

# 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 ELECTRICAL ENGINEERING

### **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 particular degree programmes, in this case the Master's programme Electrical Engineering.

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## B1 General Provisions

### Article B1.1 Definitions

In addition to the definitions in Article A1.2, the following definitions are used in this Section B:

- a. **Electrical Engineering discipline:** The group of chairs of the Faculty of Electrical Engineering, Mathematics and Computer Science, taking part in the Electrical Engineering Master's programme. They are mentioned in the table of Article B2.3.
- b. **Programme mentor:** a staff member, who is appointed by a chair to supervise students who joined the specialisation of this chair, until they start their Master's Final project.
- c. **Graduation committee:** the committee that supervises the Master's final project and will carry out the assessment of the project.

## B2 Programme objectives and final attainment targets

### Article B2.1 Aim of the programme

The programme aims to train Master students in a spectrum of professional and personal competencies to enable them to expand their knowledge and methodology in design, through analysis and research, of innovative systems in the Electrical Engineering discipline.

### Article B2.2 Final qualifications

The final qualifications of the Electrical Engineering master's programme have been obtained by combining the Meijers criteria with the Intended Learning Outcomes, obtained from the Domain Specific Frame of Reference. In Appendix BIV, this is elaborated in detail.

#### **Scientific discipline**

##### Graduates

- have in-depth knowledge in advanced subject-specific fundamentals of electrical engineering.
- have an in-depth knowledge in advanced fundamentals of mathematics and natural sciences, as far as necessary to support the knowledge in these advanced subject-specific fundamentals.
- have in-depth knowledge in one of the primary fields of applications based on subject-specific fundamentals.
- can judge applicable methods in their discipline and the limits of these methods.

#### **Research**

##### Graduates

- can develop suitable methods to make concepts, carry out and evaluate detailed research concerning technical topics
- can evaluate new complex methods for modelling, measuring, design and test, concerning their relevance, effectiveness and efficiency and can develop independently new methods.

#### **Design**

##### Graduates

- have specific skills for the design, development and operation of complex technical systems and services.
- are capable to assembly the best components of these systems optimally as well as to evaluate the interaction of the systems with their environment (taking into account technical, social, economical and ecological aspects).

- can use and develop their knowledge and skills to organise the research and the development of systems and processes, for the solution of problems.

### **Scientific approach**

#### Graduates

- can classify knowledge methodically in different areas, to combine information elements systematically, and to handle the phenomena of complexity
- can take over responsibility for scientific contributions to professional knowledge and to professional practice

### **Intellectual skills**

#### Graduates

- familiarize quickly, methodically and systematically with new and unknown tasks
- control and organise complex and changing inter-relations of work and learning which require new strategic approaches.

### **Cooperation and communication**

#### Graduates

- are able to communicate in writing and verbally about research and solutions to problems with colleagues, non-colleagues and other involved parties.
- are able to debate about both the scientific discipline and the place of the scientific discipline in society.
- are characterised by professional behaviour. This includes: drive, reliability, commitment, accuracy, perseverance and independence.
- are able to perform project-based work: are pragmatic and have a sense of responsibility; are able to deal with limited resources; are able to deal with risks; are able to compromise.
- have insight into, and are able to deal with, team roles and social dynamics.

### **Temporal and social context**

#### Graduates

- are capable to take into account technical, social, economical and ecological aspects, when designing systems.
- can reflect systematically (on) non-technical implications of engineering work and to integrate the results responsibly in their actions to develop marketable products for the global market.

