The Departmental Council of the Department of Mathematics and Computer Science of Philipps-Universität Marburg, in accordance with §50(1) Hesse Higher Education Act (HessHG), as amended on 14 December 2009 (Law Gazette of the State of Hesse (GVBl.) I No. 22/2009, p. 666), most recently amended by Article 1 Act of 14 December 2021 (GVBl., p. 931) on 25 January 2023 has adopted the following Degree Program and Examination Regulations:

Degree Program and Examination Regulations

for the program in

"Mathematics"

leading to the degree of

"Master of Science (M.Sc.)"

at Philipps-Universität Marburg

25 January 2023

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I. General

§1 Scope

These Degree Program and Examination Regulations supplement the General Regulations for Master's Degree Programs at Philipps-Universität Marburg of 13 September 2010 (Official Bulletin of Philipps-Universität Marburg, No. 52/2010), as amended from time to time – hereinafter referred to as the General Regulations – and regulate the objectives, content, structure and organization of the degree program as well as the requirements and procedures for the examination grades in the degree program "Mathematics" with the degree "Master of Science (M.Sc.)".

§2 Goals of the degree program

After completing the master's program in Mathematics, graduates have the necessary technical knowledge, skills and methods of mathematics to work independently at an advanced level, analyze and critically assess modern scientific knowledge in accordance with scientific principles, taking into account the requirements and changes in the professional world (business, industry, public service). They have deepened and broadened the knowledge and skills they acquired in their bachelor's degree and have an overview of specialist contexts in mathematics.
Graduates have acquired specialized knowledge and skills through individual focus setting, an introduction to independent scientific work, the study of current research literature and the writing of an individual master's thesis in which a research-related mathematical problem is scientifically investigated and a solution approach developed. Together with the acquired knowledge of a wide range of terms and structures of modern mathematics, they can thus also penetrate deep mathematical facts independently. They may have emphasized an application-related aspect by selecting a specific focus and studying a profile area.

Graduates of the master's program in Mathematics are not limited to a fixed job description, also due to their ability to abstract and their trained conceptual, analytical and logical thinking. They will have acquired the necessary skills to:

- work independently in industry, business and the public sector,
- lead projects that involve analyzing, modeling and solving scientific, business or technical problems,
- carry out planning, development and research tasks in scientific and public institutions,
- work as a research assistant or research associate at a university, as well as
- be admitted to a doctoral degree program.

§3 Master's degree

(1) The master's degree examination is passed if all modules provided for in accordance with §6 have been passed.

(2) After successfully completing the program in accordance with paragraph 1, the Department of Mathematics and Information Technology will award the academic degree of "Master of Science (M.Sc.)".

II. Program-related rules

§4 Access requirements

(1) The general admission requirement for the master's degree program is proof of completion of a relevant bachelor's degree program in the field of mathematics or proof of a comparable domestic or foreign university degree with professional qualifications.

In addition to the bachelor's degree in Mathematics, a teacher qualification degree (First State Examination or master's degree) in mathematics instruction entitles students to access. A bachelor's degree in another discipline qualifies for admission if at least 90 credits (LP) in mathematics modules have been completed as part of this or another degree program. At least 42 credits (LP) should be allocated to modules that correspond to the objectives and competencies of the following modules: Foundations of Mathematics, Linear Algebra I, Linear Algebra II, Analysis I, and Analysis II. In addition, skills in the fields of algebra, stochastics, function theory, vector analysis, and dimension and integration theory as well as numerics should have been acquired.
If no degree certificate with an overall grade is available by the application deadline, enrollment may be conditional. The prerequisite for an underlying bachelor's degree with a scope of 180 credits is that proof be provided that module examinations or partial module examinations have been passed representing at least 80% of the credits required for the bachelor's degree in question. The proof must contain an average grade that was determined on the basis of the graded module examinations and partial module examinations within the scope of the proven 80% of the credits required for the bachelor's degree. Enrollment can only take place under the proviso that all coursework and examination grades of the bachelor's degree have been completed before the start of the master's degree (deadline 31 March if the master's degree program starts in the summer semester or deadline 30 September if the master's degree program starts in the winter semester) and that proof of the degree certificate is provided by the end of the lecture period of the first subject semester.

(2) The examination committee (§16) will decide on the question of the relevance of the prior degree programs as defined in paragraph 1.

(3) The examination committee (§ 16) shall decide on the question of the comparability of the university degree within the meaning of paragraph 1.

(4) The examination committee (§16) may link admission to the condition that additional coursework grades and/or examination grades representing a maximum of 30 credits be completed. In this case, the degree program may be extended accordingly.

(5) The modules and courses of the degree program are generally offered in English. A German-language offering will be possible on an exceptional basis if all students in the module or course wish this. The coursework and examinations can be taken in either German or English, at the student's discretion. Optional offerings and elective courses may include import modules in German from bachelor's degree programs or other departments so that the choice may be limited here, if necessary.
The specific admission requirements are: Demonstrating either:

a) English language skills at least at level C1 of the Common European Framework of Reference for Languages, or
b) English language skills at least at level B1 of the Common European Framework of Reference for Languages and German language skills at least corresponding to the language examination level of "DSH-2".

(6) In addition to the general admission requirements for the degree program, participation in individual modules or parts of modules may be made dependent on the fulfillment of specific module admission requirements.
In this case, the prerequisites are listed in the module list (Appendix 2) under "Prerequisites for Participation".

§5 Academic advising

General academic advising is provided by the Central Academic Advising Service (Zentrale Allgemeine Studienberatung, ZAS) at Philipps-Universität Marburg. Subject-specific academic advising is usually provided by the professors or by authorized persons.

§6 Degree programs: structure, contents, curriculum and information

(1) The master's program in Mathematics is divided into the study areas Compulsory Elective Modules in Mathematics, Practical and Seminar modules, Profile Area as well as Final Module:

(2) The degree program consists of modules that are assigned to the various study areas according to Para. 1. The program structure is as follows based on module assignments, the degree to which they are required, and the student's calculated workload in credits (Leistungspunkte, LP):

	Compulsory course (Pflicht, PF) / Compulsory elective course (Wahlpflicht, WP)	Credits (Leistung-spunkte, LP)	Comment
Compulsory Elective Modules in Mathematics		***51-69***	
Algebraic Geometry: Advanced Methods	WP	R 9	
Algebraic Geometry: Modern Methods	WP	R 9	
Algebraic Geometry: Projective Varieties	WP	R 9	
Algebraic Lie Theory	WP	R 9	
Algebraic Topology I	WP	R 9	
Algebraic Topology II (Large Specialization Module)	WP	R 9	
Algebraic Topology II (Small Specialization Module)	WP	R 6	
Algebras and their representations	WP	R 9	
Analytic Number Theory	WP	R 9	
Applied Harmonic Analysis II	WP	A 6	
Approximation Theory	WP	A 9	
Commutative Algebra (Large Specialization Module)	WP	R 9	
Commutative Algebra (Small Specialization Module)	WP	R 6	**
Complex Geometry I	WP	R 9	
Complex Geometry II	WP	R 9	
Differential Geometry I	WP	R 9	
Differential Geometry II	WP	R 9	
Fourier Integral Operators	WP	R 9	
Functional Analysis	WP	A&R 9	
Galois Theory	WP	R 9	
General Relativity	WP	R 3	
Holomorphic Functions and Abelian Varieties	WP	R 9	
Hopf Algebras	WP	R 9	
Hopf Algebras II	WP	R 9	
Large Specialization Module Algebra/Geometry	WP	R 9	
Large Specialization Module Analysis/Topology	WP	R 9	

Large Specialization Module Numerical Mathematics/Optimization	WP	A 9	
Noncommutative Algebra	WP	R 9	
Numerical Analysis II	WP	A 6	
Numerical Methods for Ordinary Differential Equations	WP	A 6	
Numerical Solution Methods for Differential Equations	WP	A 9	
Numerical Solution Methods for Finite Dimensional Problems	WP	A 9	
Partial Differential Equations	WP	R 9	
Selected Topics in Numerical Analysis	WP	A 6	
Small Specialization Module Algebra/Geometry	WP	R 6	
Small Specialization Module Analysis/Topology	WP	R 6	
Small Specialization Module Numerical Mathematics/Optimization	WP	A 6	
Spectral and Scattering Theory	WP	R 9	
*Import modules with content or methodological reference to the subject area of mathematics**	WP	0-69	
Practical and Seminar Modules		***21***	
Advanced Mathematical Software Project	WP	6	
Advanced Internship*	WP	6	
Independent Scientific Practice Mathematics	PF	9	
Industrial Internship***	WP	6	
Practical course in stochastics*	WP	6	
Selected Advanced Topics in Mathematics A (Seminar)	PF	3	
Selected Advanced Topics in Mathematics B (Seminar)	PF	3	
Profile Area		***0*** *or* ***18***	Optional is possible
*Import module in a profile area from another scientific discipline**	WP	18	
Final Module		***30***	
Master's Thesis	PF	30	
Total		***120***	

* Cf. Appendix 3 Import Module List.
** In the field of Compulsory Elective Modules in Mathematics, at least 18 credits in modules on pure mathematics (marked with an "R") and at least 12 credits in modules on applied mathematics ("A") must be earned and a maximum of two advanced modules may be completed in total. Either 51 or 69 credits must be obtained in this area, depending on whether the optional Profile Area (18 credits) area is taken or not.
*** The external internship module (Industrial Internship) must be completed, unless it has already been completed as part of the bachelor's degree.

(3) In the degree program area Compulsory Elective Modules in Mathematics, students deepen and broaden their knowledge and competences in different disciplines of mathematics. In this way, they broaden their mathematical spectrum and acquire specialized knowledge that introduces them to current questions of mathematical research and modern mathematical applications.

(4) In the area of practical and seminar modules , students deepen their practice-oriented scientific competencies. Among other things, the application of skills acquired during the course of studies in the professional field of a mathematician is learned within the scope of an internship. If an industrial internship has already been completed in the

bachelor's degree, an internal internship will instead allow skills to be used for the algorithmic implementation of complex mathematical content in software (in one of the modules Advanced Mathematical Software Project or Stochastics Internship) or for the implementation of a larger software development task through all project phases (in the module Advanced Internship). In two seminars, the ability to communicate mathematical statements is deepened and the analysis and description of essential content from scientific texts is practiced. The two seminars are to be selected from two different mathematical fields. In the module Independent Scientific Practice Mathematics, techniques of scientific work in mathematics are learned and practiced. The module also prepares students for the master's thesis, and it is recommended that it be taken with the prospective adviser for the master's thesis.

(5) In the optional profile area , knowledge is acquired in another subject in which mathematical thinking or mathematical methods can be applied profitably. The ability to create analogies between mathematical thinking and content and those from another subject is acquired. The list of subjects from which modules can be chosen, which can be extended in coordination with other departments, can be found in Appendix 3 or in the most current form on the website in accordance with paragraph 8.

