

# EDUCATION AND EXAMINATION REGULATIONS

## MASTER'S DEGREE PROGRAMMES EEMCS

A. FACULTY SECTION

B. PROGRAMME-SPECIFIC SECTION

*2021-2022 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 model 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 the Regulations

1. These Regulations apply to education and examinations for the following Master's degree programmes: Applied Mathematics, Business Information Technology, Computer Science, Electrical Engineering, Embedded Systems, Interaction Technology, Internet Science and Technology, Systems & Control (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. These Regulations consist of a faculty Section (Section A) and a programme-specific Section (Section B). Section A contains general provisions that apply to education and examinations for all the Master's programmes at EEMCS. Section B contains programme-specific provisions. Together, Sections A and B form the Education and Examination Regulations for the relevant programme.
3. The 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.
4. These Regulations apply to anyone enrolled in the Master's programmes, irrespective of the academic year in which the student first enrolled in the programme.
5. Section B of these Education and Examination Regulations may include additional general provisions for the relevant programme.
6. For students who follow a study unit organised by another programme<sup>1</sup>, the rules for testing apply that are laid down in the assessment plan 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 concerned. Special facilities according to article A7 can only be granted by the programme for which the student is enrolled.
7. The general provisions and the programme-specific provisions to the Education and Examination Regulations have been authorized by the Faculty Board.
8. 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.
9. The institutional part of the Students' Charter includes a definition of what the UT considers as fraud. The Rules and Guidelines of the Examination Board of the Master's programme concerned has additional regulations about fraud, for instance about what action the Examination Board is entitled to take when they have observed a case of fraud.
10. Requests for exemptions to provisions laid down in the education and examination regulations should be submitted to the examination board or the programme board, the guiding principle here is which body has the authority to make a decision on - or to make an exception to - a provision of these regulations.
11. References in these regulations to 'the student', 'the lecturer', 'he', 'him' or 'his' must also be read as 'the female student', 'the female lecturer', 'she', or 'her'.

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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.

## Article A1.2 Definitions

The following definitions are used in these Regulations:

- a. **Academic year:** The period beginning on 1 September and ending on 31 August of the following calendar year
- b. **Admissions 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 his/her choice. If no Admissions Board has been appointed for the programme, the Programme Board will function as the Admissions Board.
- c. **Assessment plan:** A plan indicating how the testing of a course is organised.
- 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 digitally at [www.utwente.nl/coursecatalogue](http://www.utwente.nl/coursecatalogue).
- f. **Course:** A study unit of the programme, as defined by the WHW.
- g. **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.;
- h. **EC:** A unit of 28 hours of study workload, in accordance with the European Credit Transfer System, a full academic year consisting of 60 EC or 1680 hours (Article 7.4 WHW).
- i. **Education period:** The period in which the study unit is offered. This period starts in the first week in which the study unit has any educational activity and ends in the last week in which the study unit has an educational activity and/or a test. Resits are not part of the education period. This period is not always the same as a quartile.
- j. **Exam:** An evaluation in a study unit of the knowledge, understanding and skills of the student, as well as the assessment of the results of this evaluation (Article 7.10 of the WHW); an exam 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 Examination Board is the body that establishes, in an objective and expert manner, whether a student meets the criteria set out in the Education and Examination Regulations regarding the knowledge, insight and skills required in order to obtain a degree from the programme concerned.
- m. **Examiner:** The individual who has been appointed by the Examination Board, in accordance with Article 7.12c of the WHW, to hold examinations and tests and to determine their results;
- n. **Executive Board:** Executive Board of the University of Twente.
- o. **Faculty Board:** Head of the faculty (Article 9.12 WHW).
- p. **Final Examination:** A programme concludes with a final examination. A final examination is deemed successfully completed if the study units belonging to a programme have been completed successfully.
- q. **Fraud and plagiarism:** Fraud is an act or omission by a student designed to partly or wholly hinder the accurate assessment of his/her 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.
- r. **Functional impairment:** A functional impairment is a physical, sensory, or other impairment that might limit the student's academic progress.

- s. **Homologation:** Some 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. of the WHW.
- t. **Learning Management System (LMS):** System that supports online learning and teaching. In this case: Canvas.
- u. **Master's programme or programme:** The Master's degree programme, as referenced in Article 7.3a Paragraph 1 subparagraph b of the WHW: the entirety of the course components, teaching activities/methods, contact hours, testing and examination methods and recommended literature.
- v. **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.
- w. **Practical exercise:** Participation in a practical training or other educational learning activity, aimed at acquiring certain (academic) skills. Examples of practical exercises are:
  - researching and writing a thesis;
  - carrying out a research assignment;
  - taking part in fieldwork or an excursion;
  - taking part in another educational learning activity aimed at acquiring specific skills or participating in and completing a work placement.
- x. **Pre-Master's programme or Bridging programme:** A programme 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. of the WHW.
- y. **Programme Board:** The committee charged by the Faculty Board with managing the programme.
- z. **Programme Committee (PC):** The Programme Committee as referred to in Article 9.18 WHW.
- aa. **Quarter or quartile:** A part of a semester as specified in the academic calendar of the university.
- bb. **Semester:** Half an academic year, as specified in the academic calendar of the university.
- cc. **Senior Examiner:** Specific examiners, appointed by the Examination Board to take on the role as chair of an assessment committee for the Final Project.
- dd. **Student Information System (SIS):** System designated by the institutional board for registration and for providing information on all relevant data related to students and the programme, as described in the WHW. In this case: Osiris.
- ee. **Student:** Any person enrolled for a programme in accordance with Articles 7.34 and 7.37 of the WHW.
- ff. **Study Adviser:** Person appointed by the faculty board who acts as contact between the student and the programme, and as such represents the interests of the students, as well as fulfilling an advisory role.
- gg. **Study load:** The amount of time an average student needs to capture the learning material. The study load comprises for instance project work, self-study, lectures and writing papers. The study load is expressed in credit points in accordance with the European Credit Transfer System.
- hh. **Study Programme:** All study units followed by the student as part of his/her Master's programme;
- ii. **Test:** An evaluation of the knowledge, understanding and skills of the student, as well as the assessment of the results of this evaluation. A test is a part of an exam. If a study unit has only one test, this coincides with the exam for the unit in question.
- jj. **University:** The University of Twente (UT).
- kk. **WHW:** The Dutch Higher Education and Research Act (*Wet op het hoger onderwijs en wetenschappelijk onderzoek*).