### Article B2.3 Specialisations

There is only one Master's programme in Electrical Engineering and the field of specialisation determines the contents of the programme (study programme). This specialisation is defined by the chair where the Master thesis is carried out. The study programme corresponds to the specialisation. In this way graduates maintain a broad Electrical Engineering qualification while being specialized in one of the specific fields. The field of specialisation is indicated in the addendum of the degree diploma. The following specialisations are defined in the Electrical Engineering programme:

Specialisation	Name of the chair	Abbreviation
Lab on a Chip Systems	Biomedical and Environmental Sensorsystems	BIOS
Neurotechnology and Biomechatronics	Biomedical Signals and Systems	BSS
Dependable Integrated Systems	Computer Architecture for Embedded Systems	CAES
Robotics and Mechatronics	Robotics & Mechatronics	RAM
Communication Networks	Design and Analysis of Communication Systems	DACS
Integrated Circuit Design	Integrated Circuit Design	ICD
Integrated Optical Systems	Optical Sciences	OS
Nanoelectronics	NanoElectronics	NE
Computer Vision and Biometrics	Data Management and Biometrics	DMB
Micro Sensors and Systems	Integrated Devices and Systems	IDS
Semiconductor Devices and Technology	Integrated Devices and Systems	IDS
Radio Systems	Radio Systems	RS
Power Electronics	Power Electronics & EMC	PE

### B3 Further admission requirements

See Chapter A2, for general regulations regarding admission and enrolment

Article B3.1 Programme specific admission requirements

1. Admission to the Master's programme is possible for an individual who can demonstrate that he/she has the knowledge, understanding and skills as defined in the Attainment Targets of the Electrical Engineering Bachelor's programme of the University of Twente as described in Article A2 of the Programme Specific Part of the Education and Examination Regulations for the Bachelor's Degree Programme in Electrical Engineering.
2. Any individual who has obtained a Bachelor's degree in academic higher education on one of the following degree programmes meets the requirements referred to in paragraph 1:
  - a. Bachelor's programme Electrical Engineering at the University of Twente.
  - b. Bachelor's programme Electrical Engineering at the Technical University of Delft.
  - c. Bachelor's programme Electrical Engineering at the Technical University of Eindhoven.

- In addition to the language requirements stipulated in Article A2.2, the IELTS and IBT-TOEFL test results should satisfy requirements regarding the sub-scores. In case of an IELTS test all sub-scores should be at least 6.5. In case of an IBT-TOEFL test, all sub-scores should be at least 21.

Article B3.2 Pre-Master's programme for students from a Dutch University of Applied Sciences  
See Article A2.7, for general regulations regarding pre-Master's programmes.

- Students seeking admission on the basis of a Bachelor's degree awarded by a Dutch University of Applied Sciences must complete a pre-Master's (bridging) programme that includes the following subjects:

Code	Course	Study load (EC)
202001171	Calculus A	5
202001178	Linear Algebra	3
201500252	Digital Logic and Computer Organization	3
202001173	Calculus B	4
202001185	Linear Systems	6
202001141	Engineering System Dynamics <sup>a)</sup>	5
191403070	Electromagnetism PM <sup>b)</sup>	
202000238	Academic Research Skills	4
	<b>Total</b>	<b>30</b>

a) For students, opting for the specialisation Robotics & Mechatronics

b) For students opting for any other specialisation

- Small changes in the programme are possible. The final programme should be announced to the students before the start of the programme.
- The programme assumes a minimal knowledge level VWO-B in mathematics and a VWO-level in English. (VWO being the Dutch preparatory secondary school for the universities).
- The conditions for admission to the Master's programme are as stipulated in Article A2.7.
- Students from a Dutch University of Applied Sciences may be allowed by the Admission Committee to attend the pre-Master's programme as a part of their bachelor's programme.

## B4 Curriculum structure

Article B4.1 Composition of programme

The curriculum consists of the following elements:

Year	EC	Topic
First	20	Compulsory units of study
	5..10	Philosophical and Societal courses
	30..35	Electives (Including possible homologation courses)
Second	20	Internship
	40	Master's thesis project

#### Article B4.2 Compulsory units of study

Depending on the specialisation the set of compulsory courses may be fixed, or choices for compulsory courses will be made by the programme mentor after discussion with the student. For each specialisation the process of obtaining the compulsory courses is described in Appendix BI.

