Technische Universität Dresden
Faculty of Mathematics

Study Regulations for the Master's degree program in Mathematics in Business and Economics from winter semester 2023/2024

Consolidated version of the official announcements of TU Dresden of March 30, 2023 and according to § 6 para. 6 of the Study Regulations the resolution of the Faculty Board of April 19, 2023 and October 18, 2023.

This is valid for all students enrolled in the Master's degree program Mathematics in Business and Economics.

TUD Dresden University of Technology
Faculty of Mathematics

Study Regulations for the consecutive Master's degree program Mathematics in Business and Economics

as of March 30, 2023
(translated version)

On the basis of § 36 para. 1 of the Act on the Autonomy of Institutions of Higher Education in the Free State of Saxony in the version published on January 15, 2013 (SächsGVBl. p. 3), TUD Dresden University of Technology issues the following Study Regulations as statutes.

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§ 1
Scope of application

On the basis of the Act on the Autonomy of Institutions of Higher Education in the Free State of Saxony and the Examination Regulations, these Study Regulations stipulate the objectives, content, structure and organization of the consecutive Master's program in Mathematics in Business and Economics at TUD Dresden University of Technology.

§ 2
Objectives of the degree program

(1) Students will possess in-depth knowledge, skills and abilities in the mathematical areas that are particularly relevant for applications in industry. They will be familiar with advanced mathematical ways of thinking, concepts and working forms of fundamental mathematical disciplines as well as the manifold aspects of mathematical modeling of economic problems and possess comprehensive mathematical knowledge for the investigation of such models. This applies in particular to the development and analysis of such models in the context of mathematical stochastics and optimization. Students will be able to independently undertake academic work, apply and develop new scientific findings, and solve problems relevant to practice using the mathematical knowledge they have acquired. They will be able to carry out mathematical analysis and to develop solutions to mathematically relevant problems. Students will possess knowledge of economics and skills in professional communication in a scientific environment. They will be able to complete tasks both independently and in interdisciplinary teams. Students will be able to use their knowledge, understanding, and problem-solving skills in new and unfamiliar situations and to work in a team. Students will possess key skills relevant to professional life in areas such as communication and teamwork, presentation skills, work organization, time management, and project planning. Moreover, they will also become capable of critical self-reflection as well as of social commitment and will have developed their personalities.

(2) Due to their broad-based studies with a focus on stochastics and optimization, graduates of the Master's program in Mathematics in Business and Economics will be able to handle diverse and complex tasks, especially in the fields of business, administration, as well as insurance and finance. In addition, graduates will be equipped for professional positions in industry and science that require mathematical knowledge and skills as well as strong analytical and abstracting abilities.

§ 3
Admission requirements

(1) To be admitted to the degree program, candidates must have completed a first university degree recognized in Germany or a qualification from an officially recognized vocational academy in the field of mathematics or a closely related degree program, in particular in Mathematics in Business and Economics or Technomathematics. An Admissions Committee will be established to decide on questions of doubt regarding the assessment of study programs pursuant to sentence 1.

(2) Knowledge of English at the B2 level of the Common European Framework of Reference for Language is a prerequisite. Proof must be provided in the form of a certificate for general university entrance qualification, a certificate for subject-specific university entrance qualification comprising English as a foreign language, a certificate for university entrance qualification from a program completed in English, a certificate of a university degree program completed in English or the result of an internationally recognized language test, e.g. TOEFL (72), IELTS (5.5), UNIcert II.

§ 4
Start and duration of the degree program

(1) The program can be started in the winter semester or the summer semester.

(2) The standard period of study is four semesters and includes on-site attendance, self-study and the final examination.

§ 5
Teaching and learning methods

(1) The curriculum is structured in modules. In the individual modules, the course content is taught, consolidated and deepened through lectures, exercises, seminars, tutorials, internships, and self-study. In modules that are subject to more than one study regulation, synonyms are permitted for teaching and learning methods with the same content.

(2) The individual teaching and learning forms according to para. 1 sentence 2 are defined as follows:

1. Lectures provide theoretical knowledge on the subject matter of the modules.
2. Exercises allow students to apply the subject matter in exemplary sub-areas.
3. Seminars enable students to familiarize themselves under supervision in a selected subject area on the basis of specialist literature or other material, to report on the results of their work, to discuss them within the group and to present them in writing.
4. During tutorials, more advanced students impart knowledge, skills and interdisciplinary competencies to other students.
5. An internship provides practical application of acquired knowledge and competencies as well as the acquisition of professional skills in potential occupational fields.
6. Self-study allows students to acquire, consolidate and deepen their knowledge and skills on their own.

§ 6
Structure and organization of the degree program

(1) The program is organized in modules, and features a curriculum organized over four semesters. The third semester is particularly suitable for a temporary stay at another university (mobility window). Part-time study is possible in accordance with the regulations on part-time study.

(2) The degree program comprises seven compulsory modules, one elective compulsory module from the “S” elective compulsory field, four elective compulsory modules from the “M” elective compulsory field, and three to four elective compulsory modules from the “N” elective compulsory field, which allow the students to choose their specialization. In the “N” elective compulsory field, students can choose from the modules of the specializations Business and Economics – Basic and Business and Economics – Advanced. The choice of elective compulsory modules and specializations is binding. Students can change modules by submitting a written request to the Examination Office, in which the module to be replaced and the newly chosen module or specialization are to be named.

(3) Learning goals, content, teaching and learning methods, requirements, applicability including potential combination restrictions, frequency, workload, and duration of the individual modules are all listed in the module descriptions (Annex 1).

(4) The courses are held in English or, if indicated by the module descriptions, in German.

(5) The appropriate allocation of the modules to the individual semester, the observance of which makes it possible to complete the program within the standard period of study, as well as the type and scope of the courses included, and the number and standard time of the required study achievements and examined assessments are defined in the study schedule attached (Annex 2), or in an individual study schedule for part-time studies approved by the Faculty.

(6) Upon proposal of the Academic Affairs Committee, the Faculty Board may change the range of elective compulsory modules as well as the study schedule. The current selection of elective compulsory modules will be announced in the usual manner at the beginning of the semester. The amended study schedule shall apply to all students who have been informed about this in the usual manner at the beginning of their studies. The Examination Committee shall decide, upon application by the student, on any exceptions to sentence 3.

(7) If participation in an elective course of a compulsory or elective compulsory module or in a non-elective course of an elective compulsory module is limited by the number of available places as specified in the module description, the selection of participants shall be based on the chronological order of registration. To this end, students must register for the appropriate course. The form and deadline for registering will be announced to the students in the usual manner. Through the enrollment, the choice according to para. 2 sentence 3 is made, if any. At the end of the enrollment period, the students will be notified in the usual manner whether they have been selected for the respective course.

§ 7
Content of the degree program

(1) The Mathematics in Business and Economics Master's degree program is application-oriented.

(2) The content of the degree program includes the subject areas of financial and business mathematics, actuarial mathematics, stochastics, and discrete and continuous optimization. Depending on the modules and courses chosen by the student, the content of the degree program comprises advanced mathematical concepts and structures in the areas of analysis, algebra, differential equations, discrete mathematics, mathematics in business, economics and finance, geometry, numerical analysis, modeling and simulation, optimization and stochastics. Moreover, the degree program also offers opportunities for specialization in current pure and applied mathematics research. This includes important methods of scientific work as well as the rules of good scientific practice. Moreover, the degree program enables students to specialize and refine their academic profile in economics. Depending on students' choice, the degree program includes either foundational or in-depth knowledge of business administration and economics, which opens up opportunities for interdisciplinary work. Moreover, it comprises the study of exemplary topics of an adjacent field.

§ 8
Credit points

(1) ECTS credit points document the average workload of the students and their individual study progress. One credit point corresponds to a 30-hour workload. Normally, 60 credit points are awarded per academic year, i.e. 30 credit points per semester. The total workload for the program corresponds to 120 credit points and comprises the teaching and learning methods according to type and scope stipulated in the module descriptions, the study achievements and examined assessments, and the final thesis.

(2) The module descriptions indicate the number of credits that can be earned by each module. Credits are awarded upon passing the module examination. § 33 of the examination regulations shall remain unaffected.

§ 9
Academic advisory and counseling service

(1) General advice will be provided by the Central Student Information and Counseling Service at TU Dresden. It covers questions regarding study options, enrollment modalities and general student affairs. Subject-specific guidance during studies will be provided by the Academic Advisory Service of the Faculty of Mathematics. This subject-specific advisory service assists students with regard to the design of their studies.

(2) At the beginning of the third semester, each student who has not yet provided proof of academic performance shall make use of the subject-specific advisory services.

§ 10
Amendments to module descriptions

(1) In order to adapt them to changed conditions, module descriptions may be amended in a simplified procedure in order to optimize study organization, with the exemption of the fields “Module name”, “Qualification objectives”, “Content”, “Teaching and learning methods”, “Requirements for earning credit points”, “Credit points and grades” and “Module duration”.

(2) In a simplified procedure, the Faculty Board will adopt the amendments to the module descriptions upon proposal of the Academic Affairs Committee. The amendments must be published in the usual manner.

§ 11
Entry into force, publication and interim arrangements

(1) These Study Regulations enter into force on April 1, 2023, and are published in the official announcements of TU Dresden.

(2) They apply to all newly enrolled students in the Master's program in Mathematics in Business and Economics in the 2023/2024 winter semester or later.

(3) For students who enrolled prior to the 2023/2024 winter semester, the version of the Study Regulations for the consecutive Master's degree program in Mathematics in Business and Economics that has been valid for them up until this amendment continues to apply unless they declare their acceptance of the amendment in writing to the Examination Committee. The form and deadline of this declaration are specified by the Examination Committee and are announced in the usual manner. Switching to the new regulations is possible at the earliest on October 1, 2023.

Issued based on the resolution of the Faculty Board of the Faculty of Mathematics as of January 25, 2023, and the approval of the University Executive Board as of March 14, 2023.

