Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

# Master's Programme
# Mathematics

# Module Handbook

Valid from WS 2023/2024

As of: 13. February 2024

# Module overview

# List of Abbreviations

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|---|---|
| CP | Credit Points (german: Leistungspunkte) |
| S | Seminar |
| SWS | Hours per Week during the Semester (german: Semester-Wochen-Stunden) |
| Ü | Exercises (german: Übungen) |
| V | Lecture (german: Vorlesung) |

# Module descriptions

| Modul title | In-depth Course | |
|---|---|---|
| Module number/abbreviation | V | |
| Applicability | M.Sc. Mathematics: Elective Module<br>Some of the courses in the module are also offered in the following degree programmes:<br>M.Sc. Business Mathematics: Elective Module<br>M.Sc. Industrial Mathematics: Elective Module<br>M.Sc. Mathematical Physics: Elective Module | |
| Requirements for participation | Mandatory: none<br>Recommended: Prior knowledge to the extent of the Bachelor lectures of the subject area | |
| Person(s) responsible for the module | Prof. Dr. V. Cortés (as Chairman of the Examination Committee) | |
| Language | German or English, usually English | |
| Qualification goals | The students acquire deepened knowledge of the state of research in themes pertaining to the research areas of the department of mathematics and are then capable of applying advanced scientific methods relevant to the research areas. They take insight into the scientific literature and practice to handle it. | |
| Content | A subject area from a mathematical research field of the Department of Mathematics | |
| Courses and teaching formats | 6 CP Module<br>a) Lecture (V)<br>b) Exercises to the lecture (Ü)<br>12 CP Module<br>a) Lecture (V)<br>b) Exercises to the lecture (Ü) | <br>2 SWS<br>1 SWS<br><br>4 SWS<br>2 SWS |
| Credit points | Total: 6 CP or 12 CP depending on the module | |
| Workload | 6 CP Module<br>Attendance studies<br>Self-study/exam preparation<br>12 CP Module<br>Attendance studies<br>Self-study/exam preparation | <br>42 hrs.<br>138 hrs.<br><br>84 hrs.<br>276 hrs. |
| Requirements for participation in and type of coursework and examinations | Prerequisites for the module examination: usually completion of the exercise<br>Type of module examination: oral examination, alternatively written examination (graded)<br>Language of examination: usually English | |
| Duration | 1 semester | |
| Frequency of the course | Every semester | |
| Reference semester | 1-2 | |

| Modul title | Special Course | |
|---|---|---|
| Module number/abbreviation | SP | |
| Applicability | M.Sc. Mathematics: Elective Module<br>Some of the courses in the module are also offered in the following degree programmes:<br>M.Sc. Business Mathematics: Elective Module<br>M.Sc. Industrial Mathematics: Elective Module<br>M.Sc. Mathematical Physics: Elective Module | |
| Requirements for participation | Mandatory: none<br>Recommended: Prior knowledge to the extent of the Bachelor lectures of the subject area | |
| Person(s) responsible for the module | Prof. Dr. V. Cortés (as Chairman of the Examination Committee) | |
| Language | German or English, usually English | |
| Qualification goals | The students acquire a profound understanding of selected problems, methods and results of a mathematical research area. They learn to master advanced techniques and develop the ability to conduct independent scientific work in the area. | |
| Content | Research-oriented study of selected topics pertaining to a research area of the department of mathematics | |
| Courses and teaching formats | 9 CP Module | |
| | a) Lecture (V) | 2 SWS |
| | b) Exercises to the lecture (Ü) | 1 SWS |
| | 9 CP Module | |
| | a) Lecture (V) | 2 SWS |
| | b) Exercises to the lecture (Ü) | 2 SWS |
| | 18 CP Module | |
| | a) Lecture (V) | 4 SWS |
| | b) Exercises to the lecture (Ü) | 2 SWS |
| Credit points | Total: 9 CP or 18 CP depending on the module | |
| Workload | 9 CP Module | |
| | Attendance studies | 42 hrs. |
| | Self-study/exam preparation | 228 hrs. |
| | 9 CP Module | |
| | Attendance studies | 56 hrs. |
| | Self-study/exam preparation | 304 hrs. |
| | 18 CP Module | |
| | Attendance studies | 84 hrs. |
| | Self-study/exam preparation | 456 hrs. |
| Requirements for participation in and type of coursework and examinations | Prerequisites for the module examination: usually completion of the exercise<br>Type of module examination: oral examination, alternatively written examination (graded)<br>Language of examination: usually English | |
| Duration | 1 semester | |

| Frequency of the course | Every semester |
|---|---|
| Reference semester | 1-2 |