#### Article B4.3 Philosophical and Societal courses

1. The units Perspectives on Engineering Design (201900007) and Philosophy of Engineering: Ethics (201100137), worth 5 EC in total, are compulsory.
2. Students can choose the other 5 ECs from non-technical units with a workload of at least 2.5 EC provided by any university. For a course from outside the University of Twente approval by the Examination Board is necessary. If students so desire, they can also complete 5 ECs in a technical subject, in which case the rules of Article B4.4 apply. The examination board can, in response to a written request from a student, allow 10 EC to be completed entirely or partially in some other way, in the event of grounds based on the student's previous education or other knowledge and experience obtained.

#### Article B4.4 Electives

Students shall select their elective units, after consultation with the programme mentor responsible for the chosen specialisation, from the following list:

- University of Twente: the Master's subjects, offered by the studies in Electrical Engineering, Embedded systems, Systems & Control, Computer Science, Applied Mathematics, Mechanical Engineering, Applied Physics, Nanotechnology and Sustainable Energy Technology.
- The Technical University in Delft and the Technical University in Eindhoven: the Master's subjects, as listed for the study in Electrical Engineering.
- If subjects are included that do not fulfil the above, then permission will have to be obtained from the examination board.

The programme of electives requires approval by the programme mentor. See Article B5.1 for the procedure.

#### Article B4.5 Homologation courses

The rules for homologation courses are stipulated in Article A2.5, paragraph 4.

#### Article B4.6 Internship

The general regulations for the internship are stipulated in Article A3.9.

1. Requirements for starting the internship
  - a. Students must have submitted a study programme to the educational office which was approved by their programme mentor. If the courses, they actually attended, deviate from the courses in the study programme, they have to submit a new proposal to their programme mentor and submit that to the education office after approval.
  - b. Students must already have obtained at least 45 ECs of their course programme, including all compulsory specialisation courses, mentioned in Article B4.2, and the compulsory non-technical courses, mentioned in Article B4.3.1.
2. The Admission Committee can decide that the internship will be replaced by an individual research project in one of the research groups participating in the programme. The study load of such a project is 10EC. The remaining 10EC of the internship will be spent to elective courses. This decision will be

taken if during the bachelor's programme, the student acquired substantial working experience from one or more internships and the student lacks project experience in a research group.

3. In case the internship is replaced by an individual research project, the requirements from paragraph 1 apply for starting the project.
4. Students having a Bachelor's degree awarded by a Dutch University of Applied Sciences will carry out an individual research project according to paragraph 2.

#### Article B4.7 Master's final project (Master's thesis)

The general regulations for the Master's final project are stipulated in Article A3.7. The composition of the graduation committee is stipulated in Article A3.8

1. A student will carry out the final project subject to the accountability of the chair of the Electrical Engineering discipline responsible for the student's specialisation.
2. A description of the Master's project that a student will do must have been drawn up and approved by one of the members of the graduation committee.
3. The Master's final project shall take place according to a planning as stipulated in Article A3.7 and in Article B5.4. This planning must satisfy the following requirements:
  - a. According to the study load of 40EC, 28 weeks of full time work (40 hours each) are available.
  - b. To cope with unforeseen delays, four additional weeks may be added to this period.
4. The Master's project will normally be carried out within the chair, mentioned in paragraph 1. A Master's project may only be carried out external to one of the chairs of the Electrical Engineering discipline, subject to the explicit accountability of one of the chairs of the Electrical Engineering discipline. The chair concerned carries out the supervision as described in the paragraphs of this Article and in Article A3.7. The programme board regards the project as being carried out in the chair concerned. If a project is carried out external to the chair, this should be reported in advance to the examination board.

#### Article B4.8 Confidentiality

The general regulations for the confidentiality of the master's thesis and the internship report are stipulated in Article A3.11.

1. If a longer confidentiality period than five years is absolutely necessary for the master's thesis or the internship report to enable the student to participate in the project, then a confidentiality period of maximally 10 years is possible.
2. For such a longer period consent is required from the programme director.

