

# EDUCATION AND EXAMINATION REGULATIONS

## MASTER'S DEGREE PROGRAMMES EEMCS

A. FACULTY SECTION

B. PROGRAMME-SPECIFIC SECTION

*2023-2024 academic year*

## **Introduction to the Education and Examination Regulations for Master's degree programmes at the Faculty of Electrical Engineering, Mathematics and Computer Science.**

### General

The Dutch Higher Education and Research Act (Dutch abbreviation: WHW) of 1993 requires a broad outline of the teaching programme and examining for each degree programme to be recorded in the Education and Examination Regulations (EER (Dutch: OER)).

In accordance with Section 7.13, Paragraph 1, of the WHW, the EER must contain sufficient and clear information about the degree programme or group of programmes to which they apply. Section 7.13, Paragraph 2, of the WHW lists those issues that must, as a minimum, be stipulated in the EER with respect to procedures, rights and responsibilities relating to the education and examinations that are part of each degree programme or group of programmes. The WHW also includes a number of separate obligations relating to the inclusion of rules within the EER.

The EER is subdivided into two sections (Section A and Section B), which together form the EER. Section A, which can be seen as the faculty section, includes provisions that may apply to several Master's degree programmes. Section B contains the provisions that are specific to the particular Master's degree programme.

The EER is part of the UT Student Charter, which governs the rights of students and the way we treat each other at the UT. It gives an overview of the rights and obligations of our students and of the academic provisions. The charter consists of two parts: 1) the institutional section which applies to all students, irrespective of the programme and 2) the programme section, which is different for each programme and can be found in the Education and Examination Regulations (EER).

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## SECTION A: FACULTY SECTION

### A1. General provisions

#### Article A1.1 Applicability of these Regulations

1. This Faculty Section A contains general provisions that apply to education and examinations for all students in the following Master's degree programmes: Applied Mathematics, Business Information Technology, Computer Science, Electrical Engineering, Embedded Systems, Interaction Technology, Systems & Control, and Robotics (hereinafter referred to as: the Master's programmes) provided by the Faculty of Electrical Engineering, Mathematics and Computer Science (hereinafter referred to as: the faculty or EEMCS) of the University of Twente.
2. Each Master's programme also has its own Section B.
3. Section B of these Education and Examination Regulations may include additions to the general provisions in Section A only applicable to that specific programme.
4. Together the Faculty Section A and the Programme-specific Section B form the Education and Examination Regulations for the Master's programme concerned.
5. The Education and Examination Regulations apply to anyone enrolled in the Master's programmes, irrespective of the academic year in which the student first enrolled in the programme.
6. The Education and Examination Regulations also apply *mutatis mutandis* to the joint Master's degree programmes and study units provided by the faculty, pursuant to Section 7.3c of the WHW.
7. The general provisions and the programme-specific provisions to the Education and Examination Regulations are determined by the Faculty Board.
8. Students attending study units organised by another programme<sup>1</sup> are subject to the assessment rules laid down in the assessment schedule of the study unit concerned, in the Education and Examination Regulations and in the Rules and Guidelines of the Examination Board of the programme that organises the study unit. Special facilities according to article A7 can only be granted by the programme for which the student is enrolled.
9. The Examination Board sets down rules with regard to the execution of its tasks and powers in accordance with Section 7.12b of the WHW. These regulations are specified in the Rules and Guidelines of the Examination Board and include provisions about the rules of order during tests and rules in case of emergencies.
10. The institute section of the [student charter](#) includes a definition of what the University of Twente considers to be academic misconduct (fraud). The Rules and Guidelines of the Examination Board for the Master's programme in question include additional rules about academic misconduct (fraud), such as which measures the Examination Board may take if it establishes misconduct (fraud).
11. Requests for exemptions in respect of provisions laid down in the Education and Examination Regulations should be submitted to the Examination Board or the Programme Director of the student's own programme, as laid down in the relevant articles of these Regulations.

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<sup>1</sup> This does not apply, unless otherwise agreed, for units that are organised by a programme specifically for another programme, so-called service education.

## Article A1.2 Definitions

The terms used in these Regulations should be interpreted as follows:

- a. **Academic year:** The period beginning on 1 September and ending on 31 August of the following calendar year.
- b. **Admission Board:** The committee that assesses, on behalf of the Faculty Board, whether a candidate meets the requirements for admission to the Master's programme of their choice. If no Admission Board has been appointed for the programme, the Programme director functions as the Admission Board.
- c. **Assessment schedule:** a schedule showing the method of assessment for a study unit.
- d. **Combined Programme:** A programme of courses representing an amalgamation of two separate study programmes and covering the requirements and the programme intended learning outcomes of both individual Master's programmes, yielding two degrees.
- e. **Course catalogue:** The guide for the Master's programme concerned that provides further details of courses and other information specific to the programme. The course catalogue is available at [www.utwente.nl/coursecatalogue](http://www.utwente.nl/coursecatalogue).
- f. **Course:** A study unit of the programme, as defined in Article 7.3, Paragraph 2 and 3 WHW.
- g. **Credit (EC):** A unit of 28 hours of study load, in accordance with the European Credit Transfer System; a full academic year consisting of 60 EC or 1680 hours (Article 7.4 WHW).
- h. **Curriculum:** The aggregate of required and elective study units constituting a degree programme as laid down in Section B.
- i. **Double degree:** two degrees awarded by two institutions of higher education that offer a joint study programme; the joint programme covers the programme intended learning outcomes of both programmes.
- j. **Examination (also: exam):** An evaluation, performed to conclude a study unit, of the student's knowledge, understanding and skills as well as an assessment of the outcomes of that evaluation (Article 7.10 WHW); an examination may consist of a number of tests.
- k. **Examination programme:** All study units of a study programme counting towards the degree.
- l. **Examination Board:** The body that objectively and professionally assesses whether a student meets the conditions laid down in the education and examination regulations regarding the knowledge, understanding and skills required to obtain a degree (Article 7.12 WHW).
- m. **Examiner:** The individual appointed by the Examination Board to administer examinations and tests and to determine the results, in accordance with Article 7.12 Paragraph c WHW.
- n. **Exemption:** The decision of the Examination Board that the student has knowledge and skills which are comparable in terms of content, scope, and level with one or more study units or components of study units. An exemption is granted on the basis of acquired competencies, i.e., previously passed examinations in higher education or in view of knowledge and skills attained outside higher education.
- o. **Executive Board:** Executive Board of the University of Twente.
- p. **Faculty Board:** Head of the faculty (Article 9.12, Paragraph 2 WHW).
- q. **Final Examination:** A degree programme is concluded with a final examination. If the study units in the degree programme have been completed successfully, then the final examination is deemed to have been completed (Article 7.10 WHW).
- r. **Fraud and plagiarism:** Fraud is an act or omission by a student designed to partly or wholly hinder the accurate assessment of their own knowledge, understanding and skills, or those of another

person. Fraud includes plagiarism, which is the use of someone else's work without including a correct reference to the source. See the Student Charter of the UT for further details.

- s. **Higher Education and Research Act (abbreviated to 'WHW')**: The Dutch Higher Education and Research Act, Bulletin of Acts and Decrees 1992, 593, and its subsequent amendments.
- t. **Homologation**: Study units that can be offered to students who are admitted to the Master's programme but who nevertheless have insufficient knowledge, understanding or skills, according to Article 7.30b. WHW.
- u. **Learning Management System (LMS)**: System that supports online learning and teaching. In this case: Canvas.
- v. **Master's programme (also: programme)**: The Master's degree programme, as referenced in Article 7.3a Paragraph 1 subparagraph b WHW: the entirety of the course components, teaching activities/methods, contact hours, testing and examination methods and recommended literature.
- w. **Master's thesis project / final project**: A study unit comprising literature research and a contribution to scientific research, which always results in a written report.
- x. **Practical assignment**: A practical assignment as referred to in Article 7.13, Paragraph 2d WHW is a study unit or a study unit component emphasising an activity that the student engages in, as described in Section B.
- y. **Pre-Master's programme (also: Bridging programme)**: A combination of study units that can be offered to students who cannot yet be admitted to the Master's programme due to insufficient knowledge, understanding or skills, in accordance with Article 7.30e. WHW.
- z. **Programme Committee (PC)**: Committee referred to in Article 9.18 WHW.
- aa. **Programme Director**: The person appointed by the Faculty Board to administer the programme (Article 9.17 WHW).
- bb. **Quarter (also: quartile)**: A part of a semester as specified in the academic calendar of the university.
- cc. **Semester**: Half an academic year, as specified in the academic calendar of the university.
- dd. **Senior Examiner**: Specific examiners, appointed by the Examination Board to take the role as chair of an assessment committee for the Final Project.
- ee. **Student Information System (SIS)**: System designated by the Executive Board for registration and for providing information on all relevant data related to students and the programme, as referred to in the WHW. In this case: Osiris.
- ff. **Student**: Anyone enrolled in a programme in accordance with Article 7.34 and 7.37 WHW.
- gg. **Study Adviser**: Person appointed by the Faculty Board who acts as contact between the student and the university, and in this role represents the interests of the student, as well as fulfilling an advisory role.
- hh. **Study load**: The time an average student needs to learn the course material. The study load comprises project work, independent study, lectures and writing assignments, for example. The study load is expressed in credits according to the European Credit Transfer System, where 1 credit equals 28 hours.
- ii. **Study Programme**: All study units followed by the student as part of their Master's degree programme.
- jj. **Study unit**: A programme component as defined in Article 7.3, Paragraph 2 and 3 WHW. Also referred to as course.