Dresden, March 30, 2023

The Rector
of TUD Dresden University of Technology

Prof. Ursula M. Staudinger

Annex 1:
Module descriptions

Module number	**Module name**	**Responsible lecturer**
Math-Ma-20	Probability with martingales	Director of the Institute for Mathematical Stochastics id.stochastik@tu-dresden.de
Qualification objectives	Students have acquired systematic knowledge and deeper understanding of martingales in discrete time and of their properties. They are familiar with the central limit theorem and its applications and with the construction of Brownian motion. Students understand elementary properties of Brownian motion and have developed several strategies for solving related problems.	
Content	The module covers martingales, in particular convergence, stopping techniques and inequalities, central limit theorem and construction of Brownian motion and basic distributional and sample path properties.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in mathematical stochastics at the Bachelor's level is required. Literature (german and english): - Schilling, R.L.: Measures, Integrals and Martingales. Cambridge Univ. Press. 978-1-316-62024-3, - Schilling, R. L.: Maß und Integral, De Gruyter, - Schilling, R. L.: Wahrscheinlichkeit, De Gruyter, - Jacod, J. / Protter, P.: Probability Essentials, Springer.	
Applicability	This module is a compulsory module in the Master's degree program Mathematics in Business and Economics. Furthermore, this module is one of 35 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. In addition, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master's degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. The module is a prerequisite for participation in the modules Methods of financial and actuarial mathematics as well as Stochastic calculus.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	

Module duration	The module comprises one semester.

Module number	Module name	Responsible lecturer
Math-Ma-21	Methods of financial and actuarial mathematics	Director of the Institute for Mathematical Stochastics id.stochastik@tu-dresden.de
Qualification objectives	Students are familiar with continuous-time models for financial and actuarial applications. In these models, they are able to price and hedge financial derivatives or to compute ruin probabilities and related quantities. They are able to give interpretations of their results in relation to their area of application	
Content	The module covers continuous-time modeling of financial markets, including stochastic differential equations and risk-neutral valuation of derivatives, or of insurance portfolios, including renewal processes, analytical and approximate methods of ruin theory.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Participants require skills acquired in the module Probability with martingales. Literature: - Schilling, R. L. / Partzsch, L.: Brownian Motion, De Gruyter, - Schilling, R. L.: Measure, Integral, Probability & Processes, independently published.	
Applicability	This module is a compulsory module in the Master's degree program Mathematics in Business and Economics. Furthermore, this module is one of 35 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. In addition, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master's degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	**Module name**	**Responsible lecturer**
Math-Ma-24	Mathematical statistics	Director of the Institute for Mathematical Stochastics id.stochastik@tu-dresden.de
Qualification objectives	Students are able to derive functional limit theorems for empirical processes, are familiar with the basic principles of the theory of empirical processes and their applications in statistics. They have acquired a systematic understanding of irregular statistical experiments and are able to apply martingale methods.	
Content	The module covers weak convergence of probability measures on metric spaces, convergence criteria in special function spaces, functional limit theorems with applications in statistics, argmax-theorems and convex stochastic processes.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in mathematical stochastics at the Bachelor's level is required. Literature (german and english): - Schilling, R.L.: Measures, Integral, Probability & Processes. Independently published. 979-8-59910488-9, - Schilling, R. L.: Maß und Integral, De Gruyter, - Schilling, R. L.: Wahrscheinlichkeit, De Gruyter, - Jacod, J. / Protter, P.: Probability Essentials, Springer.	
Applicability	This module is a compulsory module in the Master’s degree program Mathematics in Business and Economics. Furthermore, this module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. In addition, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-26	Continuous optimization	Director of the Institute for Numerical Mathematics id.numerik@tu-dresden.de
Qualification objectives	The students know the essential terms, their interaction and their importance for the treatment of continuous optimization problems, they understand basic and advanced algorithmic concepts and their convergence properties, and and they are able to independently analyze and model concrete optimization problems, to select suitable algorithms for them, and to evaluate them with respect to effort and accuracy.	
Content	The module covers necessary and sufficient optimality conditions including constraint qualifications, convexity notions and their importance for solving optimization problems, algorithmic concepts for solving optimization problems, and global and locally superlinear convergence properties of corresponding algorithms.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in optimization at the Bachelor's level is required. Literature (german and english): - Jorge Nocedal und Stephen J. Wright: Numerical Optimization, Springer 2006, - Großmann, C. / Terno, J.: Numerik der Optimierung, Teubner, Kapitel 1-4 und 6.	
Applicability	This module is a compulsory module in the Master's degree program Mathematics in Business and Economics. Furthermore, this module is one of 35 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. In addition, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master's degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-27	Discrete optimization	Director of the Institute for Numerical Mathematics id.numerik@tu-dresden.de
Qualification objectives	Students know the essential concepts, their interaction and their importance for the solution of discrete optimization problems, understand basic algorithmic concepts, and and they are able to independently analyze and model concrete optimization problems as well as select suitable algorithms for them.	
Content	The module covers concepts and related theoretical tools for solving discrete optimization problems, in particular the branch-and-bound principle, as well as aspects of modeling and complexity. Integer linear optimization problems occupy a large space, including in particular the basics of polyhedra and integer polyhedra, as well as principles for generating cuts. Other topics are round trip problems and optimization problems on graphs and on matroids.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in optimization at the Bachelor's level is required. Literature (german and english): - George Nemhauser, Laurence Wolsey: Integer and Combinatorial Optimization, Wiley 1999, - Großmann, C. / Terno, J.: Numerik der Optimierung, Teubner, Kapitel 1, 2, 4, 9 und 10.	
Applicability	This module is a compulsory module in the Master’s degree program Mathematics in Business and Economics. Furthermore, this module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. In addition, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-SRW	Scientific research and writing	Dean of Studies of the Master's study programmes in Mathematics studiendekan.math@tu-dresden.de
Qualification objectives	Students are able to familiarize themselves with a special area of mathematics or an application of mathematics, independently review the literature on the state of the art in this area, and identify particularly relevant sources. Students are able to agree in a group on meaningful extensions of the foundations of the special field, present these to each other, and use them to jointly identify potential research topics. They are capable of critical self-reflection and social engagement as well as having developed their personalities.	
Content	Depending on the student's choice, the module includes a mathematical topic of specialization chosen from the catalog „Scientific research and writing“, such as Analysis, Algebra, Differential equations, Discrete mathematics, Financial and economic mathematics, Geometry, Numerical mathematics, Modeling and simulation, Optimization, or Stochastics.	
Teaching and learning methods	The module comprises 4 hours per week seminar, of which up to 2 hours per week can be replaced by lectures, and self-study. The area of specialization and the corresponding courses are to be chosen in the specified scope from the Catalog "Scientific Research and Writing" of the Faculty of Mathematics, which is issued in the usual manner at the beginning of each semester. The teaching language of the seminar and the lecture can be German or English and will be determined by the lecturer at the beginning of each semester and announced in the usual way.	
Prerequisites for participation	Knowledge in mathematics at the Bachelor's level is required.	
Applicability	This module is a compulsory module in the Master’s degree programmes Mathematics and Mathematics in Business and Economics.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of an ungraded combined term paper equating to 20 hours. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn five credit points for this module. The module examination will be graded as either “pass” or “fail”.	
Module frequency	The module is offered each semester.	
Workload	The workload comprises a total of 150 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-SL	Scientific literature – Research topics	Dean of Studies of the Master's study programmes in Mathematics studiendekan.math@tu-dresden.de
Qualification objectives	Students are able to apply their advanced mathematical thinking, concepts, and ways of working. They are able to work independently in a scientific manner, to acquire and develop new scientific knowledge, and to successfully tackle problems using these self-developed methods. They are able to present their results both orally and in writing. Students possess key professional skills such as presentation skills, critical self-reflection, work organization, time management and project planning.	
Content	Depending on the student's choice, the module covers a selected special area of mathematics, such as Analysis, Algebra, Differential equations, Discrete mathematics, Financial and economic mathematics, Geometry, Numerical mathematics, Modeling and simulation, Optimization, or Stochastics, according to the problem to be addressed in the thesis.	
Teaching and learning methods	The module comprises 2 hours per week seminar and self-study.	
Prerequisites for participation	Knowledge in mathematics at the Bachelor's level is required.	
Applicability	This module is a compulsory module in the Master’s degree programmes Mathematics, Technomathematics and Mathematics in Business and Economics.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a public oral examination lasting 45 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn four credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each semester.	
Workload	The workload comprises a total of 120 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-22	Stochastic calculus	Director of the Institute for Mathematical Stochastics id.stochastik@tu-dresden.de
Qualification objectives	Students have acquired systematic knowledge and deeper understanding of stochastic calculus, and have become familiar with the theory and applications of the Itô integral. They are able to apply stochastic integration to the theory of stochastic differential equations, they understand the theoretical basis of the Feynman-Kac and the Girsanov-Cameron-Martin formula and have developed strategies to solve related problems.	
Content	The module covers stochastic integration, Itô's formula, the theory of stochastic differential equations and their applications.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Participants require skills acquired in the module Probability with martingales. Literature: - Schilling, R. L. / Partzsch, L.: Brownian Motion, De Gruyter, - Schilling, R. L.: Measure, Integral, Probability & Processes, independently published.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master's degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, in the Master's degree program Mathematics in Business and Economics, this module is one of three compulsory elective modules in the compulsory elective area S, out of which one module must be selected, as well as one of 31 compulsory elective modules in the compulsory elective area M, of which modules with a total of at least 24 credit points must be selected. The module can only be selected once in the Master's degree program Mathematics in Business and Economics.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	
Workload	The workload comprises a total of 180 hours.	

Module duration	The module comprises one semester.

Module number	Module name	Responsible lecturer
Math-Ma-23	Stochastic processes	Director of the Institute for Mathematical Stochastics id.stochastik@tu-dresden.de
Qualification objectives	Students know how to construct stochastic processes, are familiar with elementary examples of stochastic processes, such as stationary, Gaussian, Lévy- or Markov-processes. They understand basic principles of the (stochastic) analysis of random processes and have developed concrete strategies to solve related problems.	
Content	The module covers the construction of stochastic processes, their path properties and distributional properties, methods for the analysis of stochastic processes.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in mathematical stochastics at the Bachelor's level is required. Literature (german and english): - Schilling, R.L.: Measures, Integral, Probability & Processes. Independently published. 979-8-59910488-9, - Schilling, R. L.: Maß und Integral, De Gruyter, - Schilling, R. L.: Wahrscheinlichkeit, De Gruyter, - Jacod, J. / Protter, P.: Probability Essentials, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, in the Master’s degree program Mathematics in Business and Economics, this module is one of three compulsory elective modules in the compulsory elective area S, out of which one module must be selected, as well as one of 31 compulsory elective modules in the compulsory elective area M, of which modules with a total of at least 24 credit points must be selected. The module can only be selected once in the Master's degree program Mathematics in Business and Economics.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	

Workload	The workload comprises a total of 180 hours.
Module duration	The module comprises one semester.