(6) The degree program is more research-oriented.

(7) An example sequence of the modularized program is given in the degree program curriculum (cf. Appendix 1).

(8) General information and regulations in their current form are available on the course-related website at

https://www.uni-marburg.de/de/fb12/studium/studiengaenge/m-sc-mathematik

In particular, the module handbook and the degree program curriculum can be viewed there. Furthermore, a list of the current import and export opportunities for the degree program is published there.

(9) The assignment of the individual courses to the modules of the degree program can be seen in the course catalog of Philipps-Universität Marburg, which is available on the homepage of the university.

§7 General standard program duration and start of studies

(1) The standard period of study for the master's program in Mathematics is 4 semesters. On the basis of these Degree Program and Examination Regulations, the department will ensure a range of courses enabling students to complete all of the work required to pass the degree program, including preparing the master's thesis, within the general standard program duration.

(2) The degree program can be started in either winter or summer semester.

§8 Study abroad

(1) The International Student Advisory Service of the respective department as well as the offices and academic units at Philipps-Universität Marburg responsible for study abroad programs will advise students on various destination universities as well as on internship opportunities abroad, technical requirements, options for getting study abroad work recognized as well as funding opportunities.

(2) Students will conclude a learning agreement with their department and the foreign host university prior to their stay abroad. The degree program to be completed abroad as well as the credits to be earned upon successful completion of a module or course must be specified in this kind of learning agreement. The students will agree to complete the agreed degree program at the host university as an integral part of their studies and the department will recognize the credits earned. The learning agreement is binding on the parties involved. To conclude a learning agreement, it is essential that the targeted learning outcomes and skills largely coincide. It is not necessary that the content be the same.

(3) In justified exceptional cases, the learning agreement can be modified or adapted before and during the stay abroad at the request of the student with the consent of the department. The consent of the foreign host university is also required.

(4) Departures from the commitments made in the learning agreement will be permitted after the fact only if they are not the student's fault and appropriate documentation is provided.

§9 Structural variant of the degree program

The master's program in Mathematics corresponds to the structural variant of a "single-subject program".

§10 Modules and credits

The rules under §10 of the General Regulations apply.

§11 Practical modules and profile modules

(1) As part of the master's program in Mathematics, an internal practical module in the field of study Practical and Seminar Modules is provided in accordance with §6 of these Degree Program and Examination Regulations.

(2) As part of the master's program in Mathematics, an external practical module in the field of study Practical and Seminar Modules is provided in accordance with §6 of these Degree Program and Examination Regulations. If the student has been unable to find an internship position despite efforts, the department may arrange a suitable external internship position within a reasonable time frame. If this effort fails, an external internship may be substituted instead by the other modules provided for in §6 of these Degree Program and Examination Regulations for the corresponding area.

(3) Otherwise, the provisions of §11 of the General Regulations apply.

§12 Module and course registration and module and course deregistration

(1) Binding registration is required for modules or courses in individual cases, insofar as this is specified in the module handbook.

(2) The registration and deregistration procedure as well as the registration and deregistration deadlines will be announced in a timely fashion on the degree program-related website in accordance with §6(8). In the event of limited capacity, module or course placements are allocated in accordance with §13 of these Degree Program and Examination Regulations.

§13 Access to compulsory elective modules or courses with limited participation options

(1) Registration caps may be set for compulsory elective modules and courses by means of a departmental council resolution, provided that this is absolutely necessary for the implementation of orderly teaching and degree program operations and for the achievement of the educational objective. Whenever the number of participants is fixed, this will be announced in an appropriate manner and in a timely fashion before the start of the compulsory elective module or course.

(2) For a compulsory elective module or a course with limited capacity, there is no entitlement to participate provided that there is open capacity to take at least one other alternative compulsory elective module or course.

(3) If the number of registrations for a compulsory elective module or course exceeds the number of available places, a selection must be made.
The selection will be conducted by lot.
In all cases, it must be ensured that, within the framework of the available capacity, hardship cases are considered in advance, in particular those as defined by §26(1 and 2) (Priority Group 1) and students with a special interest in participation (Priority Group 2). A special interest exists in particular for students:

- for whom the required elective module or course is required due to an internal specialization,
- who did not receive a place in a previous semester despite having registered, even though the degree program curriculum provided for the compulsory elective module,
- who previously did not pass the compulsory elective module or course, if repeating the module or course is required to retake the examination.

If, in individual cases, the available places are not sufficient for consideration of the two priority groups, students from Priority Group 1 must have priority registration; within each group, the decision is then made by drawing lots.

§14 Application of modules across degree programs

(1) Modules are planned that are based on the provisions of other degree programs (“import modules”) in terms of what they offer and their examination rules. More detailed information on these modules is summarized in Appendix 3.

(2) Modules offered in the master’s program in Mathematics, which can also be completed in the context of other degree programs, are subject to the regulations of §20(4) of these Degree Program and Examination Regulations as well as §14(2) General Regulations.

§15 Academic grades

§15(1) of the General Regulations applies.

III. Examination-related provisions

§16 Examination committee

(1) The departmental council will appoint the examination committee.

(2) The members of the examination committee will consist of:

1. Four professors,
2. One research assistant, and

3. Two students.

One substitute member will be elected for each member.

Of the members in accordance with item 1, three should come from the field of mathematics and one from the field of computer science.

(3) The term of office, the chairship, quorum and other issues are governed by §16 of the General Regulations.

§17 Duties of the examination committee and examination administration

The rules under §17 of the General Regulations apply.

§18 Examiners and observers

The rules under §18 of the General Regulations apply.

§19 Recognition of academic grades and examination results

The rules under §19 of the General Regulations apply.

§20 Module list, import and export module list and module manual

(1) The modules to be completed as part of the degree program are summarized in the module list (Appendix 2) as well as in the list of import modules (Appendix 3). These lists as well as §6 provide the type of modules, their allocation to the various areas of the degree program, choices among modules and within modules, the prerequisites for participation in the modules as well as the credits to be earned, the form of examination, assessment and the expertise objectives. In the case of import modules, the original module lists of the offering degree program provide this information.

(2) The offer of import modules is subject to the provision that changes to the modules can be made by the offering academic units (e.g. in particular using accreditations). This does not require an amendment to these Degree Program and Examination Regulations. Such changes will be announced by the examination committee in a timely fashion on the program website. In addition, the examination committee may decide that in general or in individual cases upon a justified petition, additional modules may be allowed as import modules, provided that the offering department or institution agrees to this.

(3) Further information with detailed module descriptions as well as the current range of import modules will be published in a module handbook on the program website.

(4) The export modules are summarized in Appendix 4.

§21 Examinations

The rules under §21 of the General Regulations apply.

§22 Examination types and durations; test-taking times; scopes

(1) Written examinations will take the form of:

- Written examinations (*Klausuren*), which may also be administered in whole or in part as e-examinations (in accordance with Appendix 6 of the General Regulations) and in whole or in part as multiple-choice examinations (in accordance with Appendix 8 of the General Regulations),
- Internship reports

- Written analyses (*schriftliche Ausarbeitungen*), or
- The master's thesis

(2) Oral examinations will take the form of:
- Individual tests, or
- The oral defense of the master's thesis

(3) Additional examination forms include:
- Presentations
- Seminar presentations

(4) The following durations or test-taking times and scopes are assigned to the examination forms mentioned above. In the case of written examinations that are not conducted under supervision, the total time available to take the tests should be longer. The examination duration is 60-120 minutes for written examinations and 20-30 minutes for individual oral examinations. Written analyses and the internship report usually comprise 10-20 pages and about two weeks of working time; the presentation and seminar presentations take place within the framework of a module event (max. 90 minutes). The scope or length of the master's thesis is usually 30-90 pages. The oral defense lasts a maximum of 60 minutes.

(5) The corresponding regulations of the Degree Program and Examination Regulations for the degree programs from which the modules are imported, as amended, will apply to the import modules in accordance with Appendix 3 or the examinations provided for in that appendix.

(6) Multimedia-based written examinations ("e-examinations") will be administered in accordance with the provisions under General Regulations, Appendix 6.

(7) Multiple-choice examinations will take place in accordance with the provisions in the General Regulations ("answer-choice examinations"), Appendix 8.

(8) Otherwise, the provisions of §22 General Regulations apply.

§23 Master's thesis

(1) The master's thesis (graduation paper) is a mandatory component of the degree program. It constitutes a final joint module together with an oral defense. The master's thesis must be written in German or English.

(2) The master's thesis is an examination paper with which the candidate is to demonstrate the ability to independently work on a delimited problem from the subject area of mathematics using scientific methods within a specified period of time. It aims to ensure that the candidate applies the knowledge acquired in the course of studies in conjunction with scientific methods to relevant questions in which advanced mathematical methods and procedures are used to a particular extent. It further aims to present the results in written form in a scientific/scholarly manner and to appropriately present and defend them publicly. The scope of the master's thesis is 27 credits. The final module includes an additional 3 credits for the oral defense.

(3) The master's thesis must be written as an individual work.

(4) Permission to write the master's thesis requires that at least 66 credits have been earned in the modules of the master's program.

(5) The candidate will propose an adviser and a reviewer authorized as examiner as the first reviewer for the master's thesis. The candidate also has the right to propose the second reviewer. The adviser and the first reviewer may be the same person. These proposals do not establish an entitlement. The first reviewer must be appointed by the examination committee for the examination of master's theses. The topic of the master's thesis is submitted to the examination committee by the first reviewer and assigned by the examination committee. If the candidate does not find an adviser and a first reviewer, the chair of the examination committee will appoint the adviser and the first reviewer and ensure that a topic for the master's thesis is issued in a timely fashion.

(6) The master's thesis must be completed within the test-taking period of 6 months. The topic of the thesis must be such that it can be written within this period. An extension of the thesis-writing time up to a maximum of 20% (e.g. due to unforeseen problems in obtaining literature or data) is possible upon justified petition by the candidate; this does not lead to the award of additional credits. The thesis-writing time begins upon issuances of the topic; the issue date must be recorded. The topic should be issued in a timely manner such that, even if an extension of the thesis-writing time is granted, there is no extension of the program duration.

(7) The master's thesis must be submitted in a timely fashion to the examination committee or to an office designated by it in 3 printed copies as well as in digital form in accordance with the specifications of the examination committee. The time of submission must be recorded in the records. When submitting the thesis, the candidate must give written assurance that he or she wrote the thesis independently and did not use any sources or aids other than those indicated. If the master's thesis is not submitted on time, it will be graded as "insufficient" (0 points) in accordance with §28(2) of the General Regulations.