- II. **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 is off.

Any other terms used can be assumed to follow the definitions ascribed to them by 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 (HBO) 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. In the event that a candidate does not have a Bachelor's degree as referred to in Paragraph 1, the Admissions Board of the Master's programme will assess the candidate's suitability for admission to the programme on the basis of the requirements stipulated in Section B.
3. The Admissions Board can admit students who lack some prior knowledge, provided they judge that this will 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 overall band score of at least 6.5 no older than two years
  - b. TOEFL internet-based test of at least 90 no older than two years
  - c. Cambridge CAE or CPE (both with an A, B, or C grade)
3. The following students are exempt from the requirement to prove their proficiency in English; students who:
  - a. have obtained a relevant Bachelor's degree from an accredited academic institution in the Netherlands;
  - b. have obtained a three-year Bachelor's degree in one of the following countries: Australia, Canada, Ireland, New Zealand, the United Kingdom or the United States of America).

### 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.

### Article A2.4 Admissions Board

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



#### Article A2.5 Admissions procedure

1. The Admissions 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 Admissions 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 Board will also assess requests for admission on the basis of the following documents:
  - a. motivation letter;
  - b. English proficiency scores according to Art. 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 Admissions 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 will 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 will be informed of this promptly. The Examination Board or the Faculty Board will 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 Admissions 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 his/her 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 Admissions 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 Admissions 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, will serve 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 twice the nominal study duration of the units to be completed unless otherwise specified.
6. Students from Dutch Universities of Applied Sciences may be allowed to follow 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, will serve 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 aims and programme intended learning outcomes of the Master's programme (Article 7.13 Paragraph 2 (a) of the WHW) are described in the Section B.

#### Article A3.2 Programme structure

1. The programme comprises the study units listed in Section B.
2. The scope of the Master's programme in ECs is 120. 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 duration of two years, with each year divided into two semesters.
5. Every semester consists of two periods of ten weeks of education.
6. Master's programmes are taught on a full-time basis.

#### Article A3.3 Language of Instruction

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

#### Article A3.4 Exemptions

1. The examination board can grant students exemption from one or more complete study units at their request. To this end, students will demonstrate that they
  - a. have completed a component of a similar content, size and level of a university or higher professional education programme or
  - b. have, as a result of work and/or professional experience, sufficient knowledge and skills regarding the study unit concerned.
2. The examination board is authorised to make exceptions to the provisions as stated in paragraph 1 and grant an exemption to a student from parts of a study unit.
3. An exemption granted by the examination board will be registered in SIS with the concerning study unit or parts thereof with an EX (exemption).
4. Students cannot be forced to take extra study units or parts of study units in their curriculum instead of the granted exemption.
5. Exemptions may be granted to a maximum of 30EC.

6. Students may be exempted from the obligation to participate in practical exercises if they can demonstrate that they expect to be placed in a moral dilemma as a result of the need to meet one of the requirements for this component. In such cases, the examination board decides whether the component can be carried out in another manner to be determined by the examination board.

#### Article A3.5 Flexible degree programmes

1. The Examination Board for the Master's programme decides whether a student may take part in a flexible degree programme as stipulated in Section 7.3h. of the WHW. The Examination Board assesses whether the programme is appropriate and consistent within the domain of the programme and whether the level is high enough in relation to the programme intended learning outcomes.
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 ECs 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:

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**, 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 will apply
3. The combined programme as described in paragraph 2 includes not only study units that are part of both Master's programmes, but also 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 2a and 2b, the study load of the final project must be at least 100% of the

requirement in ECs for the final project of the programme that has the highest number of ECs plus at least 50% of the requirement in ECs 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 2a, the study load of the internship must equal the load of the internship with the highest number of ECs.
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 degree audit which they will pass if the assessments included in their file would result in a pass for the final degree audit of both programmes individually in accordance with the applicable regulations. The Examination Boards of the programmes involved will decide whether a student will pass the final degree audit. The Programme Board will 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.
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 timetable for completion must be approved by the supervisor 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 combined 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

7. The committee contains at least two examiners, at least one of which is senior examiner; it is chaired by a senior examiner
8. The examiners must belong to (at least) two different research groups
9. All supervisors of the project are members of the assessment committee. Supervisors who are not examiners serve on the committee in an advisory capacity.
10. 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
11. 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 Board. 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 ECs 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 ECs of their examination programme;
  - b. additional requirements may apply for each programme, which will be stipulated in Section B where applicable.
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 daily 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 daily supervisor.
7. During the internship, the student will write a report about his/her work. At the end of the internship period, this report will be submitted to the company supervisor. The company supervisor will assess the report using the relevant assessment form. The assessment will be 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 will base his/her 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 of finishing the internship.