| Modul title | Seminar | |
|---|---|---|
| Module number/abbreviation | S | |
| Applicability | M.Sc. Mathematics: Elective Module<br>Some of the courses in the module are also offered in the following degree programmes:<br>M.Sc. Business Mathematics: Elective Module<br>M.Sc. Industrial Mathematics: Elective Module<br>M.Sc. Mathematical Physics: Elective Module | |
| Requirements for participation | Mandatory: none<br>Recommended: Prior knowledge in the relevant mathematical field of work as specified by the supervising university lecturer | |
| Person(s) responsible for the module | Prof. Dr. V. Cortés (as Chairman of the Examination Committee) | |
| Language | German or English, usually English | |
| Qualification goals | The students learn to familiarize themselves in an independent way with an advanced mathematical topic, to present their results in a talk and to conduct scientific discussions. | |
| Content | Selected mathematical topics pertaining to the research areas of the department of mathematics. | |
| Courses and teaching formats | a) Seminar (S) | 2 SWS |
| Credit points | Total: 6 CP | |
| Workload | Attendance studies<br>Self-study/exam preparation | 28 hrs.<br>152 hrs. |
| Requirements for participation in and type of coursework and examinations | Prerequisites for the module examination: none<br>Type of module examination: Presentation (ungraded)<br>Language of examination: usually English | |
| Duration | 1 semester | |
| Frequency of the course | Every semester | |
| Reference semester | 1-2 | |

| Modul title | Research seminar | |
|---|---|---|
| Module number/abbreviation | FS | |
| Applicability | M.Sc. Mathematics: Elective Module<br>Some of the courses in the module are also offered in the following degree programmes:<br>M.Sc. Business Mathematics: Elective Module<br>M.Sc. Industrial Mathematics: Elective Module<br>M.Sc. Mathematical Physics: Elective Module | |
| Requirements for participation | Mandatory: none<br>Recommended: in-depth prior knowledge in the relevant mathematical field of work as specified by the university lecturers involved in the research seminar | |
| Person(s) responsible for the module | Prof. Dr. V. Cortés (as Chairman of the Examination Committee) | |
| Language | German or English, usually English | |
| Qualification goals | With increasing independence, the students are capable of participating in the research activities of a mathematical working group. They learn to familiarize themselves with mathematical topics of current interest and to deepen the state of knowledge of the scientific literature, if possible, by their own work. They can present results of current research and open problems in seminar talks and are able of conducting scientific discussions in the research group. | |
| Content | Mathematical research in a research area of the department of mathematics. | |
| Courses and teaching formats | a) Research seminar (S) | 2 SWS |
| Credit points | Total: 6 CP | |
| Workload | Attendance studies<br>Self-study/exam preparation | 28 Std.<br>152 Std. |
| Requirements for participation in and type of coursework and examinations | Prerequisites for the module examination: none<br>Type of module examination: Presentation (ungraded)<br>Language of examination: usually English | |
| Duration | 1 semester | |
| Frequency of the course | Every semester | |
| Reference semester | 1-2 | |

| Modul title | Guided self-study |
|---|---|
| Module number/abbreviation | AS |
| Applicability | M.Sc. Mathematics: Elective Module<br>Some of the courses in the module are also offered in the following degree programmes:<br>M.Sc. Business Mathematics: Elective Module<br>M.Sc. Industrial Mathematics: Elective Module<br>M.Sc. Mathematical Physics: Elective Module |
| Requirements for participation | Mandatory: none<br>Recommended: advanced knowledge in the area of guided self-study/ as specified by the university lecturer conducting the programme |
| Person(s) responsible for the module | Prof. Dr. V. Cortés (as Chairman of the Examination Committee) |
| Language | German or English, usually English |
| Qualification goals | The students familiarize themselves with an advanced mathematical topic and learn special mathematical techniques |
| Content | Supervised advanced mathematical studies |
| Credit points | Total: 2-9 CP<br>(to be determined before the start of the module) |
| Requirements for participation in and type of coursework and examinations | Prerequisites for the module examination: none<br>Type of module examination: Presentation or oral examination or completion of practical courses or term papers or completion of projects (graded)<br>(will be determined before the start of the module)<br>Language of examination: usually English |
| Duration | 1 semester |
| Frequency of the course | Every semester |
| Reference semester | 1-2 |