#### Article B4.9 Sequence of examinations

1. There are no general conditions regarding the sequence in which the course units have to be attended. Prior knowledge requirements may be given in the individual course descriptions that can be found in the online study prospectus. The student should take them into account when planning the study programme.
2. See Article B4.6, paragraph 1 for the requirements to start an internship.
3. Conditions for starting the Master's thesis are stipulated in Article A3.7.
4. If in the student's study programme the internship has been replaced by an individual project, this project must have been completed before the Master's thesis is started.

## B5 Planning, procedures, guidance and assessment during the Master's study

### Article B5.1 Specialisation and subject combination

1. Before starting the Master's study, students choose one of the specialisations of the programme and with this the chair of the Electrical Engineering discipline in which the final project will be carried out. The student determines his study programme, together with the programme mentor of the chair, and draws up a schedule for attending the subjects, and for carrying out the internship and the final project.
2. The study programme should be approved by the programme mentor and then submitted to the registry of the examination committee, at the latest by six months after the start of the Master's study.
3. An alteration in the study programme may only be made with the programme mentor's agreement. If the study programme has already been submitted to the registry of the examination committee then a new version of the study programme should be submitted after an alteration.

### Article B5.2 Practical exercises

1. The study prospectus states which units include a practical exercise. If a unit involves a practical exercise, the examiner will give an assessment, by the latest, at the end of the period in which the subject is scheduled. This will be used to arrive at the final grade for that unit. If the results for the practical exercise are unsatisfactory, then the student has time available until the end of the next quarter to complete the exercise with a satisfactory result. If satisfactory results have still not been obtained, then the student can only obtain satisfactory results for the exercise by carrying out the whole exercise again..
2. The assessments of the practical exercises can only be obtained after the student has participated in the exercise concerned.

### Article B5.3 Internship

General rules for the internship are stipulated in Article A3.9

1. The topic of the internship must be such that the student can apply his/her knowledge and competences obtained from the student's course programme.
2. The examiner must be on the list of examiners for internships and master's theses, maintained by the examination board. A qualified staff member, who is not on this list, can be appointed as examiner by the examination board.
3. The examiner of the internship must justify his/her assessment by filling out the assessment form for the internship, shown in Appendix BII.

### Article B5.4 Master's final project

See Article A3.7 and Article B4.7 for regulations regarding the start and the planning procedure of the Master's final project.

1. Not later than four weeks before the planned graduation date the student should register for the final audit of the Electrical Engineering programme.
2. Before registering, the student will discuss the progress of his master's thesis with the graduation committee. The chair of the graduation committee must co-sign the application form for the final audit. By co-signing the application form, the graduation committee entitles the student to give a final presentation and receive a final grade for the master's thesis (green light declaration).

3. The student must hand over the final version of the project report to the committee not later than one week before the planned graduation date. The student and the committee are allowed to agree upon a different point of time for the delivery of the report.
4. If the final grade is a fail then the student must carry out a supplement to the project within a period of two months, after which the graduation committee will state its opinion again, which will lead at the most to a 6. In exceptional cases a higher grade is possible.
5. This new final grade will be regarded as the result of a resit.
6. If the result of a resit is a fail, then the student shall have to carry out a new Master's final project.
7. The graduation committee of the Master's final project must justify its assessment by filling out the assessment form for the Master's final project, shown in Appendix BIII.
8. If any of the rubrics for the assessment, "Scientific Quality", "Organization, planning, collaboration" or "Communication", has been assessed as insufficient (less than 5.5), the final grade cannot be higher than 5.
9. If the student cannot complete the master's thesis within the period according to the plan as mentioned in Article A3.7 and Article B4.7 for reasons of force majeure, the student can submit an application for an extension of this period to the examination board. If the force majeure is recognised by the board, an extension will be allowed, compensating for the time loss the student suffered.
10. If no extension can be given in the situation, mentioned in paragraph 9, then the arrangement of paragraphs 3 to 5 will be applied.

Article B5.5 Study counselling

Regulations for study counselling are stipulated in Chapter A6.

## **B6 Special opportunities**

Article B6.1 Extended examinations.