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

1. According to the study load of 20EC 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 will fall 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 and internship report will be made public unless confidentiality has been deemed necessary (see following Paragraphs).
2. The Programme Board may declare an internship report and/or 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 preferably before the start of the final project or internship, but no later than four weeks before the end of the final project or internship.
  - b. A confidential report remains accessible for the supervisor, the Programme Board, and any members of bodies with the authority to assess the quality of the grading of the entire programme.
  - c. All parties mentioned in 2b are required to respect the confidentiality of the report.
3. The confidentiality period will by default be set at 2 years up to a maximum of 5 years.

4. If confidentiality is deemed necessary as described in 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 for the relevant programme.

#### Article A3.12 Evaluation

To monitor and to improve the quality of teaching, the EEMCS MSc programmes use information about the students' learning experiences. This information is obtained from:

- Internal evaluations
  - Periodic course evaluations at the end of each course
  - Additional panel evaluations, on request from lecturer, students, or Programme Director
- External sources
  - National Student Survey (NSE)
  - National Alumni Survey
  - International Student Barometer

## A4. Examinations

#### Article A4.1 Signing up for courses and examinations

1. Every student must sign up in SIS in order to participate in a course. It is also mandatory to register before every examination opportunity.
2. Notwithstanding Paragraph 1, any student who has correctly signed up to participate in the instruction/classes for a particular course and has been admitted will also automatically be signed up for the subsequent examination, unless the course description specifies otherwise. For each examination after that, the student has to register in SIS manually.
3. The student has the right to inspect recent model test questions or model tests, or old tests and the associated answer keys, along with the standards for assessment.

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

1. The course catalogue in SIS stipulates how a study unit is to be assessed and the form of any examinations. Exams and tests can have the following various forms<sup>2</sup>.
  - a. Tests or exams can be held online or offline.
  - b. A test or exam may be held online by means of online surveillance<sup>3</sup> or online proctoring<sup>4</sup>, in the event where no alternative exam method is reasonably possible<sup>5</sup>.
    - i. Pursuant the DPIA<sup>6</sup> the retention period of the data is 30 days unless the examination board decides that the data needs to be maintained longer for a fraud investigation.
  - c. The examination board may lay down further rules and conditions for online (proctored) testing.

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<sup>2</sup> A test or exam can have the following forms: a written test, an assignment, an oral test, practical exercises, or a combination of these forms.

<sup>3</sup> Camera-surveillance of student(s) during exams without recording via e.g. Canvas, Teams.

<sup>4</sup> Surveillance of student(s) using special proctoring software e.g. Proctorio.

<sup>5</sup> This means online proctoring can be used for a few students as well as for an entire test.

<sup>6</sup> The DPIA is an instrument to point out privacy risks of a processing operation to be able to take measures to mitigate those risks.

- d. These further rules and conditions must comply with the General Data Protection Regulation (GDPR), the Data Protection Impact Assessment (DPIA) on proctoring and the EER.
      - e. Pursuant to Articles 12-14 of the GDPR, students must be informed before the use of online surveillance or online proctoring about the processing of their personal data.
2. At least two weeks prior to the start of the study unit an assessment plan, must be published in the Learning Management System (LMS)
3. The assessment plan includes at least all items as included in the course catalogue yet shall also include:
  - a. The learning objectives of the study unit;
  - b. when and how tests will be administered;
  - c. the relative weighting of the tests;
  - d. any required minimum grade per test
  - e. the resit for each test (if applicable), the form of the resit, when it will take place, and any conditions for participating in the resit;
4. The programme board may modify the assessment plan during the course of the study unit.
  - a. The assessment plan may only be changed in consultation with the examiners of the study unit or study units.
  - b. The programme board consults the examination board beforehand in case of changes in the form or the method of administering of a test or tests. If the change involves nothing more than moving tests or test components to a timeslot other than as shown in the schedule, the programme board must inform the examination board of the decision to make the change at the next meeting of the examination board.
  - c. Students are to be informed immediately of the change.
  - d. Changes to the assessment plan may, in reasonable expectation, not put students at a disadvantage. Examination boards may provide special facilities make in individual arrangements in these cases.
  - e. Changes to the assessment plan may, in reasonable expectation, not put students at a disadvantage. Examination boards may provide special facilities make in individual arrangements in these cases.

#### Article A4.3 Examination 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 will be provided in the year subsequent to discontinuation to take the examination(s) or parts thereof, and a transitional arrangement will 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 participants agree.

#### Article A4.4 Examination results

1. Examination results, as determined by the examiner, are expressed with a 'pass'/'fail' or in half grades from 1.0 up to and including 5.0 and from 6.0 up to and including 10.0 whereby:
  - a. Grades will only be rounded in the last phase of the assessment of the study unit.