(8) The master's thesis has not been passed if the overall grade does not receive at least 5 points (grade of "sufficient") in accordance with §28(2) of the General Regulations; it may be repeated once. The oral defense as part of the final module can also be repeated once. The examination committee will ensure that the candidate receives a new topic within six weeks of notification of the failure. A return of the topic within the period specified in §23(7)(1) of the General Regulations is permitted only if the candidate did not make use of this option when writing the master's thesis for the first time. A second repetition of the master's thesis is excluded.

(9) Grade compensation for a failed master's thesis is not permitted. Grade compensation for a failed oral defense within the scope of the final module is also excluded.

(10) Otherwise, the provisions of §23 of the General Regulations apply.

§24 Examination dates, examination registration and examination deregistration

(1) The examination committee will announce the periods of examinations and repeat examinations. Dates for written examinations (*Klausuren)* and other examination dates that are equally valid for all participants of a module are announced in the course catalog. Examination dates to be agreed upon individually (such as presentations) will be listed in the course catalog with the note "n. V." (by arrangement).

(2) Examinations will be administered within the framework of the respective module courses or immediately thereafter. If examinations are administered after module courses, they should generally be offered in a two- to three-week examination period at the end of the lecture period or at the beginning or end of the subsequent lecture-free period. As a rule, examinations should be administered on the same day of the week and at the same time as the corresponding module course. The examiner should also provide for the preparation of examinations, such as term papers (*Hausarbeiten*), during the lecture-free period.

(3) For the repetition of examinations, the first repetition date will be set in such a way that, in the case of successful participation, continued study in the following semester is guaranteed.

(4) Binding registration is required for participation in an examination. The examination committee will announce the deadlines and the form of registration in an appropriate manner no later than 4 weeks before the start of the registration period. Permission to take the examination will be denied if the registration deadline is not met or if examination permission requirements are not met.

(5) When registering for examinations, students can autonomously choose between the first date and the repeat date. When choosing the date for the repeat examination, no further repeat examination will be offered in the same semester in case of failure. In this case, if subsequent modules build on each other (consecutive modules) and require the failed module, continuous study in deviation from §24(3) cannot be guaranteed the following semester.

(6) A binding examination registration may be withdrawn without stating reasons provided that this is done before the deadline set for this by the examination committee. These deadlines as well as the format for the withdrawal will be announced together with the corresponding regulations for registration.

(7) Upon application with justification to the examination committee, alternative dates will be set for examinations that cannot be taken due to limitations on work for religious reasons. Proof of membership in the appropriate religious community must be submitted with the application. The application must be submitted no later than four weeks before the examination date.

§25 Time requirements to earn credits

The rules under §25 of the General Regulations apply.

§26 Family support, accommodations for hardships and informal part-time study

(1) In courses and examinations, consideration must be given to the stress caused by pregnancy and raising children, by caring for relatives in need, and by a student’s disability or chronic illness. The type and severity of the hardship must be proved by the student in a timely fashion to the person responsible for the course or to the office of the examination committee (Examination Office) with suitable documentation. In cases of doubt, the examination committee will decide upon written petition. In cases of illness, the examination committee may require a medical certificate from a public health officer. It must be made possible for students to utilize statutory maternity protection periods and parental leave.

(2) If a student can credibly demonstrate that he or she is unable to take the examination in whole or in part in the scheduled form due to a disability, a chronic illness, the care of dependents in need, pregnancy, or the raising of children, the examination committee will provide accommodations for these by taking appropriate measures, such as an extension of the test-taking time or a different arrangement of the examination procedure.

(3) In accordance with the applicable legal regulations, the degree program may, upon petition, be conducted in whole or in part as an informal part-time program. In the case of an approved informal part-time study, there is no entitlement to the provision of special teaching and study opportunities. In all cases, academic advising is strongly recommended before initiating informal part-time study.

§27 Absence, withdrawal, fraud, violation of regulations

(1) Coursework will be deemed failed, or an examination will be graded as “insufficient” (0 points) in accordance with §28(2) of the General Regulations if the candidate misses an examination date that is binding on him or her without good reason or if he or she withdraws without good reason from a course or examination which he or she has already started. The same applies if a course or examination is not completed within the specified completion time.

(2) Notice of the cause asserted for the failure or withdrawal must be given in writing without delay and must be credible. In the case of illness, a medical certificate must be submitted. The examination results already available will be recognized in this case.

(3) If a candidate attempts to influence the result of a course or examination by deception or the use of unauthorized aids, the course or examination in question will be deemed failed (0 points) in accordance with §28(2) of the General Regulations. A candidate who disrupts the proper performance of a type of coursework or an examination may be excluded from continuing the performance of the type of coursework or examination by the respective examiner or supervisor; in this case, the respective coursework will also be deemed failed, or the examination will be graded as “insufficient” (0 points) in accordance with §28(2) of the General Regulations. In serious cases, the examination committee can exclude the candidate from taking further examinations such that the examination entitlement in the degree program expires.

(4) Decisions in accordance with paragraphs 1 to 3 must be communicated to the candidate in writing without delay, they must be substantiated, and they must be accompanied by instructions on how to appeal.

§28 Grading and grade composition

(1) The modules Selected Advanced Topics in Mathematics A (“Seminar”), Selected Advanced Topics in Mathematics B (“Seminar”), Advanced Mathematical Software Project, Industrial Internship and Independent Scientific Practice Mathematics are not evaluated with points, in deviation from §28(2) General Regulations. Additional ungraded modules can be imported.

(2) The overall grade for the master’s examination in points in accordance with Column (a) in the table in §28(6) of the General Regulations is calculated from the mean value of the module evaluations weighted by credits (LP). Modules not graded with points (ungraded) are not taken into account.

(3) Otherwise, the provisions of §28 of General Regulations apply.

§29 Nonbinding examination option

There is no provision for a nonbinding examination option.

§30 Repeating examinations

(1) Passed examinations cannot be repeated.

(2) Failed examinations may be retaken three times.

(3) The one-time change of up to two definitively failed compulsory elective modules is permitted.

(4) §23(12) (1 & 2) General Regulations (Master's Thesis and Oral defense) and §21(3) (4) General Regulations (Compensated Partial Module Examinations) remain unaffected

§31 Loss of the right to take the examination and final failure

(1) The right to take examinations in the degree program for which the student is enrolled is definitively lost in particular if

1. An examination has not been passed after exhausting all attempts to repeat it unless it is an examination in a module pursuant to §30(3);
2. There has been a serious case of fraud pursuant to §27(3)(3).

(2) A notice of final failure and the associated loss of the right to retake the examination will be issued, which will be accompanied with instructions on how to appeal.

§32 Invalidity of examination results

The rules under §32 of the General Regulations apply.

§33 Certificate

The rules under §33 of the General Regulations apply.

§34 Diploma

The rules under §34 of the General Regulations apply.

§35 Diploma supplement

The rules under §35 of the General Regulations apply.

§ 36 Transcript of records and complete grade record

The rules under §36 of the General Regulations apply.

IV. Final provisions

§37 Inspection of examination documents

The rules under §37 of the General Regulations apply.

§38 Effective date and transitional provisions

(1) These regulations come into force on the day after their publication in the Official Bulletin of Philipps-Universität Marburg. At the same time, the examination regulations

will expire for the degree program in “Mathematics” with the degree of Master of Science (M.Sc.) of 28 October 2015 (published in the Official Bulletin of Philipps-Universität Marburg No. 6/2016) including the version of the first amendment dated 1 June 2016 (published in the Official Bulletin of Philipps-Universität Marburg No. 56/2016) and the version of the second amendment dated 25 October 2017 (published in the Official Bulletin of Philipps-Universität Marburg No. 80/2017).

(2) These Degree Program and Examination Regulations will apply to all students who start their studies as of winter semester 2023/2024.

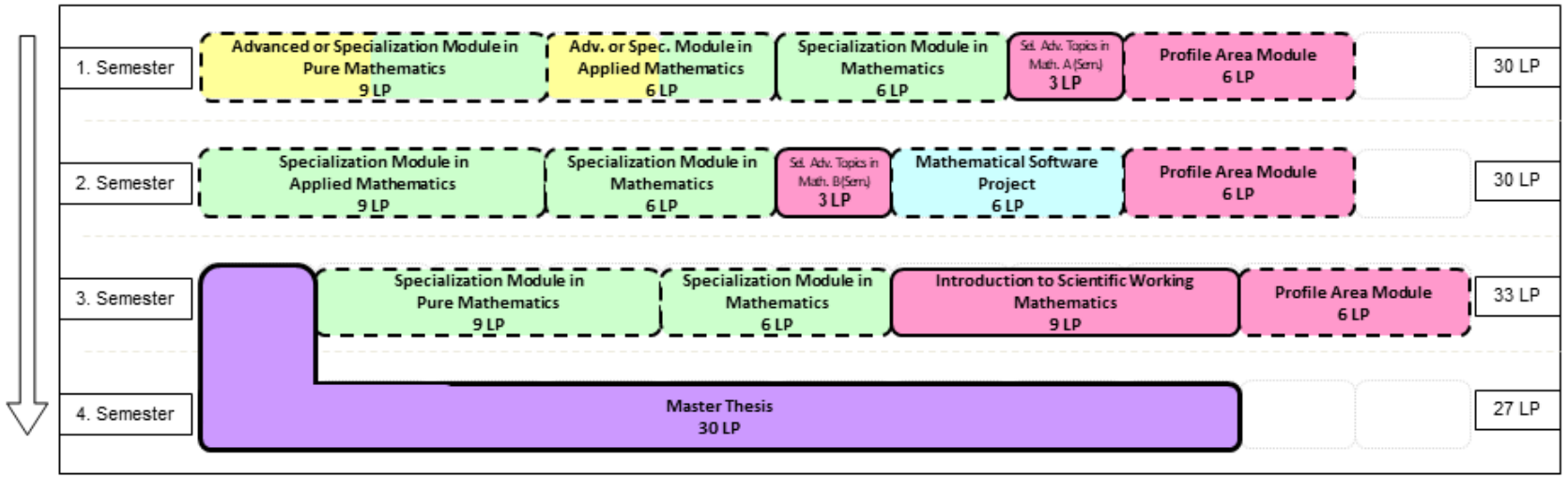
(3) Students who began their studies before these Degree Program and Examination Regulations came into force may take the master’s examination in accordance with the examination regulations of 28 October 2015, including their amended versions of 1 June 2016 and 25 October 2017, until summer semester of 2027 at the latest. The examination committee may issue rules for this transition period that favor a voluntary switch to these Degree Program and Examination Regulations. The switch to these Degree Program and Examination Regulations must be applied for in writing and is irrevocable.