- kk. Teaching Period:** The period in which a study unit is offered. This period starts in the first week in which an educational activity takes place for the study unit concerned and ends in the final week in which an educational activity takes place and/or a test is administered for the study unit concerned. Resits are not part of the teaching period. This period may sometimes not be the same as a quartile (quarter of an academic year).
- ll. Test:** An evaluation of the student's knowledge, understanding and skills as well as an assessment of the outcomes of that evaluation. A test is part of an examination. If the examination for a study unit consists of a single test, then the result of that test will count as the result of the examination in accordance with Article 4.7 WHW.
- mm. UT:** The University of Twente (UT).
- nn. Working day:** Any day from Monday to Friday with the exception of official holidays and the prearranged compulsory holidays (compulsory days free of work) on which the staff are free.

The definition of all other terms used in these Regulations is in accordance with the definition accorded by the main text of this document, the programme-specific section of the EER, the student charter or the WHW.

## A2. Previous education and admission

### Article A2.1 Previous education

1. In order to qualify for enrolment in a Master's programme, either a Bachelor's degree obtained through academic higher education (WO) is required, or a Bachelor's degree from a university of applied sciences (UAS) in addition to the successful completion of an appropriate pre-Master's programme. The requirements that the Bachelor's degree must meet are specified in Section B.
2. The Admission Board of the Master's programme assesses the candidate's suitability for admission to the programme on the basis of the requirements stipulated in Section B.
3. The Admission Board can admit students who lack a limited amount of credits on a topic regarding required prior knowledge, provided they judge that this does not reduce the student's likelihood of successfully completing the programme.
4. The Bachelor's degrees that entitle students to automatic admission are listed in Section B.
5. Additional admission requirements are stipulated in Section B.

### Article A2.2 Language requirements

1. To be admitted to the programme, students must be proficient in English.
2. Proof of proficiency in English is required by the successful completion of one of the following examinations or an equivalent:
  - a. IELTS (academic) certificate, not older than two years, with an overall band score of at least 6.5, and a minimum score on each section of at least 6.0.
  - b. TOEFL iBT (internet-based) certificate, not older than two years, with an overall score of 90, and a minimum score on each section of at least 21<sup>2</sup>.
  - c. Cambridge C1 Advanced, formerly known as; Cambridge English Advanced (CAE) from 2015 onwards (when the subscores were introduced) and Cambridge C2 Proficiency, formerly known as; Cambridge English Proficiency (CPE) from 2015 onwards (when the

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<sup>2</sup> An alternative English test can be the TOEFL iBT (Special) Home Edition test. This test is valid for February 2023, September 2023, and February 2024 intake.

- subscores were introduced). Obtained an A, B or C grade, with an overall score of at least 176 and a minimum score on each section of at least 169.
3. The following students are exempt from the requirement to prove their proficiency in English; students who hold:
    - a. a relevant Bachelor's or Master's degree from an accredited academic institution in the Netherlands.
    - b. a three-year Bachelor's degree in one of the following countries: Australia, Canada (English-speaking part), Ireland, New Zealand, UK or USA. When your awarding institution is in one of these countries, but your teaching institution was not, you are not exempted. The same rule applies to distance (online) education where the awarding institution is in one of the mentioned countries, but the student was not.
    - c. a secondary education diploma with English as an exam subject from one of the predetermined countries (according to the [country list](#)).

#### Article A2.3 Application and enrolment

1. The deadline for application for admission to the Master's programme is stipulated on the website [www.utwente.nl/master](http://www.utwente.nl/master). Different application deadlines apply to different types of applicants.
2. After admission, the student must enrol before 1 September or 1 February thereafter. The rules and regulations regarding enrolment are laid down in the [UT Enrolment Regulations](#).

#### Article A2.4 Admission Board

Each programme has an Admission Board, which is appointed by the Faculty Board. The Faculty Board appoints this board after consulting with the Programme Directors and Examination Boards of the relevant Master's programmes.

#### Article A2.5 Admissions procedure

1. The Admission Board is responsible for the admissions to the programme in relation to any students that cannot be admitted directly (see Paragraph A2.1.4).
2. With a view to admission to the programme, the Admission Board assesses the candidate's knowledge, understanding and skills, including relevant language skills. The Board may request experts from inside or outside the University to test certain types of knowledge, understanding and skills, in order to supplement written evidence from the degree programmes the student has already completed.
3. In addition to the requirements, the Admission Board also assesses requests for admission on the basis of the following documents:
  - a. motivation letter;
  - b. English proficiency scores according to Article A2.2;
  - c. Diploma;
  - d. transcript of records;
  - e. curriculum vitae;
  - f. abstract of thesis;
  - g. course descriptions for programme-specific courses, research methodology courses, mathematics courses and a table of content for the course materials.
4. The Admission Board may decide that particular units must be included in the student's study programme to compensate for lack of knowledge on the part of the student (homologation courses).

5. Candidates receive either confirmation of their admission to the Master's programme, admission to a pre-Master's programme or a negative decision. An appeal against a decision can be lodged with the UT Complaints Desk within six weeks.

#### Article A2.6 Refusal or termination of enrolment (unsuitability/judicium abeundi)

1. Based on the provisions of Section 7.42a of the WHW, the Faculty Board or the Examination Board may, in exceptional cases, ask the Executive Board to terminate or refuse a prospective student's enrolment in a programme, if that student's actions or words show that the student is unsuitable either for practising one or more of the professions for which the programme in question would prepare the student or for practical preparations for professional practice.
2. If it is believed that a prospective student is unsuitable for the programme, as described in Paragraph 1, the Examination Board or the Faculty Board will initiate an inquiry, and the student is informed of this promptly. The Examination Board or the Faculty Board does not issue any recommendation without carefully considering the interests involved and giving the prospective student the opportunity to be heard.

#### Article A2.7 Pre-Master's programme

1. The Admission Board may decide to admit a candidate to the Master's programme on the condition that a pre-Master's programme is completed successfully before their admission.
2. A pre-Master's programme is a bridging programme with a study load of 15 or 30 ECs, to be decided by the Admission Board. The courses in the pre-master are subject to the Bachelor Education and Examination Regulations.
3. The pre-Master's programme is assembled by the Admission Board. A fixed programme may be defined for specific groups of students. However, a student may also be given a personalized programme.
4. Proof of the successful completion of the pre-Master's programme, together with the related Bachelor's degree, serves as proof of admission to the relevant Master's programme, in the same and in the subsequent academic year.
5. Candidates are required to complete the pre-Master's programme within a year unless otherwise specified.
6. Students from Dutch Universities of Applied Sciences may be allowed to attend a pre-Master's programme during their Bachelor's programme. Paragraph 5 applies to these students. In this case, the relevant Bachelor's degree, together with the successfully completed pre-Master's programme, serves as proof of admission to the relevant Master's programme.
7. Deviations from these regulations are to be decided upon by the admission board.

### A3. Programme content, structure, and rules

#### Article A3.1 Aim of the programme

The qualities relating to the knowledge, understanding, and skills that the student should have acquired upon completing the programme (aims and learning outcomes) (Article 7.13 Paragraph 2 (a) of the WHW) are set out in Section B.