- b. The rounding is done in accordance with the following scheme:

<b>In case <math>n \neq 5</math></b>	
Grade $\geq n.00$ and $< n.25$	$\Rightarrow n.0$
Grade $\geq n.25$ and $< n.75$	$\Rightarrow n.5$
Grade $\geq n.75$ and $< (n+1).00$	$\Rightarrow (n+1).0$
<b>In case <math>n=5</math>:</b>	
Grade $\geq 5.00$ and $< 5.50$	$\Rightarrow 5.0$
Grade $\geq 5.50$ and $< 6.00$	$\Rightarrow 6.0$

2. Test results are expressed in a grade from 1.0 to 10.0 with one decimal place, or as 'pass / fail'
3. Exam results of 6.0 or higher are a pass.
4. ECs will only be awarded for the study unit if an examination has been completed with a grade of 6.0 or higher or a pass. No ECs will be awarded for individual components of study units and/or individual tests.
5. Exam results with a pass grade obtained at foreign universities will be registered with a P (Pass). Exam results obtained at Dutch universities will be adopted one-to-one in compliance with the former paragraphs.
6. If a student receives more than one result for the exam in the same study unit, the highest grade will apply. This also applies for the results of tests and components of tests within the same academic year and for the results of tests and components of tests that remain valid after the academic year in which they were obtained.

#### Article A4.5 Oral examinations

1. Oral examinations are conducted in public unless the Examination Board has determined otherwise in relation to a particular case.
2. If a third party wishes to be present during an oral test, they must submit a request to the Examination Board at least ten working days prior to the oral examination. This does not apply for graduation colloquia.
3. If the Examination Board has determined that members of the Examination Board (or an observer representing the Examination Board) are to be present during the oral examination, it will notify the examiner and the student at least one working day prior to the test.
4. For an oral examination, proof is required that the student was treated appropriately and that the assessment was reliable. This can be shown by, for instance, the presence of a second expert who cannot be a teaching assistant, or a video recording of the oral examination. The assessment is documented in a form that shows that the intended learning outcomes have been assessed appropriately.

#### Article A4.6 Determining and announcing results

1. The result of a written examination or practical exercise is published via SIS within 20 working days. This will be done by BOZ (Office of Educational Affairs).
  - a. The examiner will determine the result of a written examination within 15 working days after the examination and notify BOZ of the result.



- b. No rights can be derived from examination results published on the LMS or communicated via any medium other than SIS.
2. The examiner will inform the student of the result within at most 1 working day after conducting the oral test. If the oral test is part of a series of oral tests for the same study unit, which take place on more than one working day. In that case, the examiner determines the result within one working day after the conclusion of the series of oral tests.
3. In case the result for a study unit is based on multiple tests, the date of completion of the final test will count 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 will also be made known. If the Examination Board is of the opinion that the examiner has not met his/her obligations, it may appoint another examiner to ascertain the result of the examination.
5. If a second examination is planned shortly after the first, the results of the first examination will be published at least five working days prior to the second examination.

#### Article A4.7 Examination date

1. The examination date of a study unit, mentioned in the SIS, is the date upon 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 will lead 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 the student has passed an examination at the examination date, as long as the result of the examination is pending.
4. If the result of an examination is a fail and if because of this fail a student violates prior knowledge requirements of a subsequent unit in which the student participates, the Examination Board can decide that a student must interrupt this subsequent unit pending a repair of this fail.

#### Article A4.8 Validity period for results

1. The period of validity for the results of an exam that has been passed is unlimited. The validity of an exam 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 exam result.
3. The Examination Board may extend the validity of test results in individual cases at the request of the student.

#### Article A4.9 Post-examination discussion and right of inspection

1. The student is entitled to a justification of the results of a test from the examiner, whereby the examiner substantiates the assessment that has been given. If no collective discussion of the results is held, the student may request an individual discussion of the results with the examiner within ten working days of the publication of the results. *The discussion must take place no later than five weeks after the publication of the test results, but at least five working days prior to the next test opportunity, in the presence of the examiner or a designated substitute.*
2. The student has the right to inspect his or her work for a period of two years after the assessment.

#### Article A4.10 Retention of examination results

1. Written examination questions, associated details and the assessed work from written tests will be retained for a period of two years.
2. The retention period for final thesis reports is seven years.

### A5 Final Degree audit

#### Article A5.1 Master's final degree audit

1. The Examination Board determines the result of the Master's final degree audit after establishing that the student has passed all the study units associated with the programme. The date indicated on the degree certificate (i.e., the date of the final degree audit) is the day on which the student completed the final study unit of his/her degree programme.
2. A diploma can only be awarded after the student has received formal approval for his/her study programme as described in Section B.
3. If the student wishes, they may submit a substantiated request in writing to the Examination Board to postpone the final degree audit, and thus to delay the awarding of the degree certificate. The student must indicate the duration of the desired postponement in any such request.
4. In principle the maximum duration of the delay that may be granted is 12 months. In exceptional cases the student may have justifiable reasons to submit a request to delay the presentation of the certificate for more than 12 months.
5. If the student has requested postponement on the basis of Paragraph 3, the date of the final degree audit will be the date on which the Examination Board decides that the student has passed the final degree audit subsequent to the postponement.

