hours:

Monday - Thursday: 10.00 - 17.00h

Friday and before public holidays 15.00 - 17.00h

3.2.2 Student Advice Office (ZSB)

www.zsb.uni-hannover.de

The Student Advice Office (ZSB) is open to all students in higher education in Hannover. There are various types of consultation:

- Open office hours: individual confidential advice without making an appointment in advance; registration at the Info Counter in the ServiceCenter (Thurs. 14.30-17.00h)
- By appointment: individual confidential advice. Make an appointment in advance via the service hotline of Leibniz University Hannover (0511-762-2020)
- Brief consultation: first brief information (lasting up to 10 minutes) at the Info Counter in the main building (Mon.- Fri. 10.00 to 14.00h.)

Advice is provided on all matters and issues closely or widely connected to your studies. These might include.

- Changing subject
- Changing university
- Exam problems
- Career prospects after university

The Info Counter has a wide range of material on studying all over Germany. Computers are available for you to conduct data bank research on studying anywhere in the country:

Student Advice Office (ZSB) *studienberatung@uni-hannover.de*
 Welfengarten 1, 30167 Hannover Tel.: 0511-762-2020

3.2.3 Leibniz School of Education (LSoE)

www.lehrerbildung.uni-hannover.de

Leibniz School of Education is responsible, among other things, for the organisation of teacher training (Interdisciplinary Bachelor's (FüBA), Master's Teacher Training for Grammar Schools, Bachelor's Technical Education, Master's Teacher Training for Vocational Schools, Bachelor's Special Needs Education and Master's Special Needs Education.

Location: Im Moore 17c, 30167 Hannover

Subject Specialist Teacher Training for Grammar Schools (Interdisciplinary Bachelor's (FüBA), Master's Teacher Training for Grammar Schools)

Birgit Meriem *birgit.meriem@lehrerbildung.uni-hannover.de*

Room 009 Tel.: 0511-762-19746

Subject Specialist Teacher Training for Vocational Schools (Bachelor's and Master's Teacher Training for Vocational Schools)

Katja Bestel *katja.bestel@lehrerbildung.uni-hannover.de*

Room 008 Tel.: 0511-762-19762

Subject Specialist Teacher Training: Special Needs Education (Bachelor's and Master's Special Needs Education)

Jana Pflughoft *jana.pflughoft@lehrerbildung.uni-hannover.de*

Room 008 Tel.: 0511-762-19748

3.2.4 Academic Examination Office

www.uni-hannover.de/pruefungsamt

Exams are organised in the central Academic Examination Office of the university together with the Dean of Studies Office or the relevant exam committee. In particular, the Academic Examination Office is in charge of the following activities:

- Registering for and admission to exams
- Withdrawing from exams (e.g. due to illness)
- Central recording of exam results
- Issuing certificates e.g. for child benefit
- Producing an overview of grades for job applications or for changing subject / university
- Issuing reports and certificates

The staff of the Academic Examination Office are pleased to give advice in all matters concerning exams. Please use the following addresses:

Central Service Hotline:

Tel.: 0511-762-2020

Fax.: 0511-762-2137

studium@uni-hannover.de

The following people are responsible within the Academic Examination Office for the different degree programmes:

Bachelor's and Master's Degrees in Mathematics

Torsten Flenner

Torsten.Flenner@zuv.uni-hannover.de

Welfengarten 1 (Room f 311)

30167 Hannover

Teacher Training Team (Interdisciplinary Bachelor's (FüBA) / Master's Teacher Training for Grammar Schools/ Bachelor's Technical Education / Master's Teacher Training for Vocational Schools)

Welfengarten 1 (Room f 317)

30167 Hannover

Florian Bauer

Florian.Bauer@zuv.uni-hannover.de

Jana Brauer

Jana.Brauer@zuv.uni-hannover.de

Henrike Boldt

Henrike.Boldt@zuv.uni-hannover.de

Gabriele Chaborski-Reuter

gabriele.charborski-reuter@zuv.uni-hannover.de

Björn Golinski

Bjoern.Golinski@zuv.uni-hannover.de

Svenja Hitchen

Svenja.Hitchen@zuv.uni-hannover.de

Christine Meyerhof

Christine.Meyerhof@zuv.uni-hannover.de