Marburg, 18 April 2023
signed
Prof. Dr. Bernd Freisleben
Dean of the Department of
Mathematics and Computer Science
at Philipps-Universität Marburg

Appendix 1: Example degree program curriculum

***Mathematics (M.Sc.)*[1]**

Studienbeginn in einem Wintersemester oder einem Sommersemester



Anmerkungen

[1] Dargestellt wird hier der kürzest mögliche Studienverlauf mit exemplarischen Inhalten. Entsprechend verändert sich dieser nach Zeitpunkt der Aufnahme des Studiums oder einer zeitlichen Streckung. Zudem stellen gestrichelt skizzierte Wahlpflichtmodule nur eine beispielhafte Auswahl dar, zu der Alternativen möglich sind.

Anlage 1: Exemplarischer Studienverlaufsplan	Appendix 1: Example degree program curriculum
Mathematics (M.Sc.)[1]	**Mathematics (M.Sc.)**1
Studienbeginn in einem Wintersemester oder einem Sommersemester	Start of program in winter or summer semester
1. Semester	1. Semester
Advanced or Specialization Module in Pure Mathematics 9 LP	**Advanced or Specialization Module in Pure Mathematics 9 LP**
Adv. or Spec. Module in Applied Mathematics 6 LP	**Adv. or Spec. Module in Applied Mathematics 6 LP**
Specialization Module in Mathematics 6 LP	**Specialization Module in Mathematics 6 LP**
Sel. Adv. Topics in Math A (Sem.) 3 LP	**Sel. Adv. Topics in Math A (Sem.) 3 LP**
Profile Area Module 6 LP	**Profile Area Module 6 LP**
30 LP	30 LP
2. Semester	2. Semester
Specialization Module in Applied Mathematics 9 LP	**Specialization Module in Applied Mathematics 9 LP**
Specialization Module in Mathematics 6 LP	**Specialization Module in Mathematics 6 LP**
Sel. Adv. Topics in Math B (Sem.) 3 LP	**Sel. Adv. Topics in Math B (Sem.) 3 LP**
Mathematical Software Project 6 LP	**Mathematical Software Project 6 LP**
Profile Area Module 6 LP	**Profile Area Module 6 LP**
30LP	30 LP
3. Semester	3. Semester
Specialization Module in Pure Mathematics 9 LP	**Specialization Module in Pure Mathematics 9 LP**
Specialization Module in Mathematics 6 LP	**Specialization Module in Mathematics 6 LP**
Introduction to Scientific Working Mathematics 9 LP	**Introduction to Scientific Working Mathematics 9 LP**
Profile Area Module 6 LP	**Profile Area Module 6 LP**
33 LP	33 LP

4. Semester	4. Semester
Master Thesis 30 LP	**Master's Thesis 30 LP**
27 LP	27 LP
Anmerkungen	**Footnotes**
[1] Dargestellt wird hier der kürzest mögliche Studienverlauf mit exemplarischen Inhalten. Entsprechend verändert sich dieser nach Zeitpunkt der Aufnahme des Studiums oder einer zeitlichen Streckung. Zudem stellen gestrichelt skizzierte Wahlpflichtmodule nur eine beispielhafte Auswahl dar, zu der Alternativen möglich sind.	[1] The shortest possible degree program curriculum with content examples is presented here. Accordingly, this changes after the date that the program is started or an extension. In addition, elective modules outlined in dashed lines represent only an example selection for which alternatives are possible.
Legende	**Legend**
Pflichtmodule	Compulsory module
Wahlpflicht	Compulsory Elective
Basis	Basic
Aufbau	Advanced
Vertiefung	Specialization
Praxis	Practice
Profil	Profile
Abschluss	Degree

Appendix 2: List of modules

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
Compulsory Elective Modules in Mathematics						
Algebraic Geometry: Advanced Methods *Algebraische Geometrie: Weiterführende Methoden*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - record the basic properties of affine algebraic and projective varieties, - understand the interplay of abstract methods and results of commutative algebra and geometric intuition, - have deepened mathematical ways of working (development of mathematical intuition and its formal justification, abstraction, proof), - have improved their oral communication skills in exercise sections through discussion and speaking in front of an audience.	None. The competencies taught in the basic mathematical modules and the modules Algebra and Commutative Algebra are recommended. Previous knowledge of differential geometry, number theory or topology is helpful.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Algebraic Geometry: Modern Methods *Algebraische Geometrie: Moderne Methoden*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - record the basic properties of affine algebraic and projective varieties, - understand the interplay of abstract methods and results of commutative algebra and geometric intuition. - have deepened mathematical ways of working (development of mathematical intuition and its formal justification, abstraction, proof), - have improved their oral communication skills in exercise sections through discussion and speaking in front of an audience.	None. Recommended competencies are those taught in the basic mathematical modules and the modules Algebra and Commutative Algebra or Algebraic Geometry: Introduction. Previous knowledge of differential geometry, number theory or topology is helpful.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Algebraic Geometry: Projective Varieties *Algebraische Geometrie: Projektive Varietäten*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - have mastered the application of algebraic methods for the description of geometric objects (algebraic varieties), - understand the translation process of geometry-algebra-geometry and can apply it to posed problems, - have experienced how geometric questions can be solved by the use of abstract algebraic techniques, - were introduced to current developments and results by learning modern methods of algebraic geometry,	None. The competencies taught in the basic mathematical modules as well as in the Elementary Algebraic Geometry module or in the Algebra module are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
				- have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.		
Algebraic Lie Theory *Algebraische Lie-Theorie*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - have gained an insight into a current research field, - are familiar with basic structures and techniques of Algebraic Lie Theory, - understand abstract algebraic structures as symmetries, - have practiced mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in tutorial sections by practicing speaking in front of an audience and in discussion.	None. The competencies taught in the basic mathematical modules and in the advanced algebra module are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Algebraic Topology I *Algebraische Topologie I*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - know basic topological constructions, - can use algebraic invariants to solve topological questions, - can recognize and use functional relationships, - have deepened mathematical ways of working (development of mathematical intuition and its formal justification, abstraction, proof), - have improved their oral communication skills in exercise sections through discussion and speaking in front of an audience.	None. Recommended the skills taught in the basic mathematical modules and the advanced module algebra as well as an introductory course on topology.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Algebraic Topology II (Large Specialization Module) *Algebraische Topologie II (großes Vertiefungsmodul)*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - are familiar with common and advanced topological constructions, - have mastered the interplay between algebra and topology, understand relationships between different subdomains of algebraic topology (e.g. homology, cohomology, homotopy) and also adjoining areas, - can recognize and use functional relationships, - have deepened mathematical ways of working (development of mathematical intuition and its formal justification, abstraction, proof), - have improved their oral communication skills in exercise sections through discussion and speaking in front of an audience.	None. The competencies taught in the basic modules in mathematics and in the module in Algebraic Topology I are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Algebraic Topology II (Small Specialization Module)	6	Compulsory elective module	Advanced module	Students: - are familiar with common and advanced topological constructions,	None.	Credit requirement(s):

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
Algebraische Topologie II (kleines Vertiefungsmodul)			to pure mathematics	- can use algebraic invariants to solve topological questions, and understand relationships between these, - can recognize and use functional relationships, - have deepened mathematical ways of working (development of mathematical intuition and its formal justification, abstraction, proof), - have improved their oral communication skills in exercise sections through discussion and speaking in front of an audience.	The competencies taught in the basic modules in mathematics and in the module in Algebraic Topology I are recommended.	Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Algebras and their representations *Algebren und Darstellungen*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - understand the beginnings of the theory of non-commutative algebras and their representations, - can transfer their skills in dealing with matrices into a more abstract context, - understand matrices as a special case of abstract algebraic structures, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in lecture and tutorial sections by practicing speaking in front of an audience and in discussion.	None. Knowledge from the algebra module is recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Analytic Number Theory *Analytische Zahlentheorie*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - can apply methods of analysis to number-theoretical questions and further develop them, - have trained their analytical thinking and working methods, - have learned modern techniques for scientific work in this field, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic modules as well as in the advanced modules Function Theory and Vector Analysis and Number Theory are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Applied Harmonic Analysis II *Angewandte harmonische Analysis II*	6	Compulsory elective module	Advanced module to applied mathematics	Students: - have learned advanced starting points of the applied harmonic analysis and especially of the wavelet analysis from specific examples, - have studied various advanced designs and have deepened the analytical tools used, - recognize the theoretical background and the concrete application of analytical methods, - have followed recent developments in a current subfield of mathematics,	None. The competencies taught in the Applied Harmonic Analysis I module are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
				- have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.		
Approximation Theory *Approximationstheorie*	9	Compulsory elective module	Advanced module to applied mathematics	Students: - recognize and correctly assess the relevance of approximation theory for practical problems, for example from numerics, and possess the approximation-theoretical tools to solve these problems, - understand how linear algebra, analysis and numerical methods work together, - re-evaluate knowledge from the basic modules and some advanced modules, - recognize the relationships of approximation theory to other fields of mathematics and other sciences, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic modules in mathematics are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Commutative Algebra (Large Specialization Module) *Kommutative Algebra (Großes Vertiefungsmodul)*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - record the basic properties of commutative rings, - may use algebraic or homological methods for the analysis of commutative rings, - understand construction methods of commutative rings and can apply them, - have deepened mathematical ways of working (development of mathematical intuition and its formal justification, abstraction, proof), - have improved their oral communication skills in exercise sections through discussion and speaking in front of an audience.	None. The competencies taught in the basic mathematical modules and the algebra module are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Commutative Algebra (Small Specialization Module) *Kommutative Algebra (Kleines Vertiefungsmodul)*	6	Compulsory elective module	Advanced module to pure mathematics	Students: - can analyze specialized structures of commutative rings, - may use methods for the analysis of specific homological and algebraic invariants, - can apply concepts of commutative algebra in other areas (e.g. combinatorics, algebraic geometry), - have deepened mathematical ways of working (development of mathematical intuition and its formal justification, abstraction, proof),	None. The competencies taught in the basic modules in mathematics and in the advanced modules (depending on the	Credit requirement(s): Earn at least 50 percent of the points from the weekly exercise assignments or presentation with written analysis. Testing:

Name of module *German translation*	LP	Degree of obligation	Level	Qualification goals	Prerequisites	Prerequisites to earn credits (LP)
				- have improved their oral communication skills in exercise sections through discussion and speaking in front of an audience.	topic) are recommended.	In-class written examination (*Klausur*) or oral examination (individual examination)
Complex Geometry I *Komplexe Geometrie I*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - record the basic properties of complex manifolds, - understand the interplay of local results of complex analysis and global properties of complex manifolds, - have deepened mathematical ways of working (development of mathematical intuition and its formal justification, abstraction, proof), - have improved their oral communication skills in exercise sections through discussion and speaking in front of an audience.	None. The competencies taught in the basic mathematical modules as well as in the advanced module Function Theory and Vector Analysis are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Complex Geometry II *Komplexe Geometrie II*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - detect deeper properties of complex manifolds, - may use cohomological methods to solve geometric problems. - have deepened mathematical ways of working (development of mathematical intuition and its formal justification, abstraction, proof), - have improved their oral communication skills in exercise sections through discussion and speaking in front of an audience.	None. The competencies taught in the basic mathematical modules and in the module Complex Geometry I are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: Oral examination (individual examination)
Differential Geometry I *Differentialgeometrie I*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - have an understanding of curved spaces and have sharpened their mathematical intuition in a geometrical context, - can record and describe mathematical properties without any coordinates, - can connect geometric extreme properties (for example, in the case of curvature or curve length) with physical principles of variation, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic mathematical modules as well as in the advanced module Function Theory and Vector Analysis are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Differential Geometry II *Differentialgeometrie II*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - have deepened their geometrical knowledge, - know physical applications of differential geometry,	None. The competencies taught in the basic	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments.