#### Article A5.2 Diploma and transcript

1. The Examination Board grants a diploma as proof that the student has passed his/her final degree audit. The Executive Board will determine the model for the diploma and add a diploma supplement to the diploma providing information on the nature and content of the Master's programme completed. The diploma supplement will be in English and comply with the European format for such diplomas.
2. The International Diploma Supplement will be appended to the certificate for the successfully completed final degree audit (WHW, Article 7.11, Paragraph 4).
3. Individuals who have successfully completed more than one component of the programme and who cannot be awarded a diploma as stipulated in Paragraph 1 will, upon request, receive a statement issued by the relevant Examination Board stating which components have been successfully completed, as well as the study units involved, the number of ECs obtained and the method of examination for the examinations taken.

#### 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 will be stated on the diploma and the diploma supplement.
2. The *judicium Cum Laude* can be mentioned on the Master's certificate provided the following requirements are met:

- a. The **weighted average**<sup>7</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 8.0;
  - b. Those parts of the examination programme for which an exemption was granted or which were not graded with a number 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. In individual cases the Examination Board may grant the *judicium Cum Laude* even if not all requirements are met.

## A6. Student counselling and study progress

### Article A6.1 Study progress report

1. Every student can access his/her 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 Academic counselling for students

1. The Faculty Board is responsible for student counselling, which includes informing the student of study opportunities inside or outside the programme.
2. Each student is allocated a study adviser.
3. The study adviser will provide advice on study-related matters, as well as any personal problems that may affect the student's studies if the student so desires.
4. If a student wishes to exercise his/her right to specific counselling or special facilities, the student is required to contact the study adviser. The study adviser will record any agreements made with the student, and this agreement is binding on both the student and the Programme Board.
5. The following applies to the entitlement to special facilities:
  - a. there are demonstrable force majeure or personal circumstances; the student is expected to report these circumstances prior to or at the time they occur;
  - b. if necessary and possible, special dispensation for participation in examinations or tests and/or the provision of special facilities for examinations or tests will be provided. Such dispensation and additional testing opportunities can only be granted by the Examination Board.

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<sup>7</sup> The weighted average is proportional to the number of credits.

## A7. Studying with a functional impairment

1. A functional impairment is a physical, sensory, or other impairment that might limit the student's academic progress.
2. The Study Advisor and the student will discuss the most effective adjustments for the student as referred to in Article 2 of the Equal Treatment of Disabled and Chronically Ill People Act (WGB h/cz).
3. Adjustments are intended to remove specific obstructions when following the curriculum and/or sitting exams. Where necessary, these may concern facilities pertaining to the accessibility of infrastructure (buildings, classrooms and teaching facilities) and study material, changes to examination, alternative courses, or a custom study plan. Realising the programme intended learning outcomes must be guaranteed when implementing changes.
4. Based on the interview referred to in paragraph 2, the student is to submit a request for facilities to the Faculty Board, preferably three months before the student is to participate in classes, exams, and practical exercises for which the adjustments are required.
5. The request is to be submitted along with supporting documentation that is reasonably necessary for assessing the request (such as a letter from a doctor or psychologist registered in the BIG register, or in the case of dyslexia from a healthcare psychologist or special education needs expert, also registered in the BIG register).
6. The Faculty Board will decide on the admissibility of the request as referred to in paragraph 4 and will inform the student and the Study Advisor of the decision within 20 working days after receipt of the request, or sooner as the urgency of the request dictates.
7. The Study Advisor will ensure that the relevant parties are informed in good time about the facilities granted to a student with a functional impairment.
8. If the Faculty Board rejects the request in full or in part, the Faculty Board is to inform the student of the justification for the rejection and the possibilities for lodging an objection and an appeal. A written objection should be submitted in writing within six weeks after the decision has been communicated to the student. The objection is to be submitted to the objections, appeals and complaints office via the Student Services desk.
9. If extra facilities are granted, the period of validity will also be indicated. The applicant and the Study Advisor will evaluate the adjustments before the end of this period. During this evaluation, parties will discuss the effectiveness of the adjustments provided and whether they should be continued.
10. In the case of dyslexia, an additional period of 15 minutes for every hour is granted in the event additional time for a test is granted.

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

### Article A8.1 Conflicts with the regulations

If any additional regulations and/or provisions pertaining to teaching and/or examinations conflict with these Education and Examination Regulations, the present document (Education and Examination Regulations) will take precedence.

### Article A8.2 Administrative errors

If, following the publication of an examination result, a list of grades, or an overview of a student's progress, an error is discovered, the party discovering the error – be it the university or the student – is

required to make this known to the other party immediately and to cooperate in the rectification of the error.

#### Article A8.3 Amendments to the regulations

1. Substantive amendments to these Education and Examination Regulations are determined by the Faculty Board in a separate decision.
2. Every effort will be made to ensure that substantive amendments to these Regulations do not apply to the current academic year. Substantive amendments to these Regulations may, however, be applied to the current academic year provided the interests of students are not prejudiced within reasonable bounds, or in situations of force majeure.
3. Amendments to these Regulations have no effect on earlier decisions taken by the Examination Board.
4. Transitional arrangements are arranged in accordance to Article A8.4.