#### Article A3.2 Programme structure

1. Section B describes the Master's programme in accordance with Article 7.13, Paragraph 2 WHW.

2. The scope of the Master's programme is at least 120 EC. These 120 credits must not include any credits which have constituted part of a previously completed Bachelor's degree audit.
3. If students are required to sign up to participate in a particular study unit, this is only possible during the periods designated for that purpose.
4. Every Master's programme has a nominal duration of two years, with each year divided into two semesters, both divided into two quarters<sup>3</sup>
5. Master's programmes are taught on a full-time basis.

#### Article A3.3 Language of Instruction

1. The language of instruction for all EEMCS Master's programmes is English.

#### Article A3.4 Exemptions

1. The Examination Board may grant an exemption to students at their request for one or more examinations or tests. To this end, the student should demonstrate having sufficient knowledge and skills in relation to the examination concerned or the test in question.
2. An exemption granted by the Examination Board is registered in SIS under the study unit or study units, or components thereof, by means of an EX (exemption).
3. Students cannot be compelled to take additional study units or components of study units in their curriculum instead of an exemption that has been granted.
4. Exemptions may be granted to a maximum of 30 EC.
5. Students may also be exempted from practical assignment if they can demonstrate that a required practical assignment will likely give rise to a personal moral dilemma. In such cases, the Examination Board determines whether the component can be completed in another manner and in what way.

#### Article A3.5 Flexible-degree programme

1. The Examination Board decides on requests for permission to take a flexible-degree programme as referred to in Article 7.3j WHW. The Examination Board assesses whether a flexible-degree programme is appropriate and consistent within the domain of the educational programme and whether the level is high enough in light of the attainment targets of the programme.
2. The content of the flexible-degree programme is determined and motivated by the student and must be equivalent to a regular Master's programme in terms of scope, breadth and depth.
3. The following requirements must be met in order to be eligible for the Master's degree:
  - a. the deviation from the regular Master's programme must be at least 30 EC while still ensuring coherence in terms of content.
  - b. the level of the programme must match the objectives and programme intended learning outcomes that apply to the programme for which the student is enrolled.

#### Article A3.6 Combined programmes

A student can obtain diplomas for two UT Master's programmes on the basis of a combined study programme that satisfies the requirements of each individual programme, including the programme intended learning outcomes.

The following requirements apply to the combined programmes and their composition:

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<sup>3</sup> See <https://www.utwente.nl/en/ces/planning-schedules/academic-calendar/academic-calendars/> for a more detailed explanation of the academic calendar at the UT.

1. The student needs to be admitted and enrolled in both programmes in order to combine two programmes.
2. The student's programme of courses represents an amalgamation of two separate study programmes and satisfies the requirements relating to the programme intended learning outcomes of both corresponding Master's programmes. Depending on the requirements of the two Master's programmes, there are four possibilities:
  - a. A **combined final project** and **combined internship**<sup>4</sup>, whereby both study programmes also incorporate a **maximum of 20 ECs from common courses**.
  - b. A **combined final project**, but with a **separate internship or no internship**, whereby both study programmes also incorporate a **maximum of 30 ECs from common courses**.
  - c. **Two separate final projects**, with a **separate internship or no internship**, whereby both study programmes incorporate a **maximum of 30 ECs from common courses**.
  - d. In case there is a **Standard Programme** for a combined study programme **defined by two UT Master's programmes**, the requirements laid down in the Standard Programme applies.
3. The common courses programme as described in Paragraph 2 includes not only study units that are part of both Master's programmes, but also all courses for which an exemption has been granted for one Master's programme on the basis of results achieved as part of the other programme.
4. If a single combined final project is included in and is relevant to both Master's programmes, as referred to in Paragraphs 2a and 2b, the study load of the final project must be at least 100% of the requirement in EC for the final project of the programme that has the highest number of EC plus at least 50% of the requirement in EC for the final project of the other programme.
5. If a single combined internship is included that satisfies the requirements of both programmes as referred to in Paragraph 2a, the study load of the internship must equal the load of the internship with the highest number of EC.
6. Approval for the common courses is required from the Examination Boards of both Master's programmes.
7. Students who complete a study programme as described take a combined final examination which they pass if the assessments included in their file would result in a pass for the final examination of both programmes individually in accordance with the applicable regulations. The Examination Boards of the programmes involved decides whether a student passes the final examination. The Programmes provide instructions concerning the date of a combined final colloquium.

#### Article A3.7 Master's final project

1. Requirements for starting the final project:
  - a. Students must have no more than 10 ECs still to complete, other than the final project.
  - b. As an exception to the rule above, if the programme allows for a combined final project and internship, 10 ECs in unfinished courses other than the internship and final project are allowed.

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<sup>4</sup> If for students from a university of applied science the internship is substituted by an individual project for both programmes, then these projects may be combined in the same way as the internship, whereby the number of credits from the individual project and common courses together is less than or equal to 40 EC.

2. The student and examiner(s) must agree on the start date and completion date for the Master's final project.
3. This agreement is to be documented in a plan that takes into account the nominal length of the final project, a reasonable holiday period and any uncompleted study units.
4. The schedule for completion must be approved by the examiner and signed by the student.
5. The final project is concluded with an oral presentation in public at the University of Twente unless the project is carried out at another university as part of the exit year of a double degree programme.
6. Programme-specific regulations regarding the final project are stipulated in Section B.

#### Article A3.8 Composition of the assessment committee for the Final Project

1. The committee consists of at least two examiners, of which at least one is senior examiner; it is chaired by a senior examiner.
2. The examiners must belong to at least two different research groups.
3. All supervisors of the project are members of the assessment committee. Supervisors who are not examiners serve on the committee in an advisory capacity.
4. The examiners are collectively responsible for grading the thesis. In case of different opinions among the examiners, the chair of the assessment committee takes the ultimate decision on the grade.
5. In the event that the assessment committee cannot meet the above specifications, a motivated request to the Examination Board may be made by the Programme Director. The approval for the particular assignment remains valid during the academic year in which the request was granted or the duration of the final project in question with the maximum of one year.

#### Article A3.9 Internship

1. The internship is a period of study-related professional practice amounting to 20 EC and is carried out by the student at a company, university, or organization outside the University of Twente.
2. Requirements for starting the internship:
  - a. students must already have obtained at least 45 EC of their examination programme.
  - b. additional requirements may apply for each programme and are stipulated in Section B.
3. A description of the internship must be drawn up and approved by a member of UT staff appointed as examiner. This approval must be obtained before commencing the internship.
4. Students must contact the internship office for an intake at least three months before their preferred start date of the internship.
5. The day-to-day supervisor for the internship is the company supervisor: a member of the organization where the internship is carried out. This supervisor must be named in the project description, mentioned in Paragraph 3.
6. The UT supervisor mentioned in Paragraph 3 supervises the student remotely during the internship. If, in the opinion of this UT supervisor, adequate supervision by the company supervisor is not – or no longer – possible, the UT supervisor may decide to take over as the student's day-to-day supervisor.
7. During the internship, the student writes a report about their work. At the end of the internship period, this report is submitted to the company supervisor. The company supervisor assesses the internship using the relevant assessment form. The assessment is based on the supervisor's observations of the student and on the report submitted by the student.

8. The UT supervisor acts as the examiner for this unit and bases their grade on the assessment made by the company supervisor, the report written by the student and a discussion with the student. The student must submit the report to the UT supervisor within two months after finishing the internship. The internship report is *not* published publicly.

#### Article A3.10 Duration of the internship

1. According to the study load of 20 EC, the duration of an internship is the equivalent of 14 weeks of full-time work including writing a report. An extension with two weeks of this period is allowed to compensate for unforeseen delays.
2. If the host organisation and the student want to maintain a working relation after this period, the student must complete the internship first. After completion of the internship, the working relation between the student and the company falls outside the scope of the student's study programme and outside the responsibility of the University of Twente.

#### Article A3.11 Confidentiality

1. The final-thesis report is made public unless confidentiality has been deemed necessary.
2. The Programme director may declare a final thesis report to be confidential for a limited period upon receiving a motivated request to do so.
  - a. A confidentiality request must be made by the examiner as soon as possible, but no later than four weeks before the end of the final project.
  - b. A confidential report remains accessible to the supervisor, the Programme director, and any members of bodies with the authority to assess the quality of the grading of the entire programme.
  - c. All parties mentioned in Paragraph 2b are required to respect the confidentiality of the report.
3. The confidentiality period is by default be set at 2 years up to a maximum of 5 years.
4. If confidentiality is deemed necessary as described in Paragraph 2, the contents of the public final thesis presentation may be adapted to avoid making public those matters that are considered confidential.
5. Section B of these Education and Examination Regulations may include additional provisions.