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
				- have learned modern techniques for scientific work in this field, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, ability to abstract, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	mathematical modules and in the advanced modules Algebra as well as Function Theory and Vector Analysis, as well as basic knowledge of Differential Geometry, are recommended.	Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Fourier Integral Operators *Fourier-Integraloperatoren*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - know the theory of the Fourier integral operators as a central field of analysis and can use it, - have been introduced to questions of current research, - can apply knowledge from functional analysis, Fourier and distribution theory to the modern theory of partial differential equations, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic and advanced modules Analysis, as well as in the specialization modules Functional Analysis and Partial Differential Equations are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Functional Analysis *Funktionalanalysis*	9	Compulsory elective module	Advanced module	Students: - are familiar with typical problems of infinite dimensional theory and its applications, - understand the close dovetailing of pure and applied mathematics using examples such as minimization problems, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic mathematical modules Analysis and Linear Algebra as well as in the module Measure and Integration Theory are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Galois Theory *Galoistheorie*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - are familiar with Galois theory and its applications and can in particular assess its historical significance, - understand how elementary questions about geometric constructions and the solving of equations can be solved by the use of abstract algebraic methods, - are trained in the use of algebraic methods using many specific examples, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof),	None. The competencies taught in the basic modules in mathematics and in the advanced modules (depending on the topic) are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
				- have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.		
General Relativity *Allgemeine Relativitätstheorie*	3	Compulsory elective module	Advanced module to pure mathematics	Students: - possess basic knowledge and skills in an interdisciplinary subject between pure mathematics and theoretical physics, - have practiced advanced working methods. The lecture provides a complex example of mathematical modeling of physical theories, including the theoretical derivation of experimentally verifiable predictions. - were introduced to scientific work through contact with selected original literature.	None. The competencies taught in the modules Function Theory and Vector Analysis are recommended.	Credit requirement(s): Earn at least 50 percent of the points from the weekly exercise assignments and presentation. Testing: Written analysis (*schriftliche Ausarbeitung*)
Holomorphic Functions and Abelian Varieties *Holomorphe Funktionen und Abelsche Varietäten*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - are familiar with classical results of the advanced function theory of a variable, - can handle holomorphic functions in several variables required in complex and algebraic geometry, - know Abelian varieties as an important class of complex manifolds, - understand the study of the divisors on these manifolds as an essential tool for understanding geometry and possible projective embeddings, - have been introduced to current research questions, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic mathematical modules as well as in the function theory module are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Hopf Algebras *Hopf-Algebren*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - know elements of the theory of Hopf algebras, - look at known abstract mathematical structures from a new perspective, - can analyze unknown abstract structures with unfamiliar methods, - are trained in the use of tensors, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in lecture and tutorial sections by practicing speaking in front of an audience and in discussion.	None. Knowledge from the algebra module is recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
Hopf Algebras II *Hopf-Algebren II*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - know advanced methods in the theory of Hopf algebras, - can examine abstract mathematical structures using abstract examples and abstract tools, - have deepened the handling of tensors, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in lecture and tutorial sections by practicing speaking in front of an audience and in discussion.	None. Knowledge from the module Hopf Algebras is recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Large Specialization Module Algebra/Geometry *Großes Vertiefungsmodul Algebra/Geometrie*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - have gained insights into current research results in algebra or geometry, - have practiced how to use research literature, - understand the genesis of new mathematical results, - have deepened their mathematical knowledge in a specific area of algebra or geometry, - can independently access current scientific articles from national and international journals, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic mathematical modules are recommended as well as subject-specific knowledge from advanced modules.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Large Specialization Module Analysis/Topology *Großes Vertiefungsmodul Analysis/Topologie*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - have gained insights into current research results in analysis or topology, - have practiced how to use research literature, - understand the genesis of new mathematical results, - have deepened their mathematical knowledge in a specific area of analysis or topology, - can independently access current scientific articles from national and international journals, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic mathematical modules are recommended as well as subject-specific knowledge from advanced modules.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Large Specialization Module Numerical Mathematics/Optimization	9	Compulsory elective module	Advanced module	Students: - have gained insights into current research results of numerical analysis or optimization,	None.	Credit requirement(s):

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
Großes Vertiefungsmodul Numerik/Optimierung			to applied mathematics	- have practiced how to use research literature, - understand the genesis of new mathematical results, - have deepened their mathematical knowledge in a special area of numerical mathematics or optimization, - can independently access current scientific articles from national and international journals, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	The competencies taught in the basic modules in mathematics and in the advanced modules (depending on the topic) are recommended.	Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Noncommutative Algebra *Nichtkommutative Algebra*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - have gained an insight into a current research field, - understand the basic structures and techniques of non-commutative algebra, - have been confronted with unfamiliar abstract mathematical concepts, which they have gradually been able to better understand and apply using examples and theorems, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in tutorial sections by practicing speaking in front of an audience and in discussion.	None. The competencies taught in the basic modules in mathematics and in the advanced modules (depending on the topic) are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Numerical Analysis II *Numerische Analysis II*	6	Compulsory elective module	Advanced module to applied mathematics	Students: - understand how methods from functional analysis, numerics and approximation theory interact, - recognize limitations of previous methods, - recognize the relevance of regularity theory for practical problems, especially for the numerical treatment of partial differential equations, - re-evaluate their knowledge of basic and advanced modules, - understand a posteriori error theory and combination with adaptive methods, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic mathematical modules and in the module Numerics (Basic Numerical Methods) are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Numerical Methods for Ordinary Differential Equations	6	Compulsory elective module	Advanced module	Students: - can assess numerical methods in terms of applicability and expediency,	None.	Credit requirement(s):

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
Numerik für gewöhnliche Differentialgleichungen			to applied mathematics	- have gained insight into the discretization of differential equations, including methods for estimating and controlling inevitable approximation errors, - are familiar with the classification of various problem forms in differential equations and an appropriate selection of methods, - are able to recognize how strongly theoretical analysis defines the framework conditions for numerical methods; in particular, the importance of functional analytic concepts for numerical questions is clear to them, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	The competencies taught in the advanced module Numerics (Basic Numerical Methods) are recommended.	Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Numerical Solution Methods for Differential Equations *Numerik von Differentialgleichungen*	9	Compulsory elective module	Advanced module to applied mathematics	Students: - can assess numerical methods in terms of applicability and expediency, - have gained insight into the discretization of differential equations, including methods for estimating and controlling inevitable approximation errors, - are familiar with the classification of various problem forms in differential equations and an appropriate selection of methods, - recognize how much theoretical analysis defines the framework conditions for numerical methods and understand the importance of functional analytic concepts for numerical questions, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic mathematical modules and in the advanced module Basic Numerical Methods are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Numerical Solution Methods for Finite Dimensional Problems *Numerik endlichdimensionaler Probleme*	9	Compulsory elective module	Advanced module to applied mathematics	Students: - are able to classify practical problems in terms of operational procedures and the associated effort, - understand different methods, their different applications and their differences in efficiency and universality, - recognize how to build and analyze solution methods from different basic procedures for complex tasks,	None. The competencies taught in the basic mathematical modules and in the advanced module Basic Numerical Methods are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral

Name of module *German translation*	LP	Degree of obligation	Level	Qualification goals	Prerequisites	Prerequisites to earn credits (LP)
				- understand the core topic of iterative methods for large systems of equations, the development of efficient methods by combining building blocks of different characteristics, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.		examination (individual examination)
Partial Differential Equations *Partielle Differentialgleichungen*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - understand differential equations as a means of mathematical modeling and can use them, - can apply knowledge from functional analysis to the systematic theory of partial differential equations, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic mathematical modules Analysis and Linear Algebra as well as basic knowledge of functional analysis and Lebesgue integration are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Selected Topics in Numerical Analysis *Ausgewählte Themen der Numerischen Analysis*	6	Compulsory elective module	Advanced module to applied mathematics	Students: - have been introduced to current research results of numerical analysis, - have learned how to use research literature, - have gained insight into the emergence of new mathematical results, - have deepened their mathematical knowledge in a specific field of numerical analysis, - can independently access current scientific articles from national and international journals, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic modules in mathematics and in the advanced modules (depending on the topic) are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Small Specialization Module Algebra/Geometry *Kleines Vertiefungsmodul Algebra/Geometrie*	6	Compulsory elective module	Advanced module to pure mathematics	Students: - have gained insights into current research results in algebra or geometry, - have practiced how to use research literature, - understand the genesis of new mathematical results, - have deepened their mathematical knowledge in a specific area of algebra or geometry,	None. The competencies taught in the basic mathematical modules are recommended as well as subject-specific	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
				- can independently access current scientific articles from national and international journals, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	knowledge from advanced modules.	examination (individual examination)
Small Specialization Module Analysis/Topology *Kleines Vertiefungsmodul Analysis/Topologie*	6	Compulsory elective module	Advanced module to pure mathematics	Students: - have gained insights into current research results in analysis or topology, - have practiced how to use research literature, - understand the genesis of new mathematical results, - have deepened their mathematical knowledge in a specific area of analysis or topology, - can independently access current scientific articles from national and international journals, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic mathematical modules are recommended as well as subject-specific knowledge from advanced modules.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Small Specialization Module Numerical Mathematics/Optimization *Kleines Vertiefungsmodul Numerik/Optimierung*	6	Compulsory elective module	Advanced module to applied mathematics	Students: - have gained insights into current research results, - have learned how to use research literature, - understand the genesis of new mathematical results, - have deepened their mathematical knowledge in a special area of numerical mathematics or optimization, - can independently access current scientific articles from national and international journals, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.	None. The competencies taught in the basic modules in mathematics and in the advanced modules (depending on the topic) are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing: In-class written examination (*Klausur*) or oral examination (individual examination)
Spectral and Scattering Theory *Spektral- und Streutheorie*	9	Compulsory elective module	Advanced module to pure mathematics	Students: - correctly recognize and assess the relevance of spectral analytical methods for specific problems, for example from the theory of partial differential equations, and possess the appropriate tools for solving these problems, - understand how algebra, analysis, geometry and topology methods work together,	None. The competencies taught in the basic modules in mathematics are recommended.	Credit requirement(s): Earn at least 50% of the points from the weekly practice assignments. Testing:

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
				- re-evaluate their knowledge of the basic modules and some advanced modules (e.g. function theory and vector analysis as well as functional analysis), - recognize the relationships of spectral theory to other fields of mathematics and other sciences, - have deepened mathematical ways of working (developing mathematical intuition and its formal justification, abstraction, proof), - have practiced oral communication skills in exercise sections by practicing free speech in front of an audience and in discussion.		In-class written examination (*Klausur*) or oral examination (individual examination)
Practical and Seminar Modules						
Advanced Mathematical Software Project *Fortgeschrittenes Mathematisches Praktikum*	6	Compulsory elective module	Practice module	Students: - can implement mathematical algorithms in small working groups under guidance, but largely independently, - can model mathematical objects in suitable data structures, - can acquire the necessary, more detailed knowledge of the procedures used and the development environment. - possess in-depth competencies in the implementation of mathematical procedures in software, the organization of a software project and teamwork.	None. The competencies taught in the basic modules, in the module object-oriented programming or declarative programming as well as in the relevant advanced module or specialization module are recommended.	Credit requirement(s): Creating a piece of software Testing: Presentation ***Ungraded module***
Independent Scientific Practice Mathematics *Selbstständiges wissenschaftliches Arbeiten Mathematik*	9	Compulsory module	Profile module	Students: - are able to independently review and expand the level of knowledge in a scientific field of mathematics on the basis of literature recommendations and to familiarize themselves with the state of the art in research, - have knowledge of subject-specific methods of searching literature, - have mastered the typesetting systems used for the preparation of mathematical works, - are familiar with software systems that support scientific work in the field of the master's thesis.	None. The competencies taught in the basic mathematical modules as well as in the advanced modules and specialization modules are recommended.	Testing: Oral examination (individual examination) ***Ungraded module***
Industrial Internship *Industriepraktikum*	6	Compulsory elective module	Practice module	Students: - can apply typical course content to solve problems encountered in business or technical practice, - have improved their teamwork skills through the necessary integration into external work groups of a company, - have practiced to prove themselves in an environment outside the university,	None.	Testing: Internship Report ***Ungraded module***

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
				- have developed initiative in searching for internship positions and researching the companies or institutions offering them, as well as in selecting a supervising university professor.		
Selected Advanced Topics in Mathematics A ("Seminar") *Ausgewählte fortgeschrittene Themen der Mathematik A („Seminar")*	3	Compulsory module	Profile module	Students: - can develop a special mathematical topic independently, - have deepened their capacity for independent scientific work, - can analyze and break down more complicated mathematical relationships and supplement them with explanatory content, - have further qualified themselves in dealing with scientific literature and their search, - can give a structured mathematical presentation tailored to the competences of the audience, - have deepened their ability to use presentation media, - have expanded their ability to have structured discussions about mathematical contents in groups, - have learned how to use mathematical text typesetting programs during seminar preparation.	None.	Two subtests: Seminar presentation Written analysis (*schriftliche Ausarbeitung*) ***Ungraded module***
Selected Advanced Topics in Mathematics B ("Seminar") *Ausgewählte fortgeschrittene Themen der Mathematik B („Seminar")*	3	Compulsory module	Profile module	Students: - can develop another mathematical special topic independently, - can develop and expand corresponding competencies already acquired within the scope of the Selected Advanced Topics modules in Mathematics A. - have perfected their ability for independent scientific work, - can analyze and break down more complicated mathematical relationships and supplement them with explanatory content, - can safely deal with scientific literature and are well versed in their search, - can give a structured presentation tailored to the competences of the audience, - know well how to work with presentation media, - have perfected their ability for structured discussion of mathematical contents in groups, - have learned how to use mathematical text typesetting programs during seminar preparation.	None.	Two subtests: Seminar presentation Written analysis (*schriftliche Ausarbeitung*) ***Ungraded module***
Final Module						
Master's Thesis *Masterarbeit*	30	Compulsory module	Final module	Students are able to work on an extensive task from the field of mathematics using scientific methods under guidance as well as to present a paper and the results contained therein appropriately in writing and orally.	A minimum of 66 credits (LP) must have been earned.	Two subtests: Master's thesis (weight: 27 credits) and oral defense (weight: 3 credits)

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
Conditional Modules (*Auflagenmodule*) Note: These credits (LP) serve to fulfill conditional requirements only and do not count toward the 120 credits to be earned for the degree.						
Conditional Module 1 (small) *Kleines Auflagenmodul 1*	6	--- (*Auflagen-modul*)	--- (*Auflagen-modul*)	Within the framework of their bachelor's degree, students have already gained the ability to independently acquire knowledge and skills. As a part of this module, students should fill skills gaps that exist in a subject area that has been specified in more detail within the scope of a condition under §4(4) of these Degree Program and Examination Regulations. They will develop the skills by reading specialized literature and/or participating in (online) courses.	The prerequisite for this module is that it be specified as a requirement for admission to the program as part of a condition under §4(4).	Testing: Oral examination (individual examination) or in-class written examination (*Klausur*)
Conditional Module 2 (small) *Kleines Auflagenmodul 2*	6	--- (*Auflagen-modul*)	--- (*Auflagen-modul*)	Within the framework of their bachelor's degree, students have already gained the ability to independently acquire knowledge and skills. As a part of this module, students should fill skills gaps that exist in a subject area that has been specified in more detail within the scope of a condition under §4(4) of these Degree Program and Examination Regulations. They will develop the skills by reading specialized literature and/or participating in (online) courses.	The prerequisite for this module is that it be specified as a requirement for admission to the program as part of a condition under §4(4).	Testing: Oral examination (individual examination) or in-class written examination (*Klausur*)
Conditional Module 3 (small) *Kleines Auflagenmodul 3*	6	--- (*Auflagen-modul*)	--- (*Auflagen-modul*)	Within the framework of their bachelor's degree, students have already gained the ability to independently acquire knowledge and skills. As a part of this module, students should fill skills gaps that exist in a subject area that has been specified in more detail within the scope of a condition under §4(4) of these Degree Program and Examination Regulations. They will develop the skills by reading specialized literature and/or participating in (online) courses.	The prerequisite for this module is that it be specified as a requirement for admission to the program as part of a condition under §4(4).	Testing: Oral examination (individual examination) or in-class written examination (*Klausur*)
Conditional Module 4 (small) *Kleines Auflagenmodul 4*	6	--- (*Auflagen-modul*)	--- (*Auflagen-modul*)	Within the framework of their bachelor's degree, students have already gained the ability to independently acquire knowledge and skills. As a part of this module, students should fill skills gaps that exist in a subject area that has been specified in more detail within the scope of a condition under §4(4) of these Degree Program and Examination Regulations. They will develop the skills by reading specialized literature and/or participating in (online) courses.	The prerequisite for this module is that it be specified as a requirement for admission to the program as part of a condition under §4(4).	Testing: Oral examination (individual examination) or in-class written examination (*Klausur*)
Conditional Module 5 (small) *Kleines Auflagenmodul 5*	6	--- (*Auflagen-modul*)	--- (*Auflagen-modul*)	Within the framework of their bachelor's degree, students have already gained the ability to independently acquire knowledge and skills. As a part of this module, students should fill skills gaps that exist in a subject area that has been specified in more detail within the scope of a condition under §4(4) of these Degree Program and Examination Regulations. They will develop the skills by reading specialized literature and/or participating in (online) courses.	The prerequisite for this module is that it be specified as a requirement for admission to the program as part of a condition under §4(4).	Testing: Oral examination (individual examination) or in-class written examination (*Klausur*)

Name of module *German translation*	**LP**	**Degree of obligation**	**Level**	**Qualification goals**	**Prerequisites**	**Prerequisites to earn credits (LP)**
Conditional Module 1 (large) *Großes Auflagenmodul 1*	9	--- (*Auflagen-modul*)	--- (*Auflagen-modul*)	Within the framework of their bachelor's degree, students have already gained the ability to independently acquire knowledge and skills. As a part of this module, students should fill skills gaps that exist in a subject area that has been specified in more detail within the scope of a condition under §4(4) of these Degree Program and Examination Regulations. They will develop the skills by reading specialized literature and/or participating in (online) courses.	The prerequisite for this module is that it be specified as a requirement for admission to the program as part of a condition under §4(4).	Testing: Oral examination (individual examination) or in-class written examination (*Klausur*)
Conditional Module 2 (large) *Großes Auflagenmodul 2*	9	--- (*Auflagen-modul*)	--- (*Auflagen-modul*)	Within the framework of their bachelor's degree, students have already gained the ability to independently acquire knowledge and skills. As a part of this module, students should fill skills gaps that exist in a subject area that has been specified in more detail within the scope of a condition under §4(4) of these Degree Program and Examination Regulations. They will develop the skills by reading specialized literature and/or participating in (online) courses.	The prerequisite for this module is that it be specified as a requirement for admission to the program as part of a condition under §4(4).	Testing: Oral examination (individual examination) or in-class written examination (*Klausur*)
Conditional Module 3 (large) *Großes Auflagenmodul 3*	9	--- (*Auflagen-modul*)	--- (*Auflagen-modul*)	Within the framework of their bachelor's degree, students have already gained the ability to independently acquire knowledge and skills. As a part of this module, students should fill skills gaps that exist in a subject area that has been specified in more detail within the scope of a condition under §4(4) of these Degree Program and Examination Regulations. They will develop the skills by reading specialized literature and/or participating in (online) courses.	The prerequisite for this module is that it be specified as a requirement for admission to the program as part of a condition under §4(4).	Testing: Oral examination (individual examination) or in-class written examination (*Klausur*)

Appendix 3: Import Module List

The degree programs listed below can be selected at the time of the adoption of these Degree Program and Examination Regulations. Pursuant to §14(1) of the General Regulations, the specifications of the Degree Program and Examination Regulations within the framework of which the modules are offered (in particular with regard to qualification objectives, prerequisites, credits (LP) and examination modalities) apply to these modules. Options for combining modules are set forth by the learning unit that offers them, as applicable.

The catalog of selectable degree programs can be changed or supplemented by the examination committee especially if the range of degree programs offered by the departments at Philipps-Universität Marburg changes. Such changes will be published by the examination committee on the respective program website. In individual cases or in general, the utilization of the following degree programs can be made dependent on the prior attendance of a degree program advising session or a binding registration. In case of enrollment caps, the corresponding regulations of the Degree Program and Examination Regulations apply. Otherwise, no guarantee is given that the courses listed below will actually be offered and can be taken.