#### Article A8.4 Transitional arrangements; examination opportunities

1. In the case of amendments to the Education and Examination Regulations, the Faculty Board may decide to put a transitional arrangement in place.
2. Any such transitional arrangement will be published in Section B.
3. The following principles will be applicable to any transitional arrangement if a Master's programme is changed:
  - a. Changes to a Master's programme will be published before the start of the academic year in which they take effect.
  - b. No guarantee can be given that all the study units of a Master's programme, as they existed at the time of a student's enrolment in a programme, will continue to be part of the Master's programme concerned. The version of the Master's programme most recently approved by the Faculty Board will serve as the basis for establishing the results of the Master's examination.
4. Transitional arrangements will always specify the following:
  - 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 will be designated as a suitable replacement for the discontinued study unit;
  - d. the term of validity of the transitional arrangement.
5. The transitional arrangement requires the approval of the Examination Board pursuant to the provisions of Paragraph 4.
6. In exceptional cases, and provided this works to the student's advantage, the Examination Board may allow a deviation from the number of times and the method by which examinations may be taken for a study unit that has been discontinued.

#### Article A8.5 Assessment education and examination regulations

1. The Faculty Board is responsible for the regular assessment of the Education and Examination Regulations and takes into account the resultant study load for the students to enable this to be monitored and adjusted if necessary.
2. In accordance with article 9.18 of the WHW, parts of the Education and Examination Regulations need the consent of the Programme Committee. On other parts the Programme Committee can advise.
3. The Programme Committee annually assesses the way in which the Education and Examination Regulations are implemented.

#### Article A8.6 Appeal and objections

Any appeals against decisions made by the Examination Board or an examiner, and any objections to decisions made by the Faculty Board on the basis of these Regulations, must be submitted in writing to the Complaints Desk at Student Services no more than six weeks after the relevant decision has been communicated.

#### Article A8.7 Hardship clause

In the event of demonstrable and meaningful unreasonableness and unfairness, the Examination Board may allow exceptions to the provisions of these Regulations.

#### Article A8.8 Publication

The Education and Examination Regulations and the Rules and Regulations of the Examination Board are published on the website of the programme in question.

#### Article A8.9 Commencement

These Regulations take effect on 1 September 2021 and supersede the Regulations dated 1 September 2020.

## **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 may apply for all EEMCS Master's degree programmes. Section B contains the provisions that are specific to the particular degree programme, in this case the Master's programme in Applied Mathematics.

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## B1. General provisions

### Article B1.1 Definitions

AI4Health: Specialization Artificial Intelligence for Health.

Cohort: group of students enrolled in the same Master's programme who begin in the same year.

Graduation supervisor: chair holder 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 programmes in mathematics by organizing joint courses.

M-coordinator: Master coordinator.

MDS: Specialization Mathematics of Data Science.

OR: Specialization Operations Research.

SACS: Specialization 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 four specializations within the programme (see Article B4.1) and on the other by the attention paid to mathematical modelling. See Sections B4.3, B4.4, B4.5 and B4.6 for further details.

The programme offers the following four specializations:

- **SACS: Mathematical Systems Theory, Applied Analysis, and Computational Science;**
- **OR: Operation Research;**
- **MDS: Mathematics of Data Science;**
- **AI4Health: Artificial Intelligence for Health.**

Students choose a chair contributing to a specialization. During the final phase 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 and an insight into its application in different fields such as engineering, health sciences, ICT and 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 specialization 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 are capable of effective written and oral communication with others in the field as well as with laymen.
- 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 specialization and admit a student into only one of the specializations.
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 successfully completed those parts earlier.

## B4. Curriculum structure

### Article B4.1 Composition of programme

1. The Master's programme is divided into four specializations. Each student chooses a specialization and – within that specialization – a study programme consisting of units of study. Article B4.2 lists all the Master's courses that are part of the programme.
2. Students can specialise in:
  - Mathematical Systems Theory, Applied Analysis and Computational Science (SACS)
  - Operations Research (OR)
  - Mathematics of Data Science (MDS)
  - Artificial Intelligence for Health (AI4Health)
3. The Master's programme is a two-year programme. The curriculum consists of the following elements:
  - a. A minimum of 17 ECs in common courses (as referred to in articles B4.2 – 4.6).
  - 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 specialization.
  - d. Sufficient number of electives added to the above courses so that the number of ECs adds up to at least 60 EC.
  - e. 20 EC on Internship.
  - f. 40 EC on Final Project.
  - 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.

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

4. For the specialisation AI4Health, the following provisions replace B4.1.3.d-e-f:
  - d. Sufficient number of electives to have a total of at least 80 EC.
  - e. Research Topics (10 EC), for the preparation of the Masters' Thesis.
  - f. 30 EC Final Project (combined with Internship; executed at an external institution).

Articles B4.6 provides further details on the Master's programme for the specialisation AI4Health.

5. For specialisations other than AI4Health, contrary to provision B4.1.3.e and f, 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 “educatieve minor met wiskunde tweedegraads lesbevoegdheid” may use the ECs for electives and the 20 EC from the internship to form an alternate packet of 30 EC with didactical/pedagogical courses, including an internship in a highschool, to obtain the “eerstegraads lesbevoegdheid wiskunde”.
8. An alternative study programme is possible within the context of a double degree programme together with Universitas Gadjah Mada (UGM), Indonesia which is described in Appendix A: Double degree programme UGM – UT in Mathematics.
9. 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 the involvement of a UT lecturer. Besides the courses listed in the table below, other national courses can also be taken as electives as part of a study programme. The total range of national courses can be found at [elo.mastermath.nl](http://elo.mastermath.nl).