#### Article A3.12 Evaluation

1. The Programme director is responsible for monitoring the quality of the educational programme.
2. The Programme director is responsible for evaluating the programme.
3. To monitor and to improve the quality of teaching, the EEMCS MSc programmes use information about the students' learning experiences obtained from:
  - Internal evaluations
    - Periodic course evaluations at the end of each course
    - Additional (panel) evaluations, on request from lecturer, students, Programme committee, Examination Board or Programme Director
  - External sources
    - National Student Survey (NSE)
    - National Alumni Survey
    - International Student Barometer
4. Section B can include further details on how the education in the programme is evaluated.

## A4. Teaching and assessment

### Article A4.1 Examinations

1. Each study unit concludes with an examination.
2. The examination consists of one or more tests.
3. A test or examination can have various forms<sup>5</sup> and can be administered online or offline.
4. A student has the right to inspect recent model test questions, model tests, or old tests that are representative of the test or examination, as well as the associated answer keys, along with the norm for assessment and time estimated for answering the example test.
5. If an examination or test is administered online using *online surveillance*<sup>6</sup> or *online proctoring*<sup>7</sup>, the Examination Board may set further rules and conditions for online (*proctored*) assessment. General information and detailed rules on online assessment is presented at the university's [website](#).

### Article A4.2 Course Catalogue and Assessment Schedule

1. The Programme director publishes at least the following details of the study units in SIS not less than four weeks in advance: scope, intended learning outcomes and content, language of tuition and assessment, prerequisites, required and recommended study materials, design of teaching methods, and assessment.
2. The assessment schedule of a study unit is drawn up by the examiner or examiners and is determined by the Programme director. The Examination Board provides advice on the assessment schedule.
3. At least two weeks prior to the start of the study unit an assessment schedule must be published in the Learning Management System (LMS).
4. The assessment schedule includes at least all items as included in the course catalogue yet shall also include:
  - a. The intended learning outcomes of the study unit and how they are assessed and when they are attained.
  - b. when examinations, tests, and resits are held (the precise times and dates are announced via the timetable).
  - c. the relative weighting of the tests.
  - d. any required minimum grade per test; a minimum grade for a test may not be set higher than 5.5.
  - e. if applicable: information on resits (such as conditions, compensation options and grading periods).
5. The Programme director may modify the assessment schedule during the study unit:
  - a. The assessment schedule may only be changed in consultation with the examiners of the study unit.
  - b. The Programme director consults the Examination Board before any changes to the form or manner of administering an examination or one or more tests. If the change only

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<sup>5</sup> A test or exam can have the following forms: a written test, an assignment, an oral test, a presentation, practical assignment, or a combination of these forms.

<sup>6</sup> Camera surveillance of the student or students during an *unrecorded* test, using for example Canvas, Teams, etc.

<sup>7</sup> Surveillance of the student or students using special *proctoring* software, such as Proctorio.



involves moving tests to a timeslot other than as shown in the timetable, the Programme director informs the Examination Board of the decision as soon as possible.

- c. Students must be informed immediately of the change.
6. Changes to the assessment schedule may not put students at an unreasonable disadvantage. The Examination Board may take special measures in individual cases.

#### Article A4.3 Examination and test opportunities

1. There will be an opportunity to take written or oral tests at least twice a year. Other forms of examination can be completed at least once a year.
2. In the event that a study unit is discontinued, at least one opportunity is provided in the year subsequent to discontinuation to take the examination or parts thereof, and a transitional arrangement must be included in Section B for the subsequent period.
3. At the student's request, the Examination Board may permit a different form of examination than that stipulated in the course catalogue. The examiner may ask the Examination Board to permit a different form of examination on condition that all students participating in the test agree.

#### Article A4.4 Registering for courses, tests and examinations

1. Registration in SIS is required prior to participating in a course<sup>8</sup>. It is also mandatory to register before every test opportunity.
2. Notwithstanding Paragraph 1, any student who has correctly registered to participate in the instruction/classes for a particular course and has been admitted will also automatically be registered for the subsequent tests, unless the course description specifies otherwise. Only if as student has passed a test and the student still wants to take part in the subsequent test, the student has to register in SIS manually prior to the test opportunity.

#### Article A4.5 Examination date

1. The examination date of a study unit, mentioned in the SIS, is the date on which the student fulfilled the last obligation, necessary for an assessment of the unit.
2. If a student agrees with an examiner about an examination date for a certain unit, the submission of additional material by the student after this date leads to a new examination date, being the date of the submission of this additional material.
3. With respect to possible prior knowledge requirements of subsequent study units a student is allowed to assume that they passed an examination at the examination date, as long as the result of the examination is pending.
4. Notwithstanding Paragraph 3, if the pending result turns out to be a fail and because of that the student violates the prior knowledge requirements of a subsequent unit, the Examination Board can decide that the student must interrupt their participation in this subsequent unit pending a repair of the fail.

#### Article A4.6 Oral tests

1. If the student or the examiner wishes a third party to be present when administering an oral test, then a request to this end must be submitted to the Programme director at least fifteen working days prior to the oral test. The student and the examiner are notified of the Programme director's decision not less than five working days in advance. The Programme director must inform the

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<sup>8</sup> The applicable registration deadlines are mentioned on the webpage [www.utwente.nl/en/education/student-services/education/courses-and-modules/](http://www.utwente.nl/en/education/student-services/education/courses-and-modules/).

Examination Board of the decision. Public graduation colloquia, public presentations and group tests are excluded from this provision.

2. If the Examination Board has decided that members of the Examination Board or an observer on behalf of the Examination Board is to be present during the administration of an oral test, then the Examination Board must make this known to the examiner and the student at least one working day before the oral test.

#### Article A4.7 Examination results

1. The examination result of a study unit, as determined by the examiner, is expressed in half grades from 1.0 to 5.0 and from 6.0 to 10.0<sup>9</sup> or as 'pass' / 'fail'. With grades only being rounded in the final phase<sup>10</sup> of the assessment of a study unit and in accordance with the schedule below:

<b>If digit before the decimal (n) ≠ 5</b>	
Grade ≥n.00 and <n.25	⇒ n.0
Grade ≥n.25 and <n.75	⇒ n.5
Grade ≥n.75 and <(n+1).00	⇒ (n+1).0
<b>If digit before the decimal = 5:</b>	
Grade ≥5.00 and <5.50	⇒ 5.0
Grade ≥5.50 and <6.00	⇒ 6.0

2. Test results are expressed in a grade from 1 to 10 with a single decimal, or as 'pass' / 'fail'.
3. Examination results of 6.0 or higher respectively 'pass' are a pass.
4. Examination results, if a pass, obtained at foreign universities are registered as a P (pass). Examination results obtained at Dutch universities are adopted one-to-one, with due regard for the provisions in Paragraph 1.
5. Credits may only be issued for a study unit if the study unit has been completed with a pass mark.
6. If more than one examination or test result has been recorded in SIS for one and the same unit of study, the highest grade applies.

#### Article A4.8 Determining and announcing results

1. The result of a written test or practical assignment is published via SIS within 20 working days.
  - a. The examiner determines the result of a written test within 15 working days after the test.
  - b. The examiner needs to pass on the result to the examination office or process the results in SIS within 5 working days of determining the result.
  - c. No rights can be derived from test results published on the LMS or communicated via any medium other than SIS.
2. The examiner has to inform the student of the result of an oral examination within one working day, unless, for the examiner, the oral examination is part of a series of oral examinations of the same study unit which are administered on more than one working day. In that case, the examiner

<sup>9</sup> In SIS, a comma is used based on the Dutch grading system (e.g., 7.0).

<sup>10</sup> Final phase: the calculation of the examination result after all test results have been announced.

is to determine and announce the result within one working day following the conclusion of the series of oral examinations.

3. In case the result for a study unit is based on multiple tests, the date of completion of the final test counts as the examination date.
4. In case the examiner is unable to meet the terms described in Paragraphs 1 and 2 due to extraordinary circumstances, they must inform the Examination Board of this, providing reasons for this situation. The student is then informed of the delay by the Examination Board as soon as possible, whereby a new deadline for the result is also determined. If the Examination Board concludes that the examiner has not met their obligations, it may appoint another examiner to ascertain the result of the examination.
5. Notwithstanding Paragraph 1, the results of the first test have to be published at least five working days before the resit to give the student time to prepare.