Module number	Module name	Responsible lecturer
Math-Ma-25	Statistical methods	Director of the Institute for Mathematical Stochastics id.stochastik@tu-dresden.de
Qualification objectives	Students understand basic concepts and methods of statistics. They have acquired systematic knowledge of selected statistical methods, are familiar with important concepts and results and are able to formulate precise definitions and proofs. They are able to apply different methods of estimation and prediction to statistical data and to interpret their results.	
Content	The module covers basic and advanced methods for estimation and prediction, such as linear models, statistics of extreme values, time series analysis, and statistical models in machine learning.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in mathematical stochastics at the Bachelor's level is required. Literature (german and english): - Schilling, R.L.: Measures, Integral, Probability & Processes. Independently published. 979-8-59910488-9, - Schilling, R. L.: Maß und Integral, De Gruyter, - Schilling, R. L.: Wahrscheinlichkeit, De Gruyter, - Jacod, J. / Protter, P.: Probability Essentials, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, in the Master’s degree program Mathematics in Business and Economics, this module is one of three compulsory elective modules in the compulsory elective area S, out of which one module must be selected, as well as one of 31 compulsory elective modules in the compulsory elective area M, of which modules with a total of at least 24 credit points must be selected. The module can only be selected once in the Master's degree program Mathematics in Business and Economics.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	

Workload	The workload comprises a total of 180 hours.
Module duration	The module comprises one semester.

Module number	Module name	Responsible lecturer
Math-Ma-01	Algebraic structures	Director of the Institute for Algebra id.algebra@tu-dresden.de
Qualification objectives	Students know and are able to apply the important notions and theorems of abstract algebraic objects and their theory. They are able to formulate precise definitions, give proofs, apply the methods to examples, and explain applications. They can apply abstract methods to specific situations and interpret general structure theory appropriately for specific cases. They have developed the ability to understand algebraic problems and to use them in their most efficient generalization, and they have in-depth analytical skills, a developed understanding of mathematical relationships, and analytical-critical thinking skills.	
Content	The module covers basic and advanced ideas and concepts of abstract algebra.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in algebraic structures at the Bachelor's level is required. Literature (german and english): - Bosch, S.: Algebra, Springer-Lehrbuch, Springer, - Hungerford, T. W.: Algebra, Graduate Texts in Mathematics, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master's degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once per academic year.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	**Module name**	**Responsible lecturer**
Math-Ma-02	Model theory	Director of the Institute for Algebra id.algebra@tu-dresden.de
Qualification objectives	Students have a systematic understanding of the methods of model theory. They know the important concepts and theorems of model theory and are able to formulate precise definitions, give proofs, apply the methods to examples, and explain applications.	
Content	Content includes abstract model theory, including properties of theories, properties of models, and applications of model theory to concrete algebraic and relational structures.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in algebraic structures at the Bachelor's level is required. Literature (german and english): - Bosch, S.: Algebra, Springer-Lehrbuch, Springer, - Hungerford, T. W.: Algebra, Graduate Texts in Mathematics, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	**Module name**	**Responsible lecturer**
Math-Ma-03	Discrete structures	Director of the Institute for Algebra id.algebra@tu-dresden.de
Qualification objectives	Students have a systematic understanding of a class of discrete structures and the associated theory. They know the important concepts and theorems of discrete mathematics and are able to formulate precise definitions, give proofs, apply the methods to examples, and explain applications.	
Content	The module covers topics in discrete mathematics, in particular graph theory, combinatorics, and finite model theory, as well as applications in theoretical computer science.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in algebraic structures at the Bachelor's level is required. Literature (german and english): - Bosch, S.: Algebra, Springer-Lehrbuch, Springer, - Hungerford, T. W.: Algebra, Graduate Texts in Mathematics, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-04	Algebra and number theory	Director of the Institute for Algebra id.algebra@tu-dresden.de
Qualification objectives	Students understand the connections between algebra and number theory. They know the most important terms and theorems of the areas covered and are able to formulate precise definitions, give proofs, apply the methods to examples, and explain applications.	
Content	The module covers basic and advanced topics in algebraic number theory and arithmetic geometry, in particular global and local fields and rational points on algebraic varieties.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in algebraic structures at the Bachelor's level is required. Literature (german and english): - Bosch, S.: Algebra, Springer-Lehrbuch, Springer, - Hungerford, T. W.: Algebra, Graduate Texts in Mathematics, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-05	Group theory	Director of the Institute for Algebra id.algebra@tu-dresden.de
Qualification objectives	Students master the basic methods of group theory and can apply them in new contexts to develop proofs independently. They know the most important definitions and results of group theory, can formulate them precisely and explain the proofs.	
Content	The module covers basic and advanced topics in group theory, in particular abstract structure theory of groups, examples and effective use of group actions.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in algebraic structures at the Bachelor's level is required. Literature (german and english): - Bosch, S.: Algebra, Springer-Lehrbuch, Springer, - Hungerford, T. W.: Algebra, Graduate Texts in Mathematics, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master's degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-06	Commutative algebra	Director of the Institute of Geometry id.geometrie@tu-dresden.de
Qualification objectives	Students are able to define respectively state and prove the most important notions and results in commutative algebra. and apply them to problems and examples, especially from algebraic geometry.	
Content	The module covers basic definitions and theorems of commutative algebra. Further topics are the theory of local Noetherian rings and homological methods.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in algebra at the Bachelor's level is required. Literature (german and english): - Bosch, S.: Lineare Algebra, Springer-Lehrbuch, Springer, - Bosch, S.: Algebra, Springer-Lehrbuch, Springer, - Hungerford, T. W.: Algebra, Graduate Texts in Mathematics, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least every second academic year in the winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	**Module name**	**Responsible lecturer**
Math-Ma-07	Noncommutative geometry	Director of the Institute of Geometry id.geometrie@tu-dresden.de
Qualification objectives	Students are able to define respectively state and prove the most important notions and results in noncommutative geometry and apply them to problems and examples, especially from representation theory.	
Content	The module covers basic definitions and theorems of noncommutative geometry. Further topics are Hopf algebras and representation theory as well as homological methods.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in algebra at the Bachelor's level is required. Literature (german and english): - Bosch, S.: Lineare Algebra, Springer-Lehrbuch, Springer, - Bosch, S.: Algebra, Springer-Lehrbuch, Springer, - Hungerford, T. W.: Algebra, Graduate Texts in Mathematics, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least every second academic year in the summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-08	Algebraic topology	Director of the Institute of Geometry id.geometrie@tu-dresden.de
Qualification objectives	Students have a sound knowledge of the most important notions and theorems of set-theoretic and algebraic topology. They are able to apply the learned geometric, algebraic and topological methods precisely and independently and have a basic understanding of the connection with other areas of mathematics.	
Content	The module covers basic methods, concepts, and theorems of algebraic topology.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in linear algebra and group theory at the Bachelor's level is required. Literature (german and english): - Bosch, S.: Lineare Algebra, Springer-Lehrbuch, Springer, - Jänich, K.: Lineare Algebra, Springer-Lehrbuch, Springer, - Hungerford, T. W.: Algebra, Graduate Texts in Mathematics, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least every second academic year in the winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-09	Groups and geometry	Director of the Institute of Geometry id.geometrie@tu-dresden.de
Qualification objectives	Students have a sound knowledge of the most important notions and theorems of geometric group theory and the theory of Lie groups and algebras. They are able to apply the learned geometric, algebraic and analytical methods precisely and independently and have a basic understanding of the connection with other areas of mathematics.	
Content	Contents of the module are basic methods, concepts and theorems of the theory of symmetries of geometric structures.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in in geometry and algebraic structures at the Bachelor's level is required. Literature (german and english): - Bosch, S.: Lineare Algebra, Springer-Lehrbuch, Springer, - Bosch, S.: Algebra, Springer-Lehrbuch, Springer, - Hungerford, T. W.: Algebra, Graduate Texts in Mathematics, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least every second academic year in the summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-10	Algebraic methods in geometry	Director of the Institute of Geometry id.geometrie@tu-dresden.de
Qualification objectives	Students have a sound knowledge of the most important notions and theorems of algebraic, algorithmic and combinatorial geometry. They are able to apply geometric, algebraic, algorithmic and combinatorial methods precisely and independently and have a basic understanding of the connections with other areas of mathematics. They are able to formulate precise definitions, give proofs and apply the methods to examples.	
Content	The module covers basic methods, concepts and theorems of algebraic geometry, real algebraic geometry, algorithmic geometry and combinatorial geometry.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in in geometry and algebraic structures at the Bachelor's level is required. Literature (german and english): - Bosch, S.: Algebra, Springer-Lehrbuch, Springer, - Shafarevich, I. R.: Basic Algebraic Geometry, Springer, - Hungerford, T. W.: Algebra, Graduate Texts in Mathematics, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least every second academic year in the winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-11	Real algebra	Director of the Institute of Geometry id.geometrie@tu-dresden.de
Qualification objectives	Students have a sound knowledge of the most important concepts and theorems of real algebra. They are able to apply the methods of real algebra and semialgebraic geometry accurately and independently, and have a basic understanding of the connections with other areas of mathematics. They are able to formulate precise definitions, give proofs, and apply the methods to examples.	
Content	The module covers basic methods, concepts, and theorems of real algebra and semialgebraic geometry.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in geometry at the Bachelor's level is required. Literature (german and english): - Bosch, S.: Lineare Algebra, Springer-Lehrbuch, Springer, - Jänich, K.: Lineare Algebra, Springer-Lehrbuch, Springer, - Hungerford, T. W.: Algebra, Graduate Texts in Mathematics, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least every second academic year in the summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-12	Functional analysis	Director of the Institute for Analysis id.analysis@tu-dresden.de
Qualification objectives	Students have a sound knowledge of the concepts and techniques of functional analysis. They have a solid competence in recognizing, independently analyzing, processing and applying functional analysis problems and structures. They possess general problem solving and analytical thinking skills.	
Content	The module covers concepts from selected areas of functional analysis. These areas include for example operator theory and spectral theory, theory of Banach algebras and C*-algebras, theory of C_0-semigroups, geometry of Banach spaces, theory of topological vector spaces and their respective applications.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in analysis at the Bachelor's level is required. Literature (german and english): - Amann, H. / Escher, J.: Analysis. I, II, III, Birkhäuser Verlag, 2005, 2008, 2009, - Brezis: Functional analysis, Sobolev spaces and partial differential equations, Springer, 2011, - Werner, D.: Funktionalanalysis, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-13	Methods of functional analysis	Director of the Institute for Analysis id.analysis@tu-dresden.de
Qualification objectives	Students understand the connections between basic and advanced functional analysis concepts. They are able to analyze and address specific functional analysis questions using advanced methods and to identify and formulate open questions.	
Content	The module covers advanced concepts and applications of functional analysis based on fundamental functional analytic ideas. These include, for example, nonlinear functional analysis, and here in particular the theory of nonlinear semigroups and nonlinear evolution equations, harmonic analysis on Banach spaces, interpolation theory, and the theory of ordered vector lattices.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in analysis at the Bachelor's level is required. Literature (german and english): - Amann, H. / Escher, J.: Analysis. I, II, III, Birkhäuser Verlag, 2005, 2008, 2009, - Brezis: Functional analysis, Sobolev spaces and partial differential equations, Springer, 2011, - Werner, D.: Funktionalanalysis, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-14	Nonlinear analysis	Director of the Institute of Geometry id.geometrie@tu-dresden.de
Qualification objectives	Students have a sound knowledge of the concepts and techniques of nonlinear analysis. They have a solid competence to independently analyze and work on specific problems from this area and to identify and formulate open questions.	
Content	The module covers fundamental and advanced results of nonlinear analysis, typical ways of thinking, and applications.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in analysis and differential equations at the Bachelor's level is required. Literature (german and english): - Königsberger, K.: Analysis 1+2, Springer, - Werner, D.: Funktionalanalysis, Springer, - Evans, L. C.: Partial Differential Equations, AMS.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	**Module name**	**Responsible lecturer**
Math-Ma-15	Methods of analysis	Director of the Institute of Geometry id.geometrie@tu-dresden.de
Qualification objectives	Students understand the connections between basic and advanced concepts in analysis. They have a solid competence to analyze and work independently on specific problems in the field and to identify and formulate open questions.	
Content	The module covers fundamental and advanced results of nonlinear analysis, typical ways of thinking, and applications.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in analysis and differential equations at the Bachelor's level is required. Literature (german and english): - Königsberger, K.: Analysis 1+2, Springer, - Werner, D.: Funktionalanalysis, Springer, - Evans, L. C.: Partial Differential Equations, AMS.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-16	Partial differential equations	Director of the Institute of Geometry id.geometrie@tu-dresden.de
Qualification objectives	Students have a sound knowledge of concepts and techniques in the field of partial differential equations. They have a solid competence to independently analyze and work on specific problems in this field and to identify and formulate open questions.	
Content	Contents of the module are concepts from selected areas of the theory of partial differential equations, typical ways of thinking and applications.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in analysis and differential equations at the Bachelor's level is required. Literature (german and english): - Königsberger, K.: Analysis 1+2, Springer, - Werner, D.: Funktionalanalysis, Springer, - Evans, L. C.: Partial Differential Equations, AMS.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master's degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least every second academic year in the winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-17	Methods for partial differential equations	Director of the Institute of Geometry id.geometrie@tu-dresden.de
Qualification objectives	Students understand the connections between basic and advanced concepts and techniques in the field of partial differential equations. They have a solid competence to independently analyze and work on specific problems in this area and to identify and formulate open questions.	
Content	The module covers advanced methods and applications of the theory of partial differential equations based on fundamental and important ways of thinking.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in analysis and differential equations at the Bachelor's level is required. Literature (german and english): - Königsberger, K.: Analysis 1+2, Springer, - Werner, D.: Funktionalanalysis, Springer, - Evans, L. C.: Partial Differential Equations, AMS.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least every second academic year in the summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-18	Dynamical systems – Basic concepts	Director of the Institute for Analysis id.analysis@tu-dresden.de
Qualification objectives	Students have a systematic understanding of the concepts of stability theory, a sound understanding of linearization techniques, a clear idea of bifurcation scenarios and their practical and theoretical relevance, and are able to independently analyze and solve mathematical problems from the theory of dynamical systems.	
Content	The module covers basic concepts of dynamical systems theory, linear and nonlinear theory, such as stability theory, bifurcation theory, and control theory.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in ordinary differential equations at the Bachelor's level is required. Literature (german and english): - Lang, S.: Real and functional analysis, Springer, - Aulbach, B.: Gewöhnliche Differenzialgleichungen, Spektrum Akademischer Verlag, Kapitel 1 – 6.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master's degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-19	Dynamical systems – Modern concepts and applications	Director of the Institute for Analysis id.analysis@tu-dresden.de
Qualification objectives	Students have a sound understanding of modern techniques from the field of dynamical systems and a solid competence to work independently on applied problems from the theory of dynamical systems.	
Content	The module covers advanced concepts of dynamical systems theory, such as non-autonomous dynamics, as well as applications in biology, fluid mechanics, or control theory.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in ordinary differential equations at the Bachelor's level is required. Literature (german and english): - Lang, S.: Real and functional analysis, Springer, - Aulbach, B.: Gewöhnliche Differenzialgleichungen, Spektrum Akademischer Verlag, Kapitel 1 – 6.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master's degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-28	Numerical methods for partial differential equations – Basic concepts	Director of the Institute for Numerical Mathematics id.numerik@tu-dresden.de
Qualification objectives	Students are able to independently analyze and numerically solve concrete elliptic problems by choosing appropriate discretization techniques in appropriate Sobolev spaces, and to apply error estimation techniques and adaptive discretization techniques to problems involving partial differential equations.	
Content	The module covers discretization techniques for elliptic problems, a-priori and a-posteriori error estimation techniques, selected properties of Sobolev spaces, and basic principles of convergence analysis.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in the numerics of ordinary differential equations, Hilbert spaces, and linear operators at the Bachelor's level is required. Literature (german and english): - Deuflhard, P. / Bornemann, F.: Scientific Computing with Ordinary Differential Equations, Springer, - Alt, H. W.: Linear Functional Analysis - An Application-Oriented Introduction, Springer, - Deuflhard, P. / Bornemann, F.: Numerische Mathematik 2: Gewöhnliche Differentialgleichungen, De Gruyter, - Alt, H. W.: Lineare Funktionalanalysis, Springer.	
Applicability	This module is a compulsory module in the Master’s degree program Technomathematics. Furthermore, this module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected. The module is a prerequisite for participation in the module Numerical methods for partial differential equations – Advanced concepts.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	