**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

*Other AM courses*

202100097	Finite Element Methods	6	2A-2B
191506302	Applied Functional Analysis	6	1A-1B
201800171	Applied Queueing Models	5	2B
201200207	Capita Selecta Operations Research	5	2A-2B
202001574	Capita Selecta Statistics	5	2A
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

191550105	Introduction to Partial Differential Equations	5	2A
201300042	Limits to Computing	5	1A
191531920	Markov Decision Theory & 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 medical image analysis	5	2B
202100110	Case Study DS&AI	2	Year-round

**Year 2**

191508209	Internship for AM	20
191508409	Final Project	40

For the specialisation AI4Health, Year 2 consists of 20 EC courses, in addition to the following:

202100111	Research Topics AI4Health	10
191508309	Final Project (combined with internship)	30

Article B4.3 SACS Programme 2021-2022

**Chairs: Applied Analysis (AA),  
Hybrid Systems (HS),  
Mathematics of Computational Science (MACS),  
Multiscale Modeling and Simulation (MMS)**

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. Plus electives in agreement with the graduation supervisor so the entire study programme adds up to at least 60 ECs

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

Article B4.4 OR Programme 2021-2022

**Chairs: Discrete Mathematics and Mathematical Programming (DMMP),  
Stochastic Operations Research (SOR)**

1. Continuous Optimization (Mastermath, 6 EC)
2. Scientific Computing (6 EC)
3. Pioneers of Applied Mathematics (5 EC)
4. Three (3) 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. Plus electives in agreement with the graduation supervisor so the entire study programme adds up to at least 60 ECs

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

Article B4.5 MDS Programme 2021-2022

**Chairs: Discrete Mathematics and Mathematical Programming (DMMP), Stochastic Operations Research (SOR), Applied Analysis (AA), Hybrid Systems (HS), Mathematics of Computational Science (MACS), Multiscale Modeling and Simulation (MMS), Statistics (STAT)**

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. Plus electives in agreement with the graduation supervisor so the entire study programme adds up to at least 60 ECs

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

Article B4.6 AI4Health Programme 2021-2022

**Chairs: Stochastic Operations Research (SOR), Applied Analysis (AA), Statistics (STAT)**

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:
  - Deep learning for medical image analysis (5 EC)
  - Graphical models and causality (5 EC)
  - Reinforcement learning (5 EC)
  - Mixed-Integer Optimization ( 5 EC)
  - Uncertainty quantification and data-driven modeling (5 EC)
10. Plus electives in agreement with the graduation supervisor so the entire study programme adds up to at least 80 ECs

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

Article B4.7 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. The standard combined master's programme AM-AP 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 B4.7.a and B4.7.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 B4.7.c, the electives can be used to do two separate internships of 20 EC each.



Detailed information is given in Appendix B: Standard Combined Master's Programme AP-AM

#### Article B4.8 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 change to the programme to a maximum of 6 EC.

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 specialization 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 B4.9 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 at least a three-month period. 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 primary 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 his/her internship.

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

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 programme has an Internship coordinator who handles the various issues relevant to internships. 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 the chair, 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 curricula 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 specialisation AI4Health)

The final project must enable the student to apply the expertise gained during prior courses, projects and practical training sessions 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 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 specialization 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 ), whereby the 'senior examiner' has to be a professor in the student's chair of graduation.
- 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, in consultation with the graduation supervisor, contacts a chair (or multiple chairs within the chosen specialisation) 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 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:

- The Graduation Supervisor and the M-coordinator have approved the student's study programme.
- A chair/chairs willing to take responsibility for the organisation, supervision and assessment of the graduation project has/have 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, a graduation file is created in which the correspondence between the student and graduation committee is saved, along with the agreements made as a result.

The student ensures that his or her file 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 kept in the file. In particular, the file also includes work done in advance of the student's departure for the internship location as part of a combined internship and final project. During the final evaluation of the final project, explicit consideration is given to the work included in the file 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 saved in the file and states the project due date (rescheduled if necessary), as well as any corrective changes to the project description and supervision. The student confirms that he or she approves of the report and the updated agreements. Any time an extension of more than a month is granted (not including holiday periods), a new report is inserted in the file 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

Notwithstanding the current Education and Examination Regulations, the following transitional provisions apply for students who started the programme under a previous set of Education and Examination Regulations:

1. Rule regarding valid grade (highest versus latest)

**Motivation:** Change of rule starting from cohort 2009

**Validity:** This arrangement is valid for unlimited time

**Provision:**

While applying Article A4.6.3, to decide about a valid grade for a unit of study for which sittings have taken place before 1 September 2009, the grade that was valid on 31 August 2009 will be considered. The new rule is not applicable to those previous sittings.

2. Rule regarding passing the final assessment

**Motivation:** Change of rule starting from cohort 2011

**Validity:** This arrangement is valid for unlimited time

**Provision:**

Contrary to Article A4.6 and A4.10 (Fail/Pass Guidelines) of the Examination and Testing Regulations, a student who started the programme before 1 September 2011 may pass the final assessment with (at most) one five and no marks under five in the list of marks, provided the average of the marks is at least six.