Upon justified request by the student, it is permissible to approve additional import modules beyond the regular opportunities in individual cases; this requires that the offering department or institution also agree.

The current import opportunities are always published on the program website of the department offering the module as an export option.

Students should take note of the corresponding information and advising offerings in the department offering the module before starting coursework.

Any prerequisites or recommendations for participation as well as combination rules must be observed. If the department offering a module has specified combination rules and created export packages, depending on the scope of their own import window, only limited module course offerings will in fact be available.

At the time of the last resolution by the departmental council on the present Degree Program and Examination Regulations, an agreement existed on the following modules:

The following modules can be used for Compulsory Elective Modules in Mathematics The current import opportunities as well as possible allocation regulations and restrictions are shown on the website for the degree program (§6[9]) or in the online module handbook linked there. Modules for pure mathematics are marked with “R”; modules for applied mathematics are marked with “A”,			
Mathematics and Computer Science (Dept. 12), Degree program BSc Data Science	Continuous optimization	Advanced module	A 9
	Matrix Methods in Data Analysis	Advanced module	A 9
Mathematics and Computer Science (Dept. 12), Degree program BSc Mathematics	Applied harmonic analysis I	Advanced module	A 6
	Representation Theory	Advanced module	R 9
	Discrete Geometry	Advanced module	R 6
	Discrete Mathematics and Analysis of Algorithms	Advanced module	R 9
	Elementary Algebraic Geometry	Advanced module	R 9
	Elementary Topology	Advanced module	R 6
	Elementary number theory	Advanced module	R 6
	Large Advanced Module Algebra/Geometry	Advanced module	R 9
	Large Advanced Module Analysis/Topology	Advanced module	R 9
	Large Advanced Module Numerics/Optimization	Advanced module	A 9
	Group theory	Advanced module	R 6
	Small Advanced Module Algebra/Geometry	Advanced module	R 6
	Small Advanced Module Analysis/Topology	Advanced module	R 6
	Small Advanced Module Numerics/Optimization	Advanced module	A 6
	Lie Groups and Lie Algebras	Advanced module	R 9
	Numerical analysis I	Advanced module	A 6
	Topological methods in data analysis	Advanced module	A&R 9
Mathematics and Computer Science (Dept. 12), Degree program BSc Business Informatics	Operations Research	Advanced module	A 9
Mathematics and Computer Science (Dept. 12), Degree program BSc Business Mathematics	Financial Mathematics I	Advanced module	A 6
	Large Advanced Module Stochastics	Advanced module	A 9
	Small Advanced Module Stochastics	Advanced module	A 6
	Optimization I	Advanced module	A 6
	Personal Insurance Mathematics	Advanced module	A 3
	Statistics	Advanced module	A 9
Mathematics and Computer Science (Dept. 12), Degree Program MSc Business Mathematics	Selected Topics on Financial Mathematics	Specialization module	A 3
	Empirical processes	Specialization module	A 6
	Financial Optimization	Specialization module	A 6
	Financial Mathematics II	Specialization module	A 6

	Large Specialization Module Stochastics	Specialization module	[A] 9
	High-Dimensional Statistics and Machine Learning	Specialization module	[A] 6
	Small Specialization Module Stochastics	Specialization module	[A] 6
	Small Specialization Module Stochastics without Tutorial	Specialization module	[A] 3
	Mathematical and Nonparametric Statistics	Specialization module	[A] 9
	Optimization II	Specialization module	[A] 6
	Probabilistic Combinatorics	Specialization module	[A] 9
	Quantitative Risk Management	Specialization module	[A] 6
	Non-Life Insurance Mathematics	Specialization module	[A] 3
	Special Topics in Insurance Mathematics	Specialization module	[A] 3
	Stochastical Analysis	Specialization module	[A] 9
	Stochastic Processes	Specialization module	[A] 6
	Probability Theory	Specialization module	[A] 9

The following modules can be used for Practical and Seminar Modules The current import opportunities as well as possible allocation regulations and restrictions are shown on the website for the degree program (§6[9]) or in the online module handbook linked there.			
Mathematics and Computer Science (Dept. 12), Degree program BSc Computer Science	Advanced internship	Practical module	6
Mathematics and Computer Science (Dept. 12), Degree program BSc Business Mathematics	Practical Course in Stochastics	Practical module	6

The following modules can be used for the Profile Area Business Administration The current import opportunities as well as possible allocation regulations and restrictions are shown on the website for the degree program (§6[9]) or in the online module handbook linked there.			
Economics (Dept. 02), Degree program BSc Business Administration	Sales Management	Basic Module	[B] 6
	Accounting and Financial Statements	Basic Module	[B] 6
	Business Intelligence (export module)	Specialization module	[C] 6
	Business Administration Abroad I (B.Sc.)	Specialization module	6
	Controlling with Key Figures (export module)	Specialization module	[C] 6
	Digitalization and Process Management I	Specialization module	[C] 6
	Digitalization and Process Management II	Specialization module	[C] 6
	Entrepreneurial Finance	Specialization module	[C] 6
	Entrepreneurship and Innovative Business Models I	Specialization module	[C] 6
	Entrepreneurship and Innovative Business Models II	Specialization module	[C] 6
	Decision-Making, Finance and Investment	Basic Module	[B] 6

	Foundations of Taxation	Basic Module	[C] 6
	Foundations of Business Informatics	Basic Module	[B] 6
	Intermediate Finance (export module)	Specialization module	[C] 6
	International Business Strategy	Specialization module	[C] 6
	Annual Financial Statements	Basic Module	[B] 6
	Annual Financial Statement and Annual Financial Statement Analysis (export module)	Specialization module	[C] 6
	Cost and Performance Accounting	Basic Module	[B] 6
	Management Accounting (export module)	Specialization module	[C] 6
	Management and Marketing Tools (export module)	Specialization module	[C] 6
	Managing Innovation and Entrepreneurship	Specialization module	[C] 6
	Organization Structures and Behavior in Organizations	Specialization module	[C] 6
	Human Resources Management	Specialization module	[C] 6
	Quantitative Empirical Methods of Business and Market Research (export module)	Basic Module	[C] 6
	Strategic Problem-Solving and Communication	Specialization module	[C] 6
	Technology and Innovation Management	Specialization module	[C] 6
	Corporate Governance	Basic Module	[A] 6

The following modules can be used for Profile Area Biology

Before starting up study in the profile area, interested students should register with the contact person in the Department of Mathematics and Computer Science for the profile area of Biology. In addition, registration with the Office of the Dean of Studies for the Department of Biology is required prior to beginning studies in the profile area. Since the choices may be limited due to enrollment caps, we recommend you attend the information event about selecting a module and, if necessary, also make use of the advisory services offered by the Department of Biology if you have any questions.

The current import opportunities as well as possible allocation regulations and restrictions are shown on the website for the degree program (§6[9]) or in the online module handbook linked there.

Biology (Dept. 17), Degree Program BSc Biology	Current Topics in Ecology	Profile module	6
	Biochemistry I	Profile module	6
	Animal biology	Profile module	6
	Digital Light Microscopy	Profile module	6
	Introduction to *Drosophilia* cross-genetics	Profile module	6
	Introduction to Laser Scanning Confocal Microscopy	Profile module	6
	Electron Microscopy	Profile module	6
	Experimental Design and Data Analysis in Ecology	Profile module	6
	Forensic Biology	Profile module	6

	Fungal Diversity and Conservation	Profile module	6
	Functional Morphology and Animal Biochemistry	Profile module	6
	Molecular Biology and Metabolism of Prokaryotes	Profile module	6
	Molecular Mycology	Profile module	6
	Neuroethology	Profile module	6
	Next Generation Sequencing in Eukaryotes	Profile module	6
	Insect Ecology and Biodiversity	Profile module	6
	Knowledge of Central European Plants	Profile module	6
	Spatial Aspects of Biodiversity	Profile module	6
	Synthetic Biology/”Marburg does iGEM”	Profile module	6
	Participation in the International iGEM Competition	Profile module	6
	Mediterranean Vegetation (Mallorca)	Profile module	6
	Advanced Species Knowledge in Ornithology	Profile module	6
	Philosophy of Science, Ethics, and History of Biology	Profile module	6
Biology (Dept. 17), Degree Program LAaG Biology	Anatomy and Physiology of Plants for Future High School Teachers	Basic Module	6
	Anatomy and Physiology of Animals for Future High School Teachers	Basic Module	6
	Introduction to Organic Biology for Future High School Teachers	Basic Module	6
	Genetics and Microbiology for Future High School Teachers	Basic Module	6
	Cellular and Developmental Biology for Future High School Teachers	Basic Module	6

The following modules can be used for Profile Area Geography The current import opportunities as well as possible allocation regulations and restrictions are shown on the website for the degree program (§6[9]) or in the online module handbook linked there.			
Geography (Dept. 19), Degree program BSc Geography	Basic knowledge: Population Geography	Basic Module	[T1] 3
	Basic knowledge: Biogeography	Basic Module	[T1] 3
	Basic knowledge: Soil Geography	Basic Module	[T1] 3
	Basic knowledge: Geography of Peripheral Areas	Basic Module	[T1] 3
	Basic knowledge: Geomorphology	Basic Module	[T1] 3
	Basic knowledge: Hydrogeography	Basic Module	[T1] 3
	Basic knowledge: Climate Geography	Basic Module	[T1] 3
	Basic knowledge: Spatial Planning and Development	Basic Module	[T1] 3

	Basic knowledge: Urban Geography	Basic Module	T1 3
	Basic knowledge: Economic and Service Geography	Basic Module	T1 3
	Remote Sensing	Basic Module	M2 3
	Geoinformatics	Basic Module	M2 3
	Basic skills: Population Geography	Basic Module	T1 6
	Basic skills: Biogeography	Basic Module	T1 6
	Basic skills: Soil Geography	Basic Module	T1 6
	Basic skills: Geography of Peripheral Areas	Basic Module	T1 6
	Basic skills: Geomorphology	Basic Module	T1 6
	Basic skills: Hydrogeography	Basic Module	T1 6
	Basic skills: Climate Geography	Basic Module	T1 6
	Basic skills: Humans and the Environment	Basic Module	T1 6
	Basic skills: Spatial Planning and Development	Basic Module	T1 6
	Basic skills: Urban Geography	Basic Module	T1 6
	Basic skills: Economic and Service Geography	Basic Module	T1 6
	Cartography and GIS	Basic Module	M1 6
	Geography Project I	Specialization module	T2 6
	Geography Project II	Specialization module	T2 6
	Special Cartography	Basic Module	M2 3
	System Dynamics	Basic Module	M2 3
Geography (Dept. 19), Degree Program MSc Physical Geography	Biogeography	Advanced module	T3 6
	Soil Geography and Hydrogeography	Advanced module	T3 6
	Terrain Climatology	Advanced module	T3 6
	Geographic Information Systems	Advanced module	T3 6
	Geomorphology	Advanced module	T3 6
	Global Change	Basic Module	T3 6
	Environmental Information Systems I	Specialization module	T3 6
	Environmental Information Systems II	Specialization module	T3 6
	Environmental Systems	Advanced module	T3 6
Geography (Dept. 19), Degree program MSc Business Geography	Globalization of Innovation and Knowledge	Basic Module	T3 6
	Innovation and Growth in Space	Basic Module	T3 6
	Modeling and Simulation	Advanced module	T3 6
	Socioeconomic Globalization Processes	Basic Module	T3 6