#### Article A4.9 Period of validity

1. The period of validity for the results of an examination that has been passed is unlimited. The validity of an examination result can only be restricted if the tested knowledge, insight, or skills are proven to be out of date.
2. Test results are only valid in the academic year in which they were obtained unless they are aggregated into an examination result.
3. The Examination Board may extend the validity of test results in individual cases at the request of the student.

#### Article A4.10 Post-examination right of inspection and discussion

1. Student are entitled to discuss and review their test together with the examiner, and the examiner has to explain the assessment.
2. If the examiner holds a group discussion of the assessment, the student must use that opportunity to exercise the right to discussion referred to in Paragraph 1. If a student is not given the opportunity at the group discussion to discuss the reasons for the examiner's assessment of the test with the examiner, the student may submit a request for individual discussion with the examiner within five working days after the group discussion. The individual discussion has to take place no later than three working days prior to the next test opportunity.
3. If there is no group discussion of the test, then a student may submit a request to the examiner for an individual discussion within ten days after publication of the results. The individual discussion has to take place no later than three working days prior to the next test opportunity.
4. Individual and group discussions must take place no later than five weeks after the publication of the test results, but at least three working days prior to the next test opportunity, in the presence of the examiner or a substitute designated for that purpose.
5. The student has the right to inspect their work for a period of two years after the assessment.

#### Article A4.11 Retention period for tests

1. The retention period for test assignments, keys, papers, and the assessments of written tests is two years.
2. The retention period for final thesis reports is seven years.

## A5 Final Examination

### Article A5.1 Master's final examination and degree

1. The Master's final examination is considered to be complete when the student has passed all study unit examinations in the Master's programme.
2. The date of the final examination is the date on which the student completes the final study unit of the degree programme.
3. A diploma can only be awarded after the student has received formal approval for their study programme as described in Section B.
4. A student may submit a written request, giving reasons, to the Examination Board to postpone the final examination, and thus to postpone the awarding of the diploma. The maximum duration of any postponement that can be granted is twelve months, in principle. In exceptional cases<sup>11</sup>, the student may have valid reasons for requesting that the awarding of the diploma be postponed for more than twelve months.
5. If the student has requested postponement based on the provisions of Paragraph 4, then the date of the examination is the date on which the Examination Board decides that the student has passed the final examination subsequent to the postponement.
6. Students who have successfully met all requirements for the Master's final examination are awarded a Master of Science (MSc) degree.
7. The degree conferred is stated on the diploma.

### Article A5.2 Diploma

1. The Examination Board awards a diploma as proof that the student has satisfied all the requirements of the examination once the Executive Board has confirmed that the procedural requirements for awarding the diploma have been met. The date indicated on the diploma (i.e., the date of the final examination) is the date on which the student completed the final study unit of the degree programme.
2. The diploma is signed by the chair of the Examination Board. If the Chair is absent, one of the members of the Examination Board may also sign the diploma.
3. The diploma is in English and complies with the European format for such diplomas and WHW Article 7.11.
4. An International Diploma Supplement is appended to the diploma. This supplement is intended to provide insight into the nature and content of the degree programme to promote the international recognition of the programme (WHW, Article 7.11, Paragraph 4).
5. If the Examination Board has awarded a specific distinction (e.g., cum laude) to the student, then this is mentioned on the diploma.
6. Students who have successfully completed more than one examination but cannot be awarded a diploma as referred to in Paragraph 1, receive, at their own request, from the Student Services Desk a statement prepared by or on behalf of the Examination Board which in any case states the results of the examinations the student has passed.

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<sup>11</sup> Some examples (by way of illustration, not to exclude other situations): the student attends a double degree or combined degree programme, or an extensive extra-curricular activity requires more than twelve months.

### Article A5.3 Cum Laude

1. The Examination Board checks whether the student has fulfilled all requirements. If the *judicium Cum Laude* ('with distinction') applies, this is stated on the diploma and the diploma supplement.
2. The *judicium Cum Laude* can be awarded provided the following requirements are met:
  - a. The precise weighted average<sup>12</sup> of the grades for all study units of the Master's examination programme, excluding the Master's thesis (final project) and the internship (if applicable), is at least 8.00; Results for study units outside the examination programme, are not taken into account.
  - b. Those parts of the examination programme for which an exemption was granted, or which were not graded with a number<sup>13</sup> are not considered when calculating the average grade.
  - c. Exemptions within the examination programme may be granted to a maximum of 15 ECs.
  - d. The Master's thesis (final project) is graded at 9.0 or higher.
  - e. If an internship is part of the examination programme, it is graded at 8.0 or higher.
  - f. No more than one study unit of the examination programme has been graded lower than 7.0.
  - g. The study programme has been completed within 125% of the nominal duration, starting from the start date recorded in SIS.
3. Students who have been found guilty of academic misconduct in academic activities related to the programme for which the cum laude is to be awarded, are excluded from the *judicium cum laude*.
4. In individual cases the Examination Board may grant the *judicium Cum Laude* even if not all requirements are met due to extenuating circumstances. It is noted that the distinction of cum laude is never awarded automatically, but only following individual assessment of the student's academic achievements.

## A6. Student guidance and study progress

### Article A6.1 Study progress report

1. Every student can access their list of the results achieved in SIS. The student can request a certified study progress overview from the Student Services Desk if required.

### Article A6.2 Student guidance

1. The Faculty Board is responsible for student guidance.
2. Student support and guidance includes 'decentralised' guidance, as provided within study programmes, and 'central' guidance, as provided by the Centre for Educational Support.
3. Student guidance includes guidance with questions or problems with regard to career orientation and career choices and guidance with problems that affect study progress. Students are offered personal and professional student (career) guidance for optimal study progress. Where possible, needs for specific guidance are met.

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<sup>12</sup> The weighted average is proportional to the number of credits.

<sup>13</sup> With the exception of EIT Digital Master school programmes

4. Each student is assigned a study adviser.
5. The study adviser supervises students and advises them on all aspects of the studies, also on personal circumstances that may be affecting the student's studies.
6. A systematic method on how students are monitored and obstruction in study progress is signalled is documented by the programme (for example in a policy plan or an annual cycle).
7. Information about the guidance facilities of the study programme is in any case available on the website of the study programme.

#### Article A6.3 Special Facilities

1. If students wish to exercise their right to specific supervision or special facilities, they should contact the study adviser. The study adviser records the agreements made with the student in SIS.
2. A student is entitled to special facilities in case of demonstrable circumstances beyond the student's control or extenuating personal circumstances. The facility may provide for dispensation from or an additional opportunity to sit examinations or tests to be granted and/or for specific facilities to be made available. Such dispensation and additional resits may only be granted by the Examination Board.

## A7. Studying with a functional impairment

#### Article A7.1 Studying with a functional impairment

1. A functional impairment is defined as having an illness condition, impairment, or handicap that might impede or otherwise constitute a barrier to the student's academic progress.
2. Facilities are aimed at removing individual barriers in the teaching programme and/or when it comes to taking examinations and tests. These facilities may be related to access to infrastructure (buildings, classrooms, and teaching facilities) and study materials, adjustments to the form of assessment, alternative learning pathways, or a customised study plan.

#### Article A7.2 Request for facilities

1. The study adviser and the student concerned discuss the most effective facilities that can be provided for the student as referred to in Article 2 of the Equal Treatment of Disabled and Chronically Ill People Act (WGB h/cz).
2. Based on the discussion referred to in Paragraph 1, the student has to submit a request for facilities. This request should be submitted to the study adviser, who has been mandated by the Faculty Board, preferably three months before the student participates in classes, exams, and tests for which the facilities are required.
3. The request should be supported by documents that are needed to enable an assessment to be made.
4. The study adviser decides on the admissibility of the request and informs the student of the decision within twenty working days after receipt of the request, or sooner if the urgency of the request dictates.
  - a. Should the request be granted, the period of validity is also indicated.
  - b. If the request is not granted, or only partly granted, the study adviser informs the student of the justification for not granting the request as well as the possibilities for filing an objection and an appeal with the Complaints Desk.

- c. Students who are dyslexic, are granted a maximum of 15 extra minutes for each hour that a test or exam is officially scheduled.
5. The study adviser informs the relevant parties in due time about the facilities that have been granted.
6. The applicant and the study adviser evaluate the facilities before the end of the period for which they have been granted. During this evaluation, the parties discuss the effectiveness of the facilities provided and whether they should be continued. No evaluation takes place of facilities granted to students because of the functional impairment dyslexia.