3. Rule regarding the specialization Financial Engineering for students of cohort 2011 or before

**Motivation:** Discontinuation of Financial Engineering from 2012-13

**Validity:** This arrangement is valid for unlimited time

**Provision:**

A student who has started the programme with specialization Financial Engineering before 1 September 2012 may continue to earn his/her master's diploma with the programme which is already approved, including the (alternative) academic activities in the second year, namely, 30 EC coursework and 30 EC for combined internship and final project.

4. Rule regarding the specializations Mathematical Physics and Computational Methods and Mathematics and Applications of Signals and Systems for students of cohort 2014 or before

**Motivation:** Discontinuation of MASS and MPCM per 2015-2016

**Validity:** This arrangement is valid for unlimited time

**Provision:**

A student who has started the programme with specializations MASS or MPCM before 1 September 2015 may continue to earn his/her master's diploma with the programme which is already approved.

5. Rule regarding the course Philosophy of Engineering for students of cohort 2015 and before.

**Motivation:** Replacement of Philosophy of Engineering with Pioneers of Applied Mathematics

**Validity:** This arrangement is valid for unlimited time

**Provision:**

A student who started the course Philosophy of Engineering in the previous year is allowed to complete the course in 2016 as long as it is part of a programme which is already approved. Students who will start the course in 2016 or later need to replace the course with pioneers of applied mathematics, unless this causes scheduling issues. In which case the student can ask the Examination Board for an exemption.

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 2021.

## Appendix A: Double degree programme UGM – UT in Mathematics

This double degree programme starts every September and is embedded in the Master of Science Applied Mathematics (UT) and the Master of Science in Mathematics (UGM). The double degree programme follows to so-called 1 + 1 scheme, i.e., a student studies the first year at UT and the second year at UGM, or the other way around. The study load is equally distributed (50:50) between UGM and UT. It is set up so that it complies with the final qualifications of both programmes and respects the respective requirements in terms of compulsory courses.

After successful completion of the programme, the student will be awarded the following degrees:

- Master of Science (MSc) from UGM, and
- Master of Science (MSc) in 'Applied Mathematics' from UT.

Article A1 Entry year University of Twente

*Specialization Operations Research (OR)*

The entry year for students with the OR specialization consists of:

1. Three (3) compulsory AM courses:
  - a. Continuous Optimization (6 EC)
  - b. Scientific Computing (6 EC)
  - c. Pioneers of Applied Mathematics (5 EC)
2. Five (5) compulsory OR courses:
  - a. Game Theory (5EC)
  - b. Measure and Probability (5EC)
  - c. Markov Decision Theory and Algorithmic Methods (5 EC)
  - d. Queueing Theory (6 EC)
  - e. Applied Queueing models (5 EC)
3. Electives within the OR specialization so that the total amount of EC in the first year is at least 60.

*Specialization Systems Theory, Applied Analysis and Computational Science (SACS)*

The entry year for students with the SACS specialization consists of:

1. Three (3) compulsory AM courses:
  - a. Continuous Optimization (6 EC)
  - b. Scientific Computing (6 EC)
  - c. Pioneers of Applied Mathematics (5 EC)
2. Four (4) specialization courses:
  - a. Applied Functional Analysis (6EC)
  - b. Optimal Control (5EC)
  - c. Applied Finite Elements (6EC)
  - d. Measure and Probability (5EC)
3. Electives within the specialization so that the total amount of EC in the first year is at least 60.

Article A2 Exit year at the University of Twente

The exit year at the University of Twente will consist of a practical internship (20 EC, as described in Article B5) and a final thesis project (40 EC, as described in Article B6) with one of the research chairs in the specialization.

## Appendix B: Standard Combined Master's Programme AM-AP

An example of a fulfillment of the requirements of the standard combined master's programme AM-AP with specialization SACS is as follows:

### Combined Programme AM/AP (180 EC)

<p><b>Courses AP (40 EC)</b></p> <p><u>20 EC Compulsory AP courses</u></p> <ul style="list-style-type: none"> <li>Applied Quantum Mechanics 5</li> <li>Numerical Techniques for PDE 5</li> <li>Heat &amp; Mass Transfer 5</li> <li>Small Signals Detection 5</li> </ul> <p><u>20 EC Specialization Research group courses</u></p> <ul style="list-style-type: none"> <li>Electronic structure theory I 5</li> <li>Electronic structure theory II 5</li> <li>Nanophysics 5</li> <li>Advanced quantum mechanics 5</li> </ul>	<p><b>Courses AM (ca. 45 EC), SACS</b></p> <p><u>Compulsory AM courses (17 EC)</u></p> <ul style="list-style-type: none"> <li>Continuous Optimization 6</li> <li>Scientific Computing 6</li> <li>Pioneers of AM 5</li> </ul> <p><u>3 courses from SACS Specialization (17 EC)</u></p> <ul style="list-style-type: none"> <li>Applied Functional Analysis 6</li> <li>Finite Elements Methods 6</li> <li>Optimal Control 5</li> </ul> <p><u>Electives Research group (10-12 EC)</u></p> <ul style="list-style-type: none"> <li>Partial Differential Equations 6</li> <li>Measure and Probability 5</li> </ul>
<p><b>5 EC Electives:</b> Machine Learning I</p>	
<p><b>30 EC Internship AM/AP, 60 EC Master Assignment AM/AP</b></p>	