Workload	The workload comprises a total of 180 hours.
Module duration	The module comprises one semester.

Module number	Module name	Responsible lecturer
Math-Ma-29	Numerical methods for partial differential equations – Advanced concepts	Director of the Institute for Numerical Mathematics id.numerik@tu-dresden.de
Qualification objectives	Students have a systematic understanding of basic models, are able to adapt discretization techniques to specific models, and have a clear idea of recent developments and current issues. They are able to analyze concrete problems independently and to solve them numerically with the provided techniques, and they know the perspectives and limits of the treated methods with respect to efficiency and accuracy.	
Content	The module covers advanced concepts in the analytical and numerical treatment of problems with partial differential equations, such as the analysis and numerics of model-adaptive discretization techniques, and the theory and numerics of optimal control problems.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge of the numerics of partial differential equations acquired in the module Numerical Methods for Partial Differential Equations – Basic Concepts is required.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master's degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-30	Mathematical methods in continuum mechanics	Director of the Institute for Scientific Computing id.wir@tu-dresden.de
Qualification objectives	Students have a sound knowledge of the equations of continuum mechanics and their analytical properties. They are familiar with the mathematical methods used in continuum mechanics and are able to present and apply them. They have a solid competence to analyze and work on mathematical problems independently, to transfer them to new phenomena and to find solutions.	
Content	The module covers the continuum mechanical modeling of fluids and solids. Further topics are the derivation of models for solids and fluids, e.g. linear and nonlinear elasticity, plasticity, Stokes, Euler, Navier-Stokes, and their investigation by methods of partial differential equations and variational calculus. In addition, the module includes current concepts and problems, e.g. in the field of multiscale analysis.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in functional analysis and partial differential equations at the Bachelor's level is required. Literature (german and english): - Alt, H. W.: Linear Functional Analysis - An Application-Oriented Introduction, Springer, - Alt, H. W.: Lineare Funktionalanalysis, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a non-public oral examination lasting 25 minutes as an individual examination. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	
Workload	The workload comprises a total of 180 hours.	

Module duration	The module comprises one semester.

Module number	Module name	Responsible lecturer
Math-Ma-31	Finite element methods – Theory, implementation and applications	Director of the Institute for Scientific Computing id.wir@tu-dresden.de
Qualification objectives	The students have a systematic understanding of the theory of the Finite Element Method (FEM), in particular of convergence results. They have knowledge of algorithmic issues and implementation aspects in finite element software and have basic knowledge and experience in modeling application-oriented problems, e.g. from the fields of fluid mechanics and materials science. Students are able to independently analyze specific problems from the application areas covered and to solve them using appropriate FE methods.	
Content	The module covers theory and practice of the finite element method, in particular variational formulation, discretization, convergence, numerical implementation and application.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in numerics of ordinary differential equations at the Bachelor's level is required. Literature (german and english): - Gerald, Wheatley: Applied Numerical Analysis (chapters 1-6), Pearson, 2003, or Ferziger: Numerical Methods for Engineering Application (Chapters 1-5), Wiley, 1998, - Roos, H.-G. / Schwetlick, H.: Numerische Mathematik, Teubner.	
Applicability	This module is a compulsory module in the Master’s degree program Technomathematics. Furthermore, this module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. For more than 10 registered students, the module examination consists of a written test lasting 120 minutes. For up to 10 registered students, the written test will be replaced by a non-public oral examination lasting 25 minutes as an individual examination. The type of examination will be announced in writing at the end of the registration period. The language of the examination corresponds to the language of teaching determined at the beginning of the semester.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	

Workload	The workload comprises a total of 180 hours.
Module duration	The module comprises one semester.