1. On request a student can be given an extended audit by the Examination Board about courses not part of this or another programme, but which could have been part of this programme and for which the student has successfully taken interim examinations. The examinations for these courses may have taken place before or after the final degree audit.
2. As proof that the extended audit has been completed successfully, the Examination Board can, upon request, issue a separate statement.

Article B6.2 Additional regulations regarding Flexible Degree programmes

General regulations for flexible degree programmes are stipulated in Article A3.5.

1. The flexible degree programme shall include at least one unit comparable with the Master's final project of the EE Master's study; this unit shall have a workload of no less than 30 EC and no more than 50 EC.
2. A Flexible Degree programme that can be regarded as belonging to the Electrical Engineering Master's programme contains a substantial number, in the order of 20%, of the courses for this programme.
3. An applicant who submits a Flexible Degree programme can include a number of electives, to be chosen later from a list attached to his request. These electives will have to be approved by the committee that will assess the final project.
4. In case of a Flexible Degree Programme the planning, procedures and guidance during the Master's study deviate from the setup in Article B5.1.

- a. A (provisional) description of the Master's final project should be part of the programme proposal.
- b. The chair accountable for the Master's thesis and the chairperson of the graduation committee of the Master's thesis should be known.
- c. This chair person should approve the study programme and the description of the Master's thesis and confirm that the study programme forms a suitable preparation of the Master's thesis.
- d. If the accountable chair is not part of the Electrical Engineering discipline, then a full or associate professor from the Electrical Engineering discipline must be a member of the graduation committee. He/she must co-approve the items in paragraph c.

Article B6.3 Additional regulations regarding double/combined programme  
Regulations for a double/combined programme are stipulated in Article A3.6

1. On behalf of the Electrical Engineering programme a senior examiner from a group participating in the student's specialisation must be a member of the common graduation committee. This senior examiner will carry out the duties for the EE programme, normally dedicated to the chair of the graduation committee.

Article B6.4 Combining two specialisations

1. It is possible to combine two specialisations in one study programme of 120EC.
  - a. To this, the study programme of the student must contain the compulsory courses of both specialisations.
  - b. The programme mentors of both specialisations must approve the student's course programme.
  - c. The master's thesis must be supervised and assessed by members of both chairs, connected to the specialisations. One of the chairs will deliver the chair of the committee, the other one will deliver a senior examiner.
  - d. Both examiners must approve the project description of the master's thesis.
2. Both specialisations will be mentioned on the diploma.

## APPENDIX BI - SPECIALISATIONS AND THEIR COMPULSORY COURSES

### Lab on a Chip

The following courses are compulsory for all students in the specialisation:

Code	Course	Study load (EC)
191211120	Lab on a Chip	5
191210720	Biomedical Signal Acquisition	5

Two more compulsory courses will be chosen by the programme mentor from the following list, after discussion with the student:

Code	Course	Study load (EC)
101210740	Material science	5
191211080	Systems engineering	5
191210730	Technology	5
191211300	Micro electro mechanical systems design	5
193400121	Nanofluidics	5

### Neurotechnology & Biomechatronics

The following courses are compulsory for all students in the specialisation:

Code	Course	Study load (EC)
191211350	Neurophysiology	5
201400282	Bioelectromagnetics	5
191210720	Biomedical Signal Acquisition	5
193810020	Advanced Techniques for Signal Analysis	5

### Dependable Integrated Systems

The following courses are compulsory for all students in the specialisation:

Code	Course	Study load (EC)
191210750	System-on-Chip Design	10
192130240	Embedded Computer Architectures 1	5
192130200	Real-time systems 1	5

### Robotics & Mechatronics

The following courses are compulsory for all students in the specialisation:

Code	Course	Study load (EC)
201900093	Control System Design for Mechatronics	5
191211080	Systems Engineering	5
191211110	Modelling and Simulation	5
191211060	Modern Robotics	5

**Communication Networks**

The following courses are compulsory for all students in the specialisation:

Code	Course	Study load (EC)
192620010	Mobile and Wireless Networking	5
192620300	Performance Evaluation	5
201700074	Internet Security	5