| Modul title | Introductory project | |
|---|---|---|
| Module number/abbreviation | E | |
| Applicability | M.Sc. Mathematics: Compulsory module<br>M.Sc. Mathematical Physics: Compulsory module<br>The module forms an inseparable unit with the subsequent modules Preparatory Project and Master's Thesis and must therefore be taken in the same research field in which the Master's thesis is to be written. | |
| Requirements for participation | Mandatory: none<br>Recommended: Prior knowledge in the relevant mathematical field of work as specified by the university lecturer conducting the course | |
| Person(s) responsible for the module | Prof. Dr. V. Cortés (as Chairman of the Examination Committee) | |
| Language | German or English, usually English | |
| Qualification goals | The students dedicate themselves to the deepened study of a modern research area, in which the topic of the Master's thesis is embedded.<br>The aim of this study is to gain acquaintance with the up-to-date scientific literature. The student learns to gather the necessary information and background knowledge in and independent manner and gains acquaintance with a specialised topic. For this module, the student is integrated in a scientific research group. By the embedding in a research group they learn to do collaborative work and find out how to use close range informal knowledge in an optimal way. | |
| Content | Introduction to the specialised research area, in which the Master's thesis will be written. | |
| Courses and teaching formats | Variable:<br>Lectures, exercises, seminars, research seminars, guided self-study | |
| Credit points | Total: 15 CP | |
| Workload | Attendance studies + self-study/exam preparation | 450 hrs. |
| Requirements for participation in and type of coursework and examinations | Prerequisites for the module examination: none<br>Type of module examination: Depending on the task: Presentation or oral examination or completion of practical courses or written examinationor term papers or completion of projects (graded)<br>(will be determined before the start of the module)<br>Language of examination: usually English | |
| Duration | 1 semester | |
| Frequency of the course | Every semester | |
| Reference semester | 3 | |

| Modul title | Preparatory project | |
|---|---|---|
| Module number/abbreviation | V | |
| Applicability | M.Sc. Mathematics: Compulsory module<br>M.Sc. Mathematical Physics: Compulsory module<br>The module forms an inseparable unit with the preceding module Introductory Project and the subsequent module Master's Thesis and must therefore be taken in the same research field in which the Master's thesis is to be written. | |
| Requirements for participation | Mandatory: Participation in the Introductory project<br>Recommended: Prior knowledge in the relevant mathematical field of work as specified by the supervising university lecturer | |
| Person(s) responsible for the module | Prof. Dr. V. Cortés (as Chairman of the Examination Committee) | |
| Language | German or English, usually English | |
| Qualification goals | The students will acquire the special methods and knowledge of the area as much as necessary to apply them to problems and questions relevant to the topic of the Master's thesis (this will be done through the processing of preliminary tasks). The students will plan and structure the envisaged research project. The students will learn to do collaborative work and to use close range informal knowledge in an optimal way, thanks to the embedding in a research group | |
| Content | Introduction to scientific work and to the professional and methodological foundations for the Master's thesis.<br>Planning of the research project to be conducted as part of the thesis work. | |
| Courses and teaching formats | Variable:<br>Lectures, exercises, seminars, research seminars, guided self-study | |
| Credit points | Total: 15 CP | |
| Workload | Attendance studies + self-study/exam preparation | 450 hrs. |
| Requirements for participation in and type of coursework and examinations | Prerequisites for the module examination: none<br>Type of module examination: Depending on the task: Presentation or oral examination or completion of practical courses or written examinationor term papers or completion of projects (graded)<br>(will be determined before the start of the module)<br>Language of examination: usually English | |
| Duration | 1 semester | |
| Frequency of the course | Every semester | |
| Reference semester | 3 | |

| Modultitel | Master's thesis |
| --- | --- |
| Module number/abbreviation | MA |
| Applicability | M.Sc. Mathematics: Compulsory module |
| Requirements for participation | Mandatory: Students can only be admitted to the Master's thesis if they have earned at least 72 credit points. |
| Person(s) responsible for the module | Prof. Dr. V. Cortés (as Chairman of the Examination Committee) |
| Language | German or English, usually English |
| Qualification goals | The candidate is capable of comprehending an up-to-date research problem within the given time frame, of applying the pertinent scientific methods in an increasingly independent way and of presenting the results in a scientifically appropriate form. |
| Content | Conducting of a research project. Evaluation and processing of the results as well as written exposition. Oral presentation and discussion of the results. The Master's thesis constitutes the concluding module of the Master's study program. Its results will contribute to the advancement of the scientific knowledge. |
| Credit points | Total: 30 CP |
| Requirements for participation in and type of coursework and examinations | Prerequisites for the module examination: none Type of module examination: Master's thesis (graded) (will be determined before the start of the module) Language of examination: usually English |
| Duration | 1 semester |
| Frequency of the course | Every semester |
| Reference semester | 4 |