Module number	Module name	Responsible lecturer
Math-Ma-32	Scientific computing – Advanced concepts	Director of the Institute for Scientific Computing id.wir@tu-dresden.de
Qualification objectives	The students have a systematic understanding of modeling concepts and know appropriate numerical methods and their theoretical foundations. They have basic experience in the algorithmic implementation of selected methods and their application to relevant problems.	
Content	The module covers aspects of mathematical modeling and theoretical and practical aspects of numerical methods.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in modelling and simulation as well as in partial differential equations at the Bachelor's level is required. Literature (german and english): - Eck, C. / Garcke, H. / Knabner, P.:Mathematical Modeling, Springer, - Eck, C. / Garcke, H. / Knabner, P.: Mathematische Modellierung, Springer.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master's degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. For more than 20 registered students, the module examination consists of a written test lasting 90 minutes. For up to 20 registered students, the written test will be replaced by a non-public oral examination lasting 25 minutes as an individual examination. The type of examination will be announced in writing at the end of the registration period. The language of the examination corresponds to the language of teaching determined at the beginning of the semester.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-33	Scientific programming – Advanced concepts	Director of the Institute for Scientific Computing id.wir@tu-dresden.de
Qualification objectives	Students have a systematic understanding of aspects of software development for the efficient implementation of numerical algorithms. They have experience in evaluating, using, and extending such software.	
Content	The module covers aspects of software development, such as programming on high-performance computers, object-oriented programming, or template-based programming.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in modelling and simulation at the Bachelor's level is required. Literature (german and english): - Cormen, T. H. / Leiserson, C. E. / Rivest, R. L. / Stein, C.: Introduction to Algorithms, MIT Press (4th ed. 2022, 3rd ed. 2009), - Cormen, T. H. / Leiserson, C. E. / Rivest, R. L. / Stein, C.: Algorithmen - eine Einführung Introduction to Algorithms, Übersetzung Molitor, P. / Lippert, K., Oldenbourg Verlag, 2013, - Goldberg, D.: What Every Computer Scientist Should Know About Floating-Point Arithmetic, ACM Computing Surveys 23 (1), 1991.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master's degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. For more than 20 registered students, the module examination consists of a written test lasting 90 minutes. For up to 20 registered students, the written test will be replaced by a non-public oral examination lasting 25 minutes as an individual examination. The type of examination will be announced in writing at the end of the registration period. The language of the examination corresponds to the language of teaching determined at the beginning of the semester.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once in four consecutive semesters.	

Workload	The workload comprises a total of 180 hours.
Module duration	The module comprises one semester.

Module number	**Module name**	**Responsible lecturer**
Math-Ma-34	Models and methods of applied mathematics	Dean of Studies of the Master's study programmes in Mathematics studiendekan.math@tu-dresden.de
Qualification objectives	Students are able to familiarize themselves with the mathematical foundations of models and methods and to recognize prerequisites for the applicability of methods in general and in specific contexts. Students are able to analyze and evaluate the quality or efficiency of methods. With regard to applications, students know the possibilities and limitations of certain models and mathematical methods.	
Content	Depending on the student's choice, the module covers a special area of applied mathematics selected from the catalog „Models and methods of applied mathematics“, such as Analysis, Algebra, Differential equations, Discrete mathematics, Financial and economic mathematics, Geometry, Numerical mathematics, Modeling and simulation, Optimization, or Stochastics. It also includes connections to other areas of mathematics, engineering, or industry and business.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The mathematical specialization and the corresponding courses are to be chosen from the catalogue Models and methods of applied mathematics. This catalogue will be announced at the beginning of each semester in the usual manner. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in mathematics at the Bachelor's level is required.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a complex assessment equating to 15 hours. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once per academic year.	
Workload	The workload comprises a total of 180 hours.	

Module duration	The module comprises one semester.

Module number	Module name	Responsible lecturer
Math-Ma-35	Models and methods of pure mathematics	Dean of Studies of the Master's study programmes in Mathematics studiendekan.math@tu-dresden.de
Qualification objectives	Students are able to familiarize themselves with the mathematical foundations of models, structures and methods and to recognize the prerequisites for the applicability of methods in general and in specific contexts. Students are able to analyze and evaluate models, structures and methods with regard to their possibilities, limitations and usefulness.	
Content	Depending on the student's choice, the module covers a special area of pure mathematics selected from the catalog „Models and methods of pure mathematics“, such as Analysis, Algebra, Differential equations, Discrete mathematics, Financial and economic mathematics, Geometry, Numerical mathematics, Modeling and simulation, Optimization, or Stochastics. This includes connections to other areas of mathematics or the sciences.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The mathematical specialization and the corresponding courses are to be chosen from the catalogue Models and methods of pure mathematics. This catalogue will be announced at the beginning of each semester in the usual manner. The lectures and the exercises will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge in mathematics at the Bachelor's level is required.	
Applicability	This module is one of 35 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics, of which modules with a total of at least 66 credit points must be selected. Furthermore, this module is one of 34 compulsory elective modules in the compulsory elective area M of the Master’s degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. In addition, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master’s degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a complex assessment equating to 15 hours. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered at least once per academic year.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-MI	Mathematical Internship	Dean of Studies of the Master's study programmes in Mathematics studiendekan.math@tu-dresden.de
Qualification objectives	Students have insight into practical tasks, processes and frameworks related to mathematical activities. They are aware of possible career fields, have extended their existing knowledge in practice and can apply it. They can reflect on practical work experience and relate it to the knowledge acquired in the core area. Students have the ability to take on new tasks, navigate unfamiliar environments and fit into unfamiliar teams. Their communication and self-organization skills will be strengthened.	
Content	The module covers the practical application of acquired theoretical knowledge in mathematical fields of activity, where students gain their own experience in a professional environment and bring it into professional practice.	
Teaching and learning methods	The module comprises 160 hours (4 weeks) of internship and self-study.	
Prerequisites for participation	None.	
Applicability	This module is one of 34 compulsory elective modules in the compulsory elective area M of the Master's degree program Technomathematics, of which modules with a total of at least 42 credit points must be selected. Furthermore, this module is one of 31 compulsory elective modules in the compulsory elective area M of the Master's degree program Mathematics in Business and Economics, of which modules with a total of at least 24 credit points must be selected.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of an ungraded portfolio equating to 10 hours. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module examination will be graded as either "pass" or "fail".	
Module frequency	The module is offered each semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-RBI	Research and Business Internship	Dean of Studies of the Master's study programmes in Mathematics studiendekan.math@tu-dresden.de
Qualification objectives	Students have insight into practical tasks, processes and frameworks related to the application of mathematical topics. They are aware of possible areas of employment, have expanded their existing knowledge in a company or research institution and are able to apply it. They are able to reflect on their practical work experience and relate it to the knowledge they have acquired in the core area. Students have the ability to face new tasks and applications, to navigate in unfamiliar environments, and to fit into unfamiliar teams. Their communication and self-organization skills are strengthened.	
Content	The module covers the practical application of acquired knowledge in mathematical fields of activity, companies, enterprises, research institutions and similar institutions, where students gain their own experience in a professional non-university environment and bring it into professional practice.	
Teaching and learning methods	The module comprises 160 hours (4 weeks) of internship and self-study.	
Prerequisites for participation	None.	
Applicability	In the compulsory elective area N of the Master's program Technomathematics, in which modules with a total of at least 24 credit points are to be chosen, the module is one of eight compulsory elective modules in the specialization Electrical Engineering - Basic, one of eight compulsory elective modules in the specialization Electrical Engineering - Advanced, one of nine compulsory elective modules in the specialization Computer Science - Basic, one of ten compulsory elective modules in the specialization Computer Science - Advanced, one of six compulsory elective modules in the specialization Mechanical Engineering - Basic, one of eight compulsory elective modules in the specialization Mechanical Engineering - Advanced, one of eight compulsory elective modules in the specialization Physics - Basic and one of seven compulsory elective modules in the specialization Physics - Advanced. In the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules of at least 24 credit points have to be chosen, the module is one of eleven compulsory elective modules in the specialization Business and Economics - Basic and one of 15 compulsory elective modules in the specialization Business and Economics - Advanced.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of an ungraded portfolio equating to 10 hours. The language of the examination is German or English, at the student's choice.	
Credit points and grades	Participants can earn six credit points for this module. The module examination will be graded as either “pass” or “fail”.	
Module frequency	The module is offered each semester.	

Workload	The workload comprises a total of 180 hours.
Module duration	The module comprises one semester.