The following modules can be used for Profile Area Computer Science The current import opportunities as well as possible allocation regulations and restrictions are shown on the website for the degree program (§6[9]) or in the online module handbook linked there.			
Mathematics and Computer Science (Dept. 12), Degree program BSc Data Science	Efficient Algorithms	Advanced module	9
	Machine Learning	Advanced module	9
Mathematics and Computer Science (Dept. 12), Degree program MSc Data Science	Data Integration	Specialization module	6
	Information Retrieval	Specialization module	6
Mathematics and Computer Science (Dept. 12), Degree program BSc Computer Science	Algorithms and data structures	Basic Module	9
	Declarative programming	Basic Module	9
	Introduction to Bioinformatics	Advanced module	6
	Graphics Programming	Advanced module	9
	Advanced Module Computer Science 1 (large)	Advanced module	9
	Advanced Module Computer Science 2 (large)	Advanced module	9
	Advanced Module Computer Science 3 (large)	Advanced module	9
	Advanced Module Computer Science 4 (large)	Advanced module	9
	Advanced Module Computer Science 5 (large)	Advanced module	9
	IT Security	Advanced module	9
	Advanced Module Computer Science 1 (small)	Advanced module	6
	Advanced Module Computer Science 2 (small)	Advanced module	6
	Advanced Module Computer Science 3 (small)	Advanced module	6
	Advanced Module Computer Science 4 (small)	Advanced module	6
	Advanced Module Computer Science 5 (small)	Advanced module	6
	Object-Oriented Programming	Basic Module	9
	Computer Networks	Advanced module	9
	Software Design and Programming Techniques	Advanced module	6
	Software Quality	Advanced module	9
	Software Engineering	Advanced module	6
	System software and computer communication	Basic Module	9
	Computer Engineering	Basic Module	9
	Theoretical computer science	Advanced module	9
Mathematics and Computer Science (Dept. 12), Degree program MSc Computer Science	Algorithm Engineering	Specialization module	9
	Algorithms in Bioinformatics	Specialization module	6
	Operating Systems	Specialization module	6
	Image Synthesis	Specialization module	9
	Compiler Construction	Specialization module	9
	Advanced Programming Concepts	Specialization module	6

	Advanced Methods of System Development	Specialization module	6
	Geo Databases	Specialization module	6
	Large Specialization Module Computer Science 1	Specialization module	9
	Large Specialization Module Computer Science 2	Specialization module	9
	Large Specialization Module Computer Science 3	Specialization module	9
	Large Specialization Module Computer Science 4	Specialization module	9
	Large Specialization Module Computer Science 5	Specialization module	9
	Advanced Algorithmics	Specialization module	9
	Implementation of Database Systems	Specialization module	9
	Index and Storage Structures	Specialization module	6
	Small Specialization Module Computer Science 1	Specialization module	6
	Small Specialization Module Computer Science 2	Specialization module	6
	Small Specialization Module Computer Science 3	Specialization module	6
	Small Specialization Module Computer Science 4	Specialization module	6
	Small Specialization Module Computer Science 5	Specialization module	6
	Artificial Intelligence	Specialization module	6
	Model-driven Software Development	Specialization module	9
	Modern Methods of System Development	Specialization module	9
	Multimedia Signal Processing	Specialization module	9
	Neural Networks	Specialization module	6
	Software Evolution	Specialization module	6
	Distributed Systems	Specialization module	6
	Virtual Machines	Specialization module	6
	Visual Languages	Specialization module	6
	Web Technologies	Specialization module	6
Mathematics and Computer Science (Dept. 12), Degree program BSc Business Informatics	Database Systems	Advanced module	9
Mathematics and Computer Science (Dept. 12), Degree Program MSc Business Informatics	Cloud Computing	Specialization module	6

The following modules can be used for Profile Area Physics The current import opportunities as well as possible allocation regulations and restrictions are shown on the website for the degree program (§6[9]) or in the online module handbook linked there.			
Physics (Dept. 13), Degree program BSc Physics	Analytical mechanics	Basic Module	9
	Atomic and molecular physics	Advanced module	9
	Biological and Statistical Physics A	Specialization module	6

	Biological and Statistical Physics B	Specialization module	6
	Biological and Statistical Physics C	Specialization module	6
	Solid State Physics 1	Advanced module	9
	Advanced Theoretical Physics A	Specialization module	6
	Advanced Theoretical Physics B	Specialization module	6
	Advanced Theoretical Physics C	Specialization module	6
	Classical field theory	Basic Module	9
	Optics and quantum phenomena	Basic Module	9
	Quantum Mechanics 1	Basic Module	9
	Quantum Mechanics 2	Specialization module	6
	Statistical Physics 1	Advanced module	6
Physics (Dept. 13), Degree Program LAaG Physics	Electricity and heat	Basic Module	9
	Mechanical Engineering	Basic Module	9

The following modules can be used for Profile Area Economics The current import opportunities as well as possible allocation regulations and restrictions are shown on the website for the degree program (§6[9]) or in the online module handbook linked there.			
Economics (Dept. 02), Degree Program BSc Macroeconomics	Applied Institutional Economics (export module)	Specialization module	[C] 6
	Development Economics: An Introduction (export module)	Specialization module	[C] 6
	Introduction to Institutional Economics (export module)	Basic Module	[B] 6
	Introduction to Macroeconomics	Basic Module	[A] 6
	Introduction to Law and Economics (export module)	Specialization module	[C] 6
	Empirical Economic Research	Basic Module	[C] 6
	Foundations of Finance (export module)	Advanced module	[C] 6
	International Economics (export module)	Advanced module	[C] 6
	Macroeconomics II (export module)	Advanced module	[C] 6
	Macroeconomics I (export module)	Basic Module	[B] 6
	Markets and Organizations (export module)	Specialization module	[C] 6
	Microeconomics II (export module)	Advanced module	[C] 6
	Microeconomics I	Basic Module	[A] 6
	Environmental Economics (export module)	Specialization module	[C] 6
	Competition and Regulation (export module)	Specialization module	[C] 6
	Economic Policy (export module)	Advanced module	[C] 6

Appendix 4: Export Module List

The current export opportunities is always published on the program website of the department offering the module as an export opportunity.

Any prerequisites or recommendations for participation as well as combination rules must be observed. If the department offering a module has specified combination rules and created export packages, depending on the scope of their own import window, only limited module course offerings will in fact be available.

The degree programs listed below can be selected at the time of the adoption of these Degree Program and Examination Regulations. The catalog of export opportunities can be changed or supplemented by the examination committee especially if the export opportunities change. Such changes will be published by the examination committee on the degree program website in accordance with §6.

§1 Export of curricular modules to other degree programs

The following modules as listed in Appendix 2 may also be taken as part of other degree programs, as long as this is agreed upon with the department(s) in whose degree program(s) these modules are elective.

Name of module *German translation*
Algebraic Geometry: Advanced Methods *Algebraische Geometrie: Weiterführende Methoden*
Algebraic Geometry: Modern Methods *Algebraische Geometrie: Moderne Methoden*
Algebraic Geometry: Projective Varieties *Algebraische Geometrie: Projektive Varietäten*
Algebraic Lie Theory *Algebraische Lie-Theorie*
Algebraic Topology I *Algebraische Topologie I*
Algebraic Topology II (Large Specialization Module) *Algebraische Topologie II (großes Vertiefungsmodul)*
Algebraic Topology II (Small Specialization Module) *Algebraische Topologie II (kleines Vertiefungsmodul)*
Algebras and their Representations *Algebren und Darstellungen*
Analytic Number Theory *Analytische Zahlentheorie*
Applied Harmonic Analysis II

Name of module *German translation*
Angewandte harmonische Analysis II
Approximation Theory *Approximationstheorie*
Commutative Algebra (Large Specialization Module) *Kommutative Algebra (Großes Vertiefungsmodul)*
Commutative Algebra (Small Specialization Module) *Kommutative Algebra (Kleines Vertiefungsmodul)*
Complex Geometry I *Komplexe Geometrie I*
Complex Geometry II *Komplexe Geometrie II*
Differential Geometry I *Differentialgeometrie I*
Differential Geometry II *Differentialgeometrie II*
Fourier Integral Operators *Fourier-Integraloperatoren*
Functional Analysis *Funktionalanalysis*
Galois Theory *Galoistheorie*
General Relativity *Allgemeine Relativitätstheorie*
Holomorphic Functions and Abelian Varieties *Holomorphe Funktionen und Abelsche Varietäten*
Hopf Algebras *Hopf-Algebren*
Hopf Algebras II *Hopf-Algebren II*
Large Specialization Module Algebra/Geometry *Großes Vertiefungsmodul Algebra/Geometrie*
Large Specialization Module Analysis/Topology *Großes Vertiefungsmodul Analysis/Topologie*
Large Specialization Module Numerical Mathematics/Optimization *Großes Vertiefungsmodul Numerik/Optimierung*
Noncommutative algebra *Nichtkommutative Algebra*
Numerical Analysis II *Numerische Analysis II*
Numerical Methods for Ordinary Differential Equations *Numerik für gewöhnliche Differentialgleichungen*
Numerical Solution Methods for Differential Equations

Name of module *German translation*
Numerik von Differentialgleichungen
Numerical Solution Methods for Finite Dimensional Problems *Numerik endlichdimensionaler Probleme*
Partial Differential Equations *Partielle Differentialgleichungen*
Selected Topics in Numerical Analysis *Ausgewählte Themen der Numerischen Analysis*
Small Specialization Module Algebra/Geometry *Kleines Vertiefungsmodul Algebra/Geometrie*
Small Specialization Module Analysis/Topology *Kleines Vertiefungsmodul Analysis/Topologie*
Small Specialization Module Numerical Mathematics/Optimization *Kleines Vertiefungsmodul Numerik/Optimierung*
Spectral and scattering theory *Spektral- und Streutheorie*