## **A8. Amendments, transitional arrangements, appeals and objections.**

### Article A8.1 Conflicts with the regulations

If other additional regulations and/or provisions pertaining to education and/or examinations conflict with these education and examination regulations, the provisions in these education and examination regulations prevail.

### Article A8.2 Administrative errors

If, following the publication of a result, a marks sheet, or a student's progress report a manifest error is discovered, the discoverer, be it the university or the student, is required to make this known to the other party immediately upon finding the error and to cooperate in rectifying the error.

### Article A8.3 Amendments to the regulations

1. Substantive amendments to these Education and Examination Regulations are enacted by the Faculty Board in a separate decision.
2. In principle, substantive amendments to these Regulations do not apply to the current academic year. Amendments to these Regulations may apply to the current academic year if the interests of the students are not prejudiced within reasonable bounds, or in situations of force majeure.
3. Amendments to these Regulations have no effect on earlier decisions by the Examination Board.

### Article A8.4 Transitional arrangements

1. In the case of amendments to the Education and Examination Regulations, the Faculty Board adopts a transitional arrangement, as necessary.
2. The transitional arrangement must be published on the degree programme's website or published in Section B of these regulations.
3. The following principles are applicable to any transitional arrangement if a Master's programme is changed:
  - a. Changes to the curriculum are to be announced prior to the academic year in which the changes take effect.
  - b. No guarantee can be made that all programme study units that were part of the curriculum when students enrolled in a programme continue to be part of the curriculum. The final Master's examination is to be based on the curriculum most recently adopted by the Faculty Board.
4. Transitional arrangements always include:
  - a. which discontinued study units are equivalent to study units or components thereof in the revised Master's programme that is included in Section B.

- b. if a study unit without practical exercises is discontinued, there will be at least one opportunity in the subsequent academic year to take a written or oral examination or to ensure assessment by some other means.
  - c. if a study unit that involves practical exercises is removed from the programme, and during the subsequent academic year no opportunities are provided to complete these practical exercises, at least one study unit is designated as a suitable replacement for the discontinued study unit.
  - d. the term of validity of the transitional arrangement.
5. The transitional arrangement must be approved by the Examination Board.
  6. In exceptional cases and to the student's benefit, the Examination Board may deviate from the prescribed number of opportunities to sit exams and/or tests related to study units that have been dropped from the curriculum.

#### Article A8.5 Assessment of the Education and Examination Regulations

1. The Faculty Board is responsible for the regular assessment of the Education and Examination Regulations, with specific emphasis on the study load.
2. In accordance with article 9.18 of the WHW, the programme committee has a partial right of consent of and a partial right to be consulted on parts of the education and examination regulations.
3. The Programme Committee is responsible for the annual assessment of the manner in which the education and examination regulations are implemented.

#### Article A8.6 Appeal and objections

An appeal and objections must be submitted in writing to the [University of Twente Complaints Desk](#) within six weeks after notification of a decision to the student.

#### Article A8.7 Hardship clause

In cases of demonstrable unreasonableness and unfairness of a predominant nature, the Examination Board or the Programme Director may allow the provisions in these Regulations to be deviated from. This depends on which body is authorised or has the duty according to these Regulations to take a decision on or make an exception to a provision in these Regulations.

#### Article A8.8 Publication

The education and examination regulations and the Examination Board's Rules and Guidelines are to be published on the degree programme's website.

#### Article A8.9 Entry into force

These Regulations enter into force on 1 September 2023 and replace the Regulations dated 1 September 2022.



## SECTION B: PROGRAMME-SPECIFIC SECTION

# MASTER APPLIED MATHEMATICS

### **About this Section**

The Education and Examination Regulations (EER) are subdivided into two sections (Section A and Section B), which together form the EER. Section A, which can be seen as the faculty section, includes provisions that apply to all EEMCS Master's degree programmes. Section B contains the provisions that are specific to the Master's programme in Applied Mathematics

## B1. General provisions

### Article B1.1 Definitions

AI4Health:	Track Artificial Intelligence for Health within the specialisation MDS.
Cohort:	Group of students enrolled in the same master's programme who begin in the same academic year.
Graduation supervisor:	Senior examiner of the chair chosen by the student to graduate from.
Mastermath:	A cooperation between all Departments of Mathematics of the Dutch universities to enhance their master's programmes in mathematics by organizing joint courses.
M-coordinator:	Master coordinator.
MDS:	Specialisation Mathematics of Data Science.
OR:	Specialisation Operations Research.
SACS:	Specialisation Mathematical Systems Theory, Applied Analysis and Computational Science.

## B2. Programme objectives and programme intended learning outcomes

### Article B2.1 Aim of the programme

The programme aims to educate the students as competent researchers in Applied Mathematics and as academic professionals with the capacity and attitude to further develop him- or herself in his/her future career.

The programme envisages educating mathematicians who will use mathematics from the perspective of applications in a societal and multidisciplinary context and who can communicate effectively to others including non-mathematicians.

The master graduates have the following competences:

- a competence in the scientific discipline;
- b competence in doing research and modelling;
- c professional attitude;
- d academic reflection;
- e competence in communicating.

In working towards achieving these competences, attention is explicitly focused on alignment with both national and international standards, on reflection on science, technology and society, on presentation and on the feasibility of the programme from the student's point of view.

The educational profile of the programme is characterized on the one hand by the three specialisations within the programme (see Article B4.1) and on the other by the attention paid to mathematical modelling. See Sections B4.3, B4.4 and B4.5 for further details.

The programme offers the following three specialisations:

- **SACS: Mathematical Systems Theory, Applied Analysis, and Computational Science;**
- **OR: Operation Research;**
- **MDS: Mathematics of Data Science;**

Students choose a chair contributing to a specialisation. During the second year of the Master's programme, the students act as 'junior members' of the chair they have selected. It is during this phase that the students are given the greatest opportunity to demonstrate that they have acquired the qualities outlined in Article B2.2 by the time they complete their studies.

The focus on mathematical modelling is prevalent in various Master's courses (see Article B4), and especially in the internship and the final project (see Article B5 and B6).

Article B2.2 Programme intended learning outcomes

The knowledge, understanding and skills students must have acquired upon completion of the programme are as follows:

- Graduates have an in-depth knowledge of mathematics within a specialization and an insight into its application in a field such as engineering, health sciences, ICT or business sciences.
- Graduates are able to answer complex research questions with the help of different methodologies. When formulating and solving problems, graduates are capable of determining whether the mathematical tools at hand suffice, and, if not, they are able to extend theories and methods themselves or otherwise are able to find such extensions in the professional literature.
- Graduates are able to transcend the boundaries of their selected mathematical specialisation to a reasonable degree so that they can collaborate on interdisciplinary projects and also are able to formulate new problems in a scientific manner and to arrive at verifiable solutions.
- Graduates are able to function in an engineering environment. Most importantly, they are able to apply mathematical methods and techniques appropriately and they have the capacity to integrate components from mathematics as well as different areas of application.
- Graduates are able to search through, select, analyse the available literature independently and critically and use them in their research.
- Graduates demonstrate advanced proficiency in written and oral communication, effectively conveying complex ideas and results to both expert and lay audiences.
- Graduates have an adequate comprehension of the development of applied mathematics, its place in society and are aware of its ethical aspects.

### B3. Admission requirements

Article B3.1 Additional admission requirements

In addition to A2.1 and A2.2 the following admission requirements apply:

1. Students who completed a Bachelor's degree in Applied Mathematics from the Universities of Twente, Delft, or Eindhoven are eligible for direct admission to the programme. Students from other institutions may be subjected to additional requirements in accordance with their specific educational backgrounds and interests.
2. The admissions board can grant admission based on the choice for a specialisation and admit a student into only one of the specialisations.
3. Students who are assigned a pre-Master's programme, as described in Section A, Art. 2.7 of this EER, may be exempted from some parts, with proper proof that they have already successfully completed those parts.