Module number	Module name	Responsible lecturer
Math-Ma-B01	Introduction to Business Administration and Organization	Prof. Michael Schefczyk michael.schefczyk@tu-dresden.de
Qualification objectives	Students have a basic knowledge of the terms and principles of business administration and the fundamentals of organizational management. They have methodological tools and systematic orientation. Students are able to deal with business management issues successfully, recognize organizational management problems, and evaluate the effectiveness of organizational design measures.	
Content	The module covers the fundamentals of business administration and organizational management, including legal forms, innovation and property rights, project management, production and procurement, market and competition, service management, marketing, controlling, technology management, investment and financing, organizational forms and networks, task and work system design, performance motivation and organizational change.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week tutorial and self-study. The lecture and the tutorial will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	None.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of ten compulsory elective modules in the specialization Business and Economics – Basic. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of eleven compulsory elective modules in the specialization Business and Economics – Basic. The module cannot be chosen if it has already been taken in the Bachelor's program. The module is a prerequisite for participation in the modules Financial Statements, Investment and Financing, Manufacturing and Logistics as well as Corporate Decisions.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 120 minutes. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B02	Basics of Accounting	Prof. Thomas Günther lehrstuhl.controlling@tu-dresden.de
Qualification objectives	The students have basic knowledge of internal and external accounting. The independent and guided solution of (exercise) tasks enabled them to understand problems and issues in corporate context and apply the learned solution approaches to them.	
Content	The module covers external accounting, the structure of corporate financial accounting, the presentation of individual business transactions in financial accounting, and the relationship between the balance sheet and the income statement. Concerning internal accounting, it addresses the structure of cost and activity accounting in companies, the procedures of cost type, cost center, and cost unit accounting, and the problem-oriented design of cost and activity accounting in companies.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 3 hours per week exercise and self-study. The lecture and the exercise will be held in German.	
Prerequisites for participation	None.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of ten compulsory elective modules in the specialization Business and Economics – Basic. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of eleven compulsory elective modules in the specialization Business and Economics – Basic. The module cannot be chosen if it has already been taken in the Bachelor's program. The module is a prerequisite for participation in the modules Financial Statements, Investment and Financing as well as Manufacturing and Logistics.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 120 minutes. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B03	Financial Statements, Investment and Financing	Prof. Michael Dobler wus@mailbox.tu-dresden.de
Qualification objectives	Students can present the fundamentals, central regulations, and instruments of annual financial statements under the German Commercial Code and German tax law and use this knowledge problem-oriented when preparing and analyzing annual financial statements. They can explain different investment methods, compare them on a case-by-case basis, and calculate the profitability of investment projects. They understand the methods of financial planning and know the possibilities of satisfying companies' financial and capital requirements via various forms of external and internal financing.	
Content	The module covers the theoretical principles of external accounting in the area of annual financial statements, the commercial law provisions for merchants and corporations, and the main differences in accounting between German commercial law and German tax law. In the area of investment and financing, the module focuses on the theoretical and mathematical foundations of finance, investment processes and methods for investment decisions, and the possibilities of corporate financing.	
Teaching and learning methods	The module comprises 3 hours per week lecture, 1 hour per week exercise and self-study. The lecture and the exercise will be held in German.	
Prerequisites for participation	Participants require skills acquired in the modules Introduction to Business Administration and Organization as well as Basics of Accounting.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of ten compulsory elective modules in the specialization Business and Economics – Basic. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of eleven compulsory elective modules in the specialization Business and Economics – Basic. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 120 minutes. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B04	Manufacturing and Logistics	Prof. Udo Buscher udo.buscher@tu-dresden.de
Qualification objectives	The students know essential tasks in the subject areas of production and logistics. They understand the theoretical basis for analyzing production processes and cost changes, can carry out production program planning and design production processes effectively and efficiently, considering the selected manufacturing organization. Students know analysis and design principles for the logistics system, its subsystems and rules for coordination logistics processes. They can apply quantitative methods in logistics to model practical logistics problems and solve them using suitable mathematical methods.	
Content	The module includes the following topics - Production and Cost theory, - Program Planning, - Supply Planning, - Execution Planning, - Building blocks of Enterprise Logistics, - Fundamentals of Network Optimization, - selected applications of Distribution Logistics, and - Fundamentals of Procurement Logistics.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 2 hours per week exercise and self-study. The lecture and the exercise will be held in German.	
Prerequisites for participation	Participants require skills acquired in the modules Introduction to Business Administration and Organization as well as Basics of Accounting.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of ten compulsory elective modules in the specialization Business and Economics – Basic. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of eleven compulsory elective modules in the specialization Business and Economics – Basic. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 120 minutes. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B05	Introduction to Economics	Prof. Marcel Thum marcel.thum@tu-dresden.de
Qualification objectives	The students have basic knowledge in economics. They can identify recognize economic problems and present them appropriately.	
Content	This module covers central economic concepts, basic economic methods and applications of micro- and macroeconomic problems.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 1 hour per week exercise and self-study. The lecture and the exercise will be held in German.	
Prerequisites for participation	None.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of ten compulsory elective modules in the specialization Business and Economics – Basic. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of eleven compulsory elective modules in the specialization Business and Economics – Basic. The module cannot be chosen if it has already been taken in the Bachelor's program. The module is a prerequisite for participation in the modules Introduction to Microeconomics, Strategy and Competition, Introduction to Macroeconomics as well as Econometrics – Basics.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 90 minutes. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B06	Introduction to Microeconomics	Prof. Christian Leßmann christian.lessmann@tu-dresden.de
Qualification objectives	Students are familiar with the basic concepts of microeconomics. They are able to understand and analyze the decisions of single households and firms and apply them to other contexts.	
Content	The module covers the fundamentals of household and production theory and of welfare economics.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 1 hour per week exercise and self-study. The lecture and the exercise will be held in German.	
Prerequisites for participation	Participants require skills acquired in the module Introduction to Economics.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of ten compulsory elective modules in the specialization Business and Economics – Basic. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of eleven compulsory elective modules in the specialization Business and Economics – Basic. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 90 minutes. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B07	Strategy and Competition	Prof. Alexander Kemnitz alexander.kemnitz@tu-dresden.de
Qualification objectives	Students understand the basics of price and competition theory. They are able to explain the results of market processes depending on the number and level of information of market participants and have a basic understanding of the analysis of strategic decision situations.	
Content	The module covers the following topics - Fundamentals of monopolistic and monopsonistic pricing, - Oligopoly and monopolistic competition, - Game Theory, - Asymmetric information.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 1 hour per week exercise and self-study. The lecture and the exercise will be held in German.	
Prerequisites for participation	Participants require skills acquired in the module Introduction to Economics.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of ten compulsory elective modules in the specialization Business and Economics – Basic. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of eleven compulsory elective modules in the specialization Business and Economics – Basic. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 90 minutes. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B08	Introduction to Macroeconomics	Prof. Stefan Eichler stefan.eichler@tu-dresden.de
Qualification objectives	Students can analyze macroeconomic relationships by models and interpret and graphically represent the results. They can derive the economic consequences of changes in economic policy or exogenous framework conditions in model frameworks and explain them for practical purposes.	
Content	The module covers the fundamentals of macroeconomic analysis. This includes national accounts, the interaction of supply and demand in goods and money markets in open and closed economies, the mechanisms of interaction between monetary and fiscal policies, and economic growth.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 1 hour per week exercise and self-study. The lecture and the exercise will be held in German.	
Prerequisites for participation	Participants require mathematical knowledge at university entrance-level proficiency as well as the skills acquired in the module Introduction to Economics.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of ten compulsory elective modules in the specialization Business and Economics – Basic. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of eleven compulsory elective modules in the specialization Business and Economics – Basic. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 90 minutes. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B09	Econometrics – Basics	Prof. Bernhard Schipp econometrics@tu-dresden.de
Qualification objectives	Students can interpret basic econometric models, apply them to economic problems, and interpret the results.	
Content	The module includes the following topics - Interval Estimators and Hypothesis Testing, - Linear Multiple Regression Models, - Hypothesis testing in Multiple Linear Regression Models, - Structural breaks and Indicator Variables, and - Forecasting Models.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 1 hour per week exercise and self-study. The lecture and the exercise will be held in German.	
Prerequisites for participation	Participants require mathematical knowledge at university entrance-level proficiency as well as the skills acquired in the module Introduction to Economics.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of ten compulsory elective modules in the specialization Business and Economics – Basic. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of eleven compulsory elective modules in the specialization Business and Economics – Basic. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 90 minutes. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B10	Corporate Decisions	Prof. Rainer Lasch logistik@mailbox.tu-dresden.de
Qualification objectives	Students can describe basic approaches to various business decision-making situations and select and apply them appropriately to decisions under certainty, risk, and uncertainty.	
Content	The module covers - Fundamentals of Decision Theory, - Decisions in the presence of certainty, uncertainty, risk, and variable information structure, - Fundamentals of Game Theory, - Committee decisions, - Multilevel decisions.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 1 hours per week tutorial and self-study. The lecture and the tutotrial will be held in German.	
Prerequisites for participation	Participants require skills acquired in the module Introduction to Business Administration and Organization.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of ten compulsory elective modules in the specialization Business and Economics – Basic. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of eleven compulsory elective modules in the specialization Business and Economics – Basic. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 90 minutes. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B11	Introduction to Environmental Economics	Prof. Dominik Möst ee2@mailbox.tu-dresden.de
Qualification objectives	Students can reproduce basic terms, definitions, concepts, and methods of energy economics and name relevant parameters of energy sources. In addition, they can explain techno-economic relationships, concepts, and methods of renewable energies, illustrate fundamental relationships in energy economics, like Hotelling, calculate physical relationships, and analyze practical problems against an energy industry backdrop.	
Content	The module covers the basics of the energy industry in the form of fundamental terms and contexts, as well as different market forms in general and the energy industry in particular. Further contents are the value chain of both conventional (hard coal, lignite, natural gas, oil, uranium) and renewable energy sources (wind, water, solar, biomass), energy sources, and their effects on the energy industry. Moreover, it covers the final energy carriers electricity, heat, and mobility, their energy-economic context, and case studies on practical and current topics from the energy industry.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 2 hours per week exercise and self-study. The lecture and the exercise will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge of business administration at the Bachelor's level of the Business Administration and Economics program is required.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a portfolio equating to 15 hours. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B12	Distribution Logistics	Prof. Rainer Lasch logistik@mailbox.tu-dresden.de
Qualification objectives	Students have in-depth knowledge of logistics. They can apply quantitative methods for the design and optimization of transport and transshipment problems, network flow problems, round trip and tour problems, and location management. In addition, they will be able to solve problems in physical distribution. Furthermore, students can apply presentation and rhetoric techniques.	
Content	The module covers in particular - Transportation and transshipment Planning - Network Flow Planning - Round Trip and Tour Planning - Location Management, and - physical distribution.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 2 hours per week exercise and self-study. The lecture and the exercise will be held in German.	
Prerequisites for participation	Knowledge of business administration at the Bachelor's level of the Business Administration and Economics program is required.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a complex assessment equating to 15 hours. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B13	Production Logistics	Prof. Rainer Lasch logistik@mailbox.tu-dresden.de
Qualification objectives	Students understand basic principles and planning aspects for internal transport, storage, order picking, various production technologies and production planning and control systems. They can describe the respective technologies and systems in a problem-related way. They can select and apply models and procedures of lot sizing and detailed planning and describe, compare, and use concepts of production control. Furthermore, students can apply presentation and rhetoric techniques.	
Content	In particular, the module covers - Internal transportation systems, - storage systems - order picking systems, - production technologies, - Production Planning and Control Systems, - lot size planning methods and models, - detailed planning methods and models, and - production control concepts.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 2 hours per week exercise and self-study. The lecture and the exercise will be held in German.	
Prerequisites for participation	Knowledge of business administration at the Bachelor's level of the Business Administration and Economics program is required.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a complex assessment equating to 15 hours. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B14	Time Series Econometrics	Prof. Bernhard Schipp econometrics@tu-dresden.de
Qualification objectives	Students can apply and evaluate the procedures of time series econometrics. Moreover, they can plan the empirical approach for a given research question.	
Content	The module covers - Fundamentals of stochastic processes, - Autoregressive-Integrated-Moving-Average-Models, - Generalized Autoregressive Conditional Heteroscedasticity Models, - Vector Autoregressive Models, and - continuous-time models. The application of these concepts and methods to economic problems is also covered.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 2 hours per week exercise, and self-study. The lecture and the exercise will be held either in German or English. This will be specified by the lecturer at the beginning of each semester and announced in the usual manner.	
Prerequisites for participation	Knowledge of statistics and econometrics at the Bachelor's level of the Business Administration and Economics program is required.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. For 10 or more registered students, the module examination consists of a written test lasting 120 minutes. In case of less than 10 registered students, the written test will be replaced by a non-public oral examination lasting 20 minutes as an individual examination. The type of examination will be announced in writing at the end of the registration period. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B15	Multivariate Statistics	Prof. Bernhard Schipp econometrics@tu-dresden.de
Qualification objectives	Students can apply and evaluate the procedures of multivariate statistics. Moreover, they can plan the empirical approach for a given research question.	
Content	The module covers - Analysis of variance and covariance, - Cluster Analysis, - Discriminant Analysis, - Principal Component Analysis - Factor Analysis, - Conjoint Analysis, and - Correspondence Analysis. A further focus is on the application of these methods to problems in economics.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 2 hours per week exercise and self-study. The lecture and the exercise will be held in German.	
Prerequisites for participation	Knowledge of economics as well as knowledge of linear algebra and statistics at the Bachelor's level of the Business Administration and Economics program is required.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 120 minutes. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B16	Econometrics – Advanced Course	Prof. Bernhard Schipp econometrics@tu-dresden.de
Qualification objectives	Students master the application and interpretation of basic econometric models. They can independently analyze the assumptions necessary for correctly applying econometric models, select the methodology suitable to the problem, and interpret the results.	
Content	The module covers extensions to the multiple linear regression model that are used to solve problems in the linear regression model. These include - Autocorrelation, - Heteroscedasticity - Multicollinearity, and - Structural breaks. Regression diagnostics are also included.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 1 hour per week exercise and self-study. The lecture and the exercise will be held in German.	
Prerequisites for participation	Knowledge of economics as well as knowledge of linear algebra and statistics at the Bachelor's level of the Business Administration and Economics program is required.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. For 10 or more registered students, the module examination consists of a written test lasting 90 minutes. In case of less than 10 registered students, the written test will be replaced by a non-public oral examination lasting 20 minutes as an individual examination. The type of examination will be announced in writing at the end of the registration period. The language of the examination is German.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B17	Operations Research and Logistics	Prof. Jörn Schönberger joern.schoenberger@tu-dresden.de
Qualification objectives	The students know a variety of methods and models available to solve diverse optimization problems. Furthermore, students are able to use optimization software to solve complex problems.	
Content	The module's content includes the design and planning of transportation networks, transportation planning and program design, basic models of vehicle deployment planning, integrated planning of self-routing and subcontracting, and the design of freight rates.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 2 hours per week exercise and self-study. The lecture and the exercise will be held in English.	
Prerequisites for participation	Basic knowledge of operations research at the Bachelor's level of the Transport Economics program is required. The following literature is recommended for preparation: - Ivanov, D. / Tsipoulanidis, A. / Schönberger, J.: Global Supply Chain and Operations Management - A Decision-Oriented Introduction to the Creation of Value, Springer, newest edition.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program. The module is a prerequisite for participation in the modules Decision Support in Transportation Logistics as well as Management of Public Transport Systems and Services.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a complex assessment equating to 75 hours. The language of the examination is English.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B18	Decision Support in Transportation Logistics	Prof. Jörn Schönberger joern.schoenberger@tu-dresden.de
Qualification objectives	The students know the design concepts of algebraic search methods for decision problems. Furthermore, they understand the conception and realization of modern search methods of artificial intelligence, such as evolutionary and genetic search, local search, ant algorithms, etc. and are able to design and implement prototypical search methods for selected decision problems from (transport) logistics. The students can work on complex, practical decision problems by applying search procedures and derive concrete proposals for action. They possess indepth skills in the use of software and programming languages (media competence). Furthermore, the students are strengthened in their personality.	
Content	In logistics, many complicated and interrelated decision problems arise connected with the conception, planning, and execution of transports (of persons and goods). These problems can be represented (modeled) in an algebraically compact way. However, solving these models using standard solution methods ("black-box solvers") is not possible because either the necessary structural model properties are not available or the available solution time is not sufficient. In such a situation, the design and implementation of so-called problem-specific heuristics has to be considered. This will be discussed with reference to current research.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 2 hours per week exercise and self-study. The lecture and the exercise will be held in English.	
Prerequisites for participation	Participants require skills acquired in the module Operations Research and Logistics. Knowledge of a higher level programming language (ideally C++) at the Bachelor's level of the Transport Economics program is also required. The following literature is recommended for preparation: - Stroustrup, B.: Programming: Principles and Practice Using C++, Addison Wesley, newest edition.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a complex assessment equating to 75 hours. The language of the examination is English.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	

Module frequency	The module is offered each summer semester.
Workload	The workload comprises a total of 180 hours.
Module duration	The module comprises one semester.

Module number	Module name	Responsible lecturer
Math-Ma-B19	Management of Public Transport Systems and Services	Prof. Jörn Schönberger joern.schoenberger@tu-dresden.de
Qualification objectives	Students are familiar with the decision problems that arise in the context of the design, configuration, and operation of passenger transportation systems. They have an insight into the algebraic modeling of these decision situations and can apply techniques and tools with which the complex models can be solved. Students are able to select and apply the modeling and decision-making techniques they have learned in a goal-oriented manner. Furthermore, the students are strengthened in their personality.	
Content	Module contents are the planning of infrastructure, especially the definition of line routes. Other content includes timetabling, planning of staff deployment based on the defined service provision processes, specification of the public transport products offered, and an overview of challenges arising from the operating concepts for shared mobility systems. The content is based on the current state of research.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 2 hours per week exercise and self-study. The lecture and the exercise will be held in English.	
Prerequisites for participation	Participants require skills acquired in the module Operations Research and Logistics, as well as basic knowledge of programming at the Bachelor's level of the subject Transport Economics, e.g. VBA, PHP, Java, C++, as taught in the module programming at the Bachelor's level of the Transport Economics program. The following literature is recommended for preparation: - Stroustrup, B.: Programming: Principles and Practice Using C++, Addison Wesley, newest edition.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a complex assessment equating to 75 hours. The language of the examination is English.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	

Module duration	The module comprises one semester.

Module number	Module name	Responsible lecturer
Math-Ma-B20	Theoretical Multivariate Statistics	Prof. Ostap Okhrin ostap.okhrin@tu-dresden.de
Qualification objectives	Students will be able to apply procedures that are commonly used in describing multivariate data. Students are familiar with the following topics and methods: matrix algebra, regression analysis, simple analysis of variance, general and specific multivariate distributions, copulas, theory of multivariate normal distribution, estimation theory, hypothesis testing. Furthermore, students acquire mathematical and statistical foundations to understand other procedures such as cluster analysis, principal component analysis and other methods.	
Content	The module's content are procedures of theoretical multivariate statistics and their methods of analysis.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 2 hours per week exercise and self-study. The lecture and the exercise will be held in English.	
Prerequisites for participation	Knowledge of mathematics and statistics at the Bachelor's level of the Transport Economics program is required. The following literature is recommended for preparation: - Sydsaeter, K. / Hammond, P.: Essential Mathematics for Economic Analysis, Financial Times Prentice Hall, Harlow, newest edition. - Härdle, W. K. / Okhrin, O. / Okhrin, Y.: Basic Elements of Computational Statistics, Springer, 2017.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program. The module is a prerequisite for participation in the module Applied Multivariate Statistics.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 120 minutes. The language of the examination is English.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B21	Applied Multivariate Statistics	Prof. Ostap Okhrin ostap.okhrin@tu-dresden.de
Qualification objectives	Students know the most important multivariate statistical methods, such as cluster analysis, regression analysis, analysis of variance, discriminant analysis, and factor analysis. They can apply them to real data. They also have key skills in the areas of rhetoric, presentation, and presentation techniques and possess social skills and the ability to work in a team.	
Content	The Module contents are the application of multivariate statistical methods to specific problems and the introduction to a free programming language for statistical calculations and graphics.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 2 hours per week exercise and self-study. The lecture and the exercise will be held in English.	
Prerequisites for participation	Participants require skills acquired in the module Theoretical Multivariate Statistics.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a complex assessment equating to 75 hours. The language of the examination is English.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B22	Methods in Data Analytics	Prof. Pascal Kerschke pascal.kerschke@tu-dresden.de
Qualification objectives	The students know basic methods of data analysis. In addition, they are able to apply these methods and recognize and solve problems that arise in the process.	
Content	The Module contents are theoretical concepts and the application of basic data analysis methods relevant for working with traffic-related data.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 2 hours per week exercise and self-study. The lecture and the exercise will be held in English.	
Prerequisites for participation	Basic knowledge of statistics and data analytics at the Bachelor's level of the Transport Economics program is required. The following literature is recommended for preparation: - Heumann, C. / Schomaker, M. / Shalabh: Introduction to Statistics and Data Analysis, Springer, 2016.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program. The module is a prerequisite for participation in the module Advanced Methods in Data Analytics.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 90 minutes. The language of the examination is English.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each winter semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B23	Advanced Methods in Data Analytics	Prof. Pascal Kerschke pascal.kerschke@tu-dresden.de
Qualification objectives	Students are familiar with advanced methods of data analysis that enable them to analyze data in depth. Furthermore, they are able to apply these methods and recognize and solve problems that arise in the process. Furthermore, the students are strengthened in their personality.	
Content	The Module contents are theoretical concepts and the application of advanced methods of data analysis relevant to the processing of traffic-related data. These are treated with reference to current research.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 2 hours per week exercise and self-study. The lecture and the exercise will be held in English.	
Prerequisites for participation	Participants require skills acquired in the module Data Analytics.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a written test lasting 90 minutes. The language of the examination is English.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each summer semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Module number	Module name	Responsible lecturer
Math-Ma-B24	Applied Data Analysis	Prof. Alfred Benedikt Brendel Alfred_Benedikt.Brendel@tu-dresden.de
Qualification objectives	Students are familiar with data-driven analysis using statistical methods. They can prepare, present, and apply these methods scientifically. The students are familiar with the technical data analysis terms in English.	
Content	The module covers theoretical foundations and practical applications of descriptive analysis, data preparation, statistical inference, analysis of variance, and regression models.	
Teaching and learning methods	The module comprises 2 hours per week lecture, 1 hour per week exercise and self-study. The lecture and the exercise will be held in English.	
Prerequisites for participation	According to § 6 para. 7 of the Study Regulations, participation in the lecture and the exercise is limited to a total of 60 participants only.	
Applicability	In the compulsory elective area N of the Master's program Mathematics, in which modules with a total of at least 18 credit points are to be chosen, the module is one of 14 compulsory elective modules in the specialization Business and Economics – Advanced. Furthermore, in the compulsory elective area N of the Master's program Mathematics in Business and Economics, in which modules with a total of at least 24 credit points have to be chosen, the module is one of 15 compulsory elective modules in the specialization Business and Economics – Advanced. The module cannot be chosen if it has already been taken in the Bachelor's program.	
Requirements for earning credit points	Credit points are earned after passing the module examination. The module examination consists of a computer-based written test lasting 90 minutes. The language of the examination is English.	
Credit points and grades	Participants can earn six credit points for this module. The module grade corresponds to the grade of the examined assessment.	
Module frequency	The module is offered each semester.	
Workload	The workload comprises a total of 180 hours.	
Module duration	The module comprises one semester.	