## B4. Curriculum structure

### Article B4.1 Composition of programme

1. The Master's programme is divided into three specialisations. Each student chooses a specialisation and – within that specialisation – a study programme consisting of units of study. Article B4.2 lists all the Master's courses that are provided by the Master's programme of AM.
2. Students can specialise in:
  - Mathematical Systems Theory, Applied Analysis and Computational Science (SACS)
  - Operations Research (OR)
  - Mathematics of Data Science (MDS)
3. The Master's programme is a full-time two-year programme. The curriculum consists at least of the following elements:
  - a. A minimum of 17 ECs in common courses (as referred to in articles B4.2 – 4.5).
  - b. In case a student excludes or is exempted from the common course Continuous Optimization, at least another Mastermath course (national courses offered via [elo.mastermath.nl](http://elo.mastermath.nl)) must be included.
  - c. In addition to a. and b. mathematics courses of a Master's level so that the programme intended learning outcomes are met and the student satisfies the requirements of the chosen specialisation.
  - d. 20 EC on Internship.
  - e. 40 EC on Final Project.
  - f. Sufficient number of electives added to the above courses so that the total number of ECs of the master adds up to at least 120 EC.
  - g. The Master's programme may contain a maximum of 10 ECs of homologation courses of bachelor level, if these are needed for the successful completion of the programme and approved by the graduation supervisor.

Articles B4.3, B4.4 and B4.5 provide further details on the Master's programme for the specialisations SACS, OR and MDS respectively.

4. Within the specialisation MDS there exists a track AI4Health, for which the following provisions replace B4.1.3.d-e:
  - d. Research Topics (10 EC), for the preparation of the Masters' Thesis.
  - e. 30 EC Final Project (combined with Internship; executed at an external institution).

Articles B4.5 provides further details on the Master's programme for the track AI4Health.

5. When the track AI4Health has not been chosen, contrary to provision B4.1.3.d and e, Internship and Final Project may be combined (60 ECs), subject to a minimum of 3 months at an external institution.

The rules and procedures governing the Internship and Final Project are specified in Articles B5 and B6.

6. **National Mastermath courses**

National courses are offered and coordinated by the Mathematics Coordination Group. See [elo.mastermath.nl](http://elo.mastermath.nl) for a list of these. The examination rules and prerequisites are also posted on this website. These courses are offered in addition to the Master's courses offered as part of the programme. The courses mentioned in B4.1.3.c and B4.1.3.d may be replaced by similar courses from the national curriculum.

7. Students with a bachelor degree which includes the “educatieve minor met wiskunde tweedegraads lesbevoegdheid” may use the ECs for electives and the 20 EC from the internship to create an alternate package of 30 EC with didactical/pedagogical courses, including an internship in a highschool, to obtain the “eerstegraads lesbevoegdheid wiskunde”.
8. If the student wishes to take a different course than the units of study listed, advance permission must be obtained in writing from the Examination Board.

#### Article B4.2 Overview of the master's programme

The table below lists the AM courses that can be part of the study programme. These courses are given at the UT or offered nationally with at least one lecturer from the UT. Besides the courses listed in the table below, master-level courses provided by other programmes at the UT can be chosen as an elective. Also, other national courses can be taken as electives. The total range of national courses can be found at [elo.mastermath.nl](http://elo.mastermath.nl). The electives have to be approved as part of the master's programme by the graduation supervisor and the examination board.

#### Year 1

Course code	Name	ECs	Period
<i>Common mandatory courses</i>			
191581200	Continuous Optimization	6	1A-1B
191551200	Scientific Computing	6	2A-2B
201500510	Pioneers of Applied Mathematics	5	2B
<i>Other AM courses</i>			
202100097	Finite Element Methods	6	2A-2B
191506302	Applied Functional Analysis	6	1A-1B
201800171	Applied Queueing Models	5	2B
202300130	Capita Selecta Applied Mathematics	2-5	Year-round
202100110	Case Studies for DS&AI	2-10	Year-round
201800222	Complex Networks	5	1A
201800177	Deep Learning-From Theory to Practice	5	1B
191581100	Discrete Optimization	6	1A-1B
191521800	Game Theory	5	1A
201700080	Information Theory and Statistics	5	2A
201700034	Introduction to Partial Differential Equations	5	2A
201300042	Limits to Computing	5	1A
191531920	Markov Decision Theory and Algorithmic Methods	5	1B

201800321	Measure and Probability	5	1A
191560430	Nonlinear Dynamics	5	1A
191551150	Numerical Techniques for PDE	5	1B
191561620	Optimal Control	5	1B
191581420	Mixed-Integer Optimization	5	2A
201700033	Partial Differential Equations	6	2A-2B
191531870	Queueing Theory	6	2A
191560671	Robust Control	5	2A
201700364	Spatial Statistics	5	2B
201900115	Statistical Learning	5	1A
201800339	Stochastic Processes	5	1B
191561560	Systems and Control	6	1A-1B
191571090	Time Series Analysis	5	2B
202100112	Graphical Models and Causality	5	2B
202100109	Reinforcement learning	5	2A
202100108	Uncertainty Quantification and Data-Driven Modeling	5	2A
202100107	Deep learning for 3D Medical Image Analysis	5	2B

As part of the programme the student can also select the Capita Selecta AM. This Capita Selecta is between 2-5 EC. The lecturer together with the student can select a specific topic including learning objectives and a specific assessment using the form on the AM master website. The proposal has to be approved by the examination board.

## Year 2

Course code	Name	ECs
191508209	Internship AM	20
202100111	Research Topics AI4Health	10
191508309	Final Project AI4Health	30
191508409	Final Project	40

Article B4.3 SACS Programme 2023-2024

The following course requirements apply:

1. Continuous Optimization (Mastermath, 6 EC)
2. Scientific Computing (6 EC)
3. Pioneers of Applied Mathematics (5 EC)
4. Applied Functional Analysis (6 EC)
5. Optimal Control (5 EC)
6. Finite Elements Methods (6 EC)
7. Electives, in agreement with the graduation supervisor, so the entire study programme adds up to at least 60 ECs (excluding internship/final project).

The study-programme must include at least one mastermath course, if Continuous Optimization is excluded from the study programme.

#### Article B4.4 OR Programme 2023-2024

The following course requirements apply:

1. Continuous Optimization (Mastermath, 6 EC)
2. Scientific Computing (6 EC)
3. Pioneers of Applied Mathematics (5 EC)
4. Three courses from:
  - Discrete Optimization (Mastermath, 6 EC)
  - Queueing Theory (6 EC)
  - Game Theory (5 EC)
  - Markov Decision Theory and Algorithmic Methods (5 EC)
  - Applied Queueing Models (5 EC)
  - Stochastic Processes (5 EC)
  - Measure and Probability (5 EC)
  - Mixed-Integer Optimization (5 EC)
5. Electives, in agreement with the graduation supervisor, so the entire study programme adds up to at least 60 ECs (excluding internship/final project).

The study-programme must include at least one mastermath course, if Continuous Optimization is excluded from the study programme.

#### Article B4.5 MDS Programme 2023-2024

Within the MDS programme there are two tracks. The course requirements are different. For the main track, the following course requirements apply:

1. Continuous Optimization (Mastermath, 6 EC)
2. Scientific Computing (6 EC)
3. Pioneers of Applied Mathematics (5 EC)
4. Three courses from:
  - Complex Networks (5 EC)
  - Deep Learning: from Theory to Practice \* (5EC)
  - Graphical Models and Causality (5 EC)
  - Statistical Learning \*(5EC)
  - Machine Learning I \* (5 EC)
  - Spatial Statistics (5 EC)

An additional requirement is that students need to select at least one of the \*-marked courses.

5. Electives, in agreement with the graduation supervisor, so the entire study programme adds up to at least 60 ECs (excluding internship/final project).

The study-programme must include at least one mastermath course, if Continuous Optimization is excluded from the study programme.

For the track AI4Health, the following course requirements apply:

1. Continuous Optimization (Mastermath, 6 EC)
2. Scientific Computing (6 EC)
3. Pioneers of Applied Mathematics (5 EC)
4. Machine Learning I (5 EC)
5. Deep Learning: from Theory to Practice (5 EC)
6. Statistical Learning (5 EC)
7. Markov Decision Theory and Algorithmic Methods (5 EC)
8. Case Studies in DS&AI (6-10 EC)
9. Two courses from:
  - a. Deep learning for medical image analysis (5 EC)
  - b. Graphical models and causality (5 EC)
  - c. Reinforcement learning (5 EC)
  - d. Mixed-Integer Optimization (5 EC)
  - e. Uncertainty quantification and data-driven modeling (5 EC)
10. Electives, in agreement with the graduation supervisor, so the entire study programme adds up to at least 80 ECs (excluding research topics/final project).