Annex 2:
Study schedule (for full-time students) – Starting in the winter semester [1]
with type and scope of courses given in hrs/week as well as required work, the type, scope and format of which can be found in the module descriptions

Module number	Module name	1st Semester	2nd Semester	3rd Semester (M)	4th Semester	CP
		L/E/S/T	L/E/S/T	L/E/S/T	L/E/S/T	
Compulsory Field						
Math-Ma-20	Probability with martingales	3/1/0/0 Ex				6
Math-Ma-21	Methods of financial and actuarial mathematics		3/1/0/0 Ex			6
Math-Ma-24	Mathematical statistics		3/1/0/0 Ex			6
Math-Ma-26	Continuous optimization	3/1/0/0 Ex				6
Math-Ma-27	Discrete optimization		3/1/0/0 Ex			6
Math-Ma-SRW	Scientific research and writing			0/0/4/0 or 2/0/2/0 Ex		5
Math-Ma-SL	Scientific literature – Research topics				0/0/2/0 Ex	4
					Final thesis	27
Elective Compulsory Field [2]						
Elective Compulsory Field S [3]						
Math-Ma-22	Stochastic calculus		3/1/0/0 Ex			6
Math-Ma-23	Stochastic processes		3/1/0/0 Ex			6
Math-Ma-25	Statistical methods	3/1/0/0 Ex				6
Elective Compulsory Field M [4]						
Math-Ma-01	Algebraic structures		3/1/0/0 Ex			6
Math-Ma-02	Model theory	3/1/0/0 Ex				6
Math-Ma-03	Discrete structures		3/1/0/0 Ex			6
Math-Ma-04	Algebra and number theory	3/1/0/0 Ex				6
Math-Ma-05	Group theory		3/1/0/0 Ex			6
Math-Ma-06	Commutative algebra	3/1/0/0 Ex				6
Math-Ma-07	Noncommutative geometry		3/1/0/0 Ex			6
Math-Ma-08	Algebraic topology			3/1/0/0 Ex		6

Module number	Module name	1st Semester	2nd Semester	3rd Semester (M)	4th Semester	CP
		L/E/S/T	L/E/S/T	L/E/S/T	L/E/S/T	
Math-Ma-09	Groups and geometry		3/1/0/0 Ex			6
Math-Ma-10	Algebraic methods in geometry			3/1/0/0 Ex		6
Math-Ma-11	Real algebra		3/1/0/0 Ex			6
Math-Ma-12	Functional analysis		3/1/0/0 Ex			6
Math-Ma-13	Methods of functional analysis			3/1/0/0 Ex		6
Math-Ma-14	Nonlinear analysis	3/1/0/0 Ex				6
Math-Ma-15	Methods of analysis		3/1/0/0 Ex			6
Math-Ma-16	Partial differential equations	3/1/0/0 Ex				6
Math-Ma-17	Methods for partial differential equations		3/1/0/0 Ex			6
Math-Ma-18	Dynamical systems – Basic concepts	3/1/0/0 Ex				6
Math-Ma-19	Dynamical systems – Modern concepts and applications			3/1/0/0 Ex		6
Math-Ma-22	Stochastic calculus		3/1/0/0 Ex			6
Math-Ma-23	Stochastic processes		3/1/0/0 Ex			6
Math-Ma-25	Statistical methods	3/1/0/0 Ex				6
Math-Ma-28	Numerical methods for partial differential equations – Basic concepts	3/1/0/0 Ex				6
Math-Ma-29	Numerical methods for partial differential equations – Advanced concepts		3/1/0/0 Ex			6
Math-Ma-30	Mathematical methods in continuum mechanics			3/1/0/0 Ex		6
Math-Ma-31	Finite element methods – Theory, implementation and applications	3/1/0/0 Ex				6
Math-Ma-32	Scientific computing – Advanced concepts		3/1/0/0 Ex			6
Math-Ma-33	Scientific programming – Advanced concepts		3/1/0/0 Ex			6
Math-Ma-34	Models and methods of applied mathematics			3/1/0/0 Ex		6

Module number	Module name	1st Semester	2nd Semester	3rd Semester (M)	4th Semester	CP
		L/E/S/T	L/E/S/T	L/E/S/T	L/E/S/T	
Math-Ma-35	Models and methods of pure mathematics		3/1/0/0 Ex			6
Math-Ma-MI	Mathematical Internship			4 weeks Internship		6
Elective Compulsory Field N[5]						
Specialization Business and Economics – Basic[6]						
Math-Ma-B01	Introduction to Business Administration and Organization	3/0/0/1 Ex				6
Math-Ma-B02	Basics of Accounting	3/3/0/0 Ex				6
Math-Ma-B03	Financial Statements, Investment and Financing		3/1/0/0 Ex			6
Math-Ma-B04	Manufacturing and Logistics			2/2/0/0 Ex		6
Math-Ma-B05	Introduction to Economics	2/1/0/0 Ex				6
Math-Ma-B06	Introduction to Microeconomics		2/1/0/0 Ex			6
Math-Ma-B07	Strategy and Competition		2/1/0/0 Ex			6
Math-Ma-B08	Introduction to Macroeconomics			2/1/0/0 Ex		6
Math-Ma-B09	Econometrics – Basics			2/1/0/0 Ex		6
Math-Ma-B10	Corporate Decisions		2/0/0/1 Ex			6
Math-Ma-RBI	Research and Business Internship			4 weeks Internship		6
Specialization Business and Economics – Advanced[6]						
Math-Ma-B11	Introduction to Environmental Economics	2/2/0/0 Ex				6
Math-Ma-B12	Distribution Logistics	2/2/0/0 Ex				6
Math-Ma-B13	Production Logistics		2/2/0/0 Ex			6
Math-Ma-B14	Time Series Econometrics		2/2/0/0 Ex			6
Math-Ma-B15	Multivariate Statistics	2/2/0/0 Ex				6
Math-Ma-B16	Econometrics – Advanced Course		2/1/0/0 Ex			6
Math-Ma-B17	Operations Research and Logistics	2/2/0/0 Ex				6
Math-Ma-B18	Decision Support in Transportation Logistics		2/2/0/0 Ex			6

Module number	Module name	1st Semester	2nd Semester	3rd Semester (M)	4th Semester	CP
		L/E/S/T	L/E/S/T	L/E/S/T	L/E/S/T	
Math-Ma-B19	Management of Public Transport Systems and Services		2/2/0/0 Ex			6
Math-Ma-B20	Theoretical Multivariate Statistics	2/2/0/0 Ex				6
Math-Ma-B21	Applied Multivariate Statistics		2/2/0/0 Ex			6
Math-Ma-B22	Methods in Data Analytics	2/2/0/0 Ex				6
Math-Ma-B23	Advanced Methods in Data Analytics		2/2/0/0 Ex			6
Math-Ma-B24	Applied Data Analysis			2/1/0/0 Ex		6
Math-Ma-RBI	Research and Business Internship			4 weeks Internship		6
CP		**30**	**30**	**29**	**31**	**120**

[1] The study schedule refers to the beginning of the winter semester. If the study program is started in the summer semester, corresponding prerequisites must be taken into account when selecting the elective modules.
[2] Modules amounting to a least 54 credits must be selected.
[3] From the elective compulsory field S, one module amounting to a least six credits must be selected.
[4] From the elective compulsory field M, four modules amounting to a least 24 credits must be selected.
[5] One specialization must be selected from the elective area N.
[6] From a specialization, three to four modules amounting to a least 24 credits must be selected.

M Mobility window according to § 6 para. 1 sentence 3 Study Regulations
CP Credit Points
L Lecture
E Exercise
S Seminar
T Tutorial
Ex Examination(s)

Annex 3:

Example of how to structure part-time studies – Starting in the winter semester

This description represents a possible schedule of studies in part-time studies; it is possible to deviate from this schedule.

Module number	Module name	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	CP
		L/E/S/T	L/E/S/T	L/E/S/T	L/E/S/T	L/E/S/T	L/E/S/T	L/E/S/T	
Compulsory Field									
Math-Ma-20	Probability with martingales	3/1/0/0 Ex							6
Math-Ma-21	Methods of financial and actuarial mathematics		3/1/0/0 Ex						6
Math-Ma-24	Mathematical statistics		3/1/0/0 Ex						6
Math-Ma-26	Continuous optimization	3/1/0/0 Ex							6
Math-Ma-27	Discrete optimization		3/1/0/0 Ex						6
Math-Ma-SRW	Scientific research and writing						0/0/4/0 or 2/0/2/0 Ex		5
Math-Ma-SL	Scientific literature – Research topics							0/0/2/0Ex	4
								Final thesis	27
Elective Compulsory Field – in the total amount of at least 54 credit points									
Elective Compulsory Field S – one module must be chosen									
	Compulsory Elective Module*				3/1/0/0 Ex				6
Elective Compulsory Field M – in the total amount of at least 24 credit points									
	Compulsory Elective Module 1*			3/1/0/0 Ex					6
	Compulsory Elective Module 2*			3/1/0/0 Ex					6
	Compulsory Elective Module 3*					3/1/0/0 Ex			6
	Compulsory Elective Module 4*						3/1/0/0 Ex		6
Elective Compulsory Field N – in the total amount of at least 24 credit points									
	Compulsory Elective Module 1*			*/*/*/* Ex*					6
	Compulsory Elective Module 2*				*/*/*/* Ex*				6
	Compulsory Elective Module 3*					*/*/*/* Ex*			6
	Compulsory Elective Module 4*						*/*/*/* Ex*		6
CP		12	18	18	12	12	17	31	120

* depending on choice made by the student CP Credit Points Ex Examination(s)

L Lecture
E Exercise
S Seminar
T Tutorial