The study-programme must include at least one mastermath course, if Continuous Optimization is excluded from the study programme.

Article B4.6 Combined Master's programme for Applied Mathematics and Applied Physics

The combined master's programme AM-AP is the combination of the separate master's programmes AM and AP, which the student follows in parallel. For this combined programme a standard combined master's programme AM-AP exists which is subject to the following requirements:

- a. Compulsory courses from Master Applied Mathematics 30-45 EC
- b. Compulsory courses from Master Applied Physics 30-45 EC
- c. Combined Internship 30 EC
- d. Combined Master Assignment 60 EC
- e. Elective courses 0-30 EC
- f. Total (minimal) 180 EC
- g. In fulfilling B4.6.a and B4.6.b, courses that are part of both compulsory master's programmes are placed in the most appropriate programme.
- h. A maximum of 15 EC bachelor level courses can be part of the combined programme.
- i. Contrary to B4.6.c, it is possible to do an AM internship and an AP internship separately each of 20 EC.



#### Article B4.7 Approval of the study programme

Students can create part of their own study programme using the units of study offered, with due observance of the provisions of Article B4.1. The study programme must be approved by the examination board with due observance of the provisions of Article B4.1. Students should have their programme approved within 3 months of starting the master. Approved programmes need to be handed in at the Office of Educational Affairs (BOZ). The M-coordinator and graduation supervisor are authorized to approve a later single change to the programme to a maximum of 6 EC in total. When multiple small changes are requested, approval of the examination board is once again required.

The units of study comprising the study programmes are annually determined for new students and, if necessary, changed for students further along in the degree programme. Each specialisation is handled separately. This includes the scope and interrelation of units of study and the schedule of interim examinations. If changes are made, a transitional arrangement will apply to cohorts further along in the degree programme, in accordance with the provisions in Article B8.

#### Article B4.8 Sequence of examinations

Students may participate in examinations [and/or practical exercises] for the units below only if they have passed the examination or examinations for the units mentioned:

- Internship after passing at least 45 EC of the approved study programme. See Article B5 and in particular, B5.3.3, for the requirements to start an internship.
- Final project after passing the internship (except in case of a combined internship and final project). See Article B6.3 for the requirements to start the Final project.

## B5. Internship

#### Article B5.1 Aim of the internship

The 20-EC internship is completed over a period of at least 14 weeks. The student spends the time in an off-campus work setting. University of Twente is only eligible as an internship host in exceptional cases, at the discretion of the study adviser, graduation supervisor and Examination Board. During the internship, the student performs work determined by the host organisation and in line with the organisation's aims. The work must also be related to the programme both in terms of substance and level. The aims of the internship are for the student to:

- experience how to practically apply the knowledge and skills gained from the programme
- learn how to work with colleagues within an organisation and work in accordance with the rules and preconditions applicable to and deemed important by the organisation

At the conclusion of the internship, the student submits a written report about the internship.

#### Article B5.2 Prior to the internship

The programme has an Internship coordinator who handles the various issues relevant to internships. Prior to the internship, the following actions should be taken

1. Notwithstanding Article A3.9.4, the student contacts the internship coordinator at least three months before the student wants to start the internship in the Netherlands. For internships abroad, the student must contact the internship coordinator about six months before the internship starts.

2. The internship coordinator can assist in finding an appropriate placement, taking into consideration – as much as reasonably possible – the student’s wishes in terms of, for instance, the type of assignment, type of company, regional placement and term of the internship. The internship will be geared as much as possible to the student’s chair.
3. Lecturers may assist the student in finding a suitable placement or the student may find one by himself/herself.

#### Article B5.3 Internship admission

The internship must be reported to and registered through the coordinator. The following matters must be arranged by the graduation supervisor (or someone designated by the supervisor).

1. The supervisors -- AM internship mentor and company mentor -- are designated (see Supervision).
2. The internship job description is assessed and approved by the AM internship mentor.
3. Prior to starting the internship, the student must have a study programme signed by the M-coordinator and a senior examiner and a minimum of 45 ECs of the programme completed.

#### Article B5.4 Supervision

Two supervisors are designated before the student leaves for the internship location:

1. the company mentor: a member of the staff of the company who assists and evaluates the student at the company.
2. the AM internship mentor: the examiner from AM, who assists with and evaluates the content of the internship.

#### Article B5.5 Evaluation

The AM internship mentor determines a grade for the internship after receiving the report. The company evaluation is also taken into consideration. The internship coordinator verifies whether the report meets the requirements.

## B6. Final project

#### Article B6.1 The final project

There are three types of final projects:

- a (stand-alone) final project (40 EC) or
- a final project in combination with the internship (60 EC).
- a final project (30 EC; executed externally and relevant only for the track AI4Health)

The final project must enable the student to apply the expertise gained during prior courses to solve well-defined problems of sufficient academic difficulty. In completing the final project, students must be allowed to make their own decisions. Students must be able to address the problem systematically, achieve clear results and formulate clear conclusions. Students are expected to report, both orally and in writing, on their findings and read and process relevant literature critically.

Students who choose the combined internship and final project may use part of their ECs to focus on the project theme before leaving for the internship location and work on their report after their return.

At the beginning of the final project, the student and the graduation supervisor make work agreements. The graduation supervisor ensures that the assignment is in line with the 'mission' of the student's chosen specialisation and arranges for adequate supervision.

The student will meet with the supervisors regularly to discuss the progress of the final project. These meetings focus on both the content and the implementation of the final project (comparable to the job appraisal interviews students will encounter later in their career).

To complete the final project, the student must submit a written report in hardcopy unless specified otherwise and give a public presentation at the UT.

#### Article B6.2 Graduation Assessment Committee

- a. The regulations about the composition of the graduation assessment committee are laid down by the Examination Board in the 'Rules and Guidelines' and in Article A3.8 (faculty section of this EER).
- b. In addition, the committee should be composed of at least 3 members. Also, the examiner belonging to the different chair than the student's chair of graduation should be one who was not involved in daily supervision.

#### Article B6.3 Final project admission and eligibility

The student contacts a graduation supervisor willing to take responsibility for the development, organisation and supervision of the project and/or an external organisation where the project can be performed. The study adviser and the M-coordinator can help in this process. The graduation supervisor can be of assistance in making arrangements with external organisations. The following conditions must be met prior to definitive admission to the final project:

- A senior examiner and the M-coordinator have approved the student's study programme.
- A graduation supervisor willing to take responsibility for the organisation, supervision and assessment of the graduation project has been found.
- Disregarding the final project or combined internship and final project, the student has no more than 10 EC of uncompleted courses from the approved study programme.

#### Article B6.4 Rules for supervising and evaluating final project

The graduation supervisor is responsible for ensuring that there is proper supervision and evaluation during the course of the final project.

As part of supervision, the graduation supervisor is responsible for properly documenting the correspondence between the student and graduation committee, along with any agreements made as a result. This includes reports of any obstacles beyond the student's control that he or she has encountered while working on the final project, such as special personal circumstances, changes at the company where the student is performing his/her project, inadequate facilities or requisite information not being available on time.

The graduation supervisors ensure that work schedules and all additional agreements with the student are also documented. In particular, the early work done in advance of the student's departure for the internship location as part of a combined internship and final project is well-documented. During the final

evaluation of the final project, explicit consideration is given to the early work but the report does not necessarily have to describe that work in detail.

No later than 5 weeks before the final project is due, the student and graduation supervisor confer on the project's status. A report of this meeting is documented and states the project due date (rescheduled if necessary), as well as any corrective changes to the project description and supervision. The student explicitly confirms approval of the updated agreements. Any time an extension of more than a month is granted (not including holiday periods), this is documented including motivation no less than three weeks before the extension is to expire.

## **B7. Degree**

Students who have successfully completed their Master's final examination are awarded a Master of Science degree. The degree awarded is stated on the diploma. If it is a double degree, this will also be stated on the diploma.

## **B8. Transitional and final provisions**

### Article B8.1 Transitional provisions

Students who have started their master's programme more than 6 years ago, need to design an individual programme together with their graduation supervisor to satisfy the programme's intended learning outcomes. This individual programme needs to be approved by the examination board.

### Article B8.2 Publication

1. The faculty board will ensure the appropriate publication of these Regulations and any amendments to them.
2. The Education and Examination Regulations will be posted on the faculty website.

### Article B8.3 Effective date

These Regulations enter into force with effect from 1 September 2023.