One more compulsory course will be chosen by the programme mentor from the following ones, after discussion with the student:

Code	Course	Study load (EC)
201400177	Cloud Networking	5
201200006	Quantitative Evaluation of Embedded Systems	5
192653100	Internet Management and Measurement	5
201700073	Ad-Hoc Networks	5
201400176	Dependable Networking	5
201700077	Advanced Networking	5
201700083	Security Services for IoT	5

**Computer Vision and Biometrics**

The following courses are compulsory for all students in the specialisation:

Code	Course	Study load (EC)
201600070	Machine Learning I	5
201500040	Introduction to Biometrics 3TU	5
191210910	Image Processing and Computer Vision	5
201100254	Advanced Computer Vision and Pattern Recognition	5

**Integrated Circuit Design**

The following courses are compulsory for all students in the specialisation:

Code	Course	Study load (EC)
191210750	System-on-Chip Design	10
191210850	Advanced Analog IC-Electronics	5

One additional compulsory course will be chosen by the programme mentor from the following list, after discussion with the student:

Code	Course	Study load (EC)
191210870	Integrated Circuits and Systems for mixed signals	5
191211500	Wireless Transceivers Electronics	5
191210840	A/D Converters	5

191210860	Advanced Electronics Project	5
191211720	Microwave Techniques	5

**Micro Sensors and Systems**

Code	Course	Study load (EC)
191211300	Micro Electro Mechanical Systems Design	5
191210930	Measurement Systems for Mechatronics	5

Additional compulsory courses for 10EC will be chosen by the programme mentor from the following list, after discussion with the student:

Code	Course	Study load (EC)
191210730	Technology	5
191211690	EMstatics	5
191211440	Integrated Circuit Technology	5
201900135	Advanced Semiconductor Device Physics	5

**Semiconductor Devices and Technology**

The following courses are compulsory for all students in the specialisation:

Code	Course	Study load (EC)
191210730	Technology	5
201900135	Advanced Semiconductor Device Physics	5

From each of the following two groups one additional compulsory course will be chosen by the programme mentor from the following list, after discussion with the student:

Code	Course	Study load (EC)
191210740	Material Science	5
193400141	Nanoelectronics	5
191211440	Integrated Circuit Technology	5
201900042	Nanomaterial research	5

Code	Course	Study load (EC)
191210930	Measurement Systems for Mechatronics	5
191210750	System-on-Chip Design	10
201700025	Solar Energy	5
191211300	Micro Electro Mechanical Systems Design	5

**Integrated Optical Systems**

The following courses are compulsory for all students in the specialisation:

Code	Course	Study load (EC)
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193400131	Nano-optics	5
191210880	Integrated optics	5

Two more compulsory courses will be chosen by the programme mentor from the following ones, after discussion with the student:

Code	Course	Study load (EC)
191210740	Materials science	5
191211080	Systems engineering	5
191210730	Technology	5
193520030	Non-linear optics	5
201300139	Laser physics	5

### NanoElectronics

The following courses are compulsory for all students in the specialisation:

Code	Course	Study load (EC)
191210740	Materials Science	5
193400141	NanoElectronics	5

Two additional compulsory courses will be chosen by the programme mentor from the following list, after discussion with the student:

Code	Course	Study load (EC)
201600070	Machine Learning I	5
191411291	Applied Quantum Mechanics	5
201600071	Machine Learning II	5
191210730	Technology	5
191211440	Integrated Circuit Technology	5
191211000	Semiconductor Project	5
201900135	Advanced Semiconductor Device Physics	5

### Power Electronics

The following courses are compulsory for all students in the specialisation:

Code	Course	Study load (EC)
201900254	Power Electronic Converters	5
202001505	Energy Conversion: People, Planet, Prosperity	5
191211040	Electromagnetic Compatibility	5
202001506	Power Electronic Systems	5

### Radio Systems

The following courses are compulsory for all students in the specialisation:

Code	Course	Study load (EC)
191211030	Mobile Radio Communication	5

201800175	Advanced Multiple Antenna Radio Systems	5
201200231	Smart Antennas	5
202100101	Wireless Communication Systems	5

## APPENDIX BII – ASSESSMENT FORM FOR THE INTERNSHIP

**Student Name:**  
**Student number:**

**Internship: 191211208**  
**MSc specialisation**

<b>Final assessment by the university supervisor</b>	
<b>Grade:</b>	
<b>Motivation</b>	
<input type="checkbox"/> (* )	<b>Formalities completed</b> <b>(To be filled out by Internship Office EEMCS)</b>

Date internship report handed in: (dd/mm/yy) .....

Assessment date (dd/mm/yy): .....

Name of Examiner 1:

Name of Examiner 2:

Signature: .....

Signature: .....

APPENDIX BIII – ASSESSMENT FORM FOR THE MASTER’S THESIS<sup>1</sup>

**MSc in Electrical Engineering – Thesis Assessment (191211219)**

<b>Student Name:</b>	
<b>Student Number:</b>	
<b>MSc Specialisation:</b>	
<b>Research group(s) to which credits will be allocated:</b>	
<b>Confidential?</b>	<input type="checkbox"/> No <input type="checkbox"/> Yes

<b>Assessment Criteria</b>	<b>Grade and notes</b>
<b>Scientific Quality (50%)</b> <ul style="list-style-type: none"> <li>• Interpret problem and translate it to more concrete research questions or design specifications.</li> <li>• Find and study relevant literature and HW/SW tools and critically assess their merits.</li> <li>• Work in a systematic way and document findings effectively.</li> <li>• Work in correspondence with the level of the elective courses.</li> <li>• Original work of sufficient depth, relevant to the chair.</li> </ul>	
<b>Organization, planning, collaboration (20%)</b> <ul style="list-style-type: none"> <li>• Work independently and goal oriented under the guidance of a supervisor.</li> <li>• Seek assistance if required and beneficial for the project.</li> <li>• Benefit from the guidance of your supervisor by scheduling regular meetings, providing progress reports and initiating topics to be discussed.</li> <li>• Organize work by making a project plan, executing it, adjusting it when necessary, handling unexpected developments and finish in time.</li> </ul>	
<b>Communication (30%)</b> <ul style="list-style-type: none"> <li>• Write a Master thesis that motivates the work in a context, communicates the work and its results in a clear, well-structured way to peers.</li> <li>• Give a MSc presentation with similar qualities than the thesis targeting both fellow-students and chair-members.</li> </ul>	

<sup>1</sup> The layout of this form may be adapted for publication on the website.

<b>Final Grade based on 50-20-30 % weighting:</b>	
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<b>Committee members</b>	<b>Name</b>	<b>Signature</b>
<b>1. Chair</b>		
<b>2. Second examiner</b>		

**Date of the examination:**

### **Scientific Quality (50%)**

- 4: there are errors or omissions that could have easily been prevented by using standard theory at the level of (elective) master courses.
- 5: there are errors or omissions that could have been prevented by using standard theory at the level of the (elective) master courses.
- 6: work has been done at the level of the elective courses, but this has not led to new insights.
- 7: work has been done at the level of the elective courses, and this has had a clarifying effect in the area of the assignment.
- 8: work has been done at the level of the elective courses, and new insights have been gained that are useful in the chair's current research. Maybe (in time) publishable.
- 9: theoretical treatment goes beyond the level of the elective courses, and the result is very useful for research in the chair and can (eventually) be used for a non-trivial publication.
- 10: Brilliant results. The beginning of a new research theme in the chair.

### **Organization, planning, collaboration (20%)**

- 4: The supervisors have tried to give guidance to the process, but this has apparently been ignored by the student.
- 5: The supervisors have tried to give guidance to the process, but the student has not picked this up.
- 6: Significant guidance has been necessary, and the supervisors have had to raise these issues before action was taken.
- 7: Guidance has been necessary, but this has been sought by the student.
- 8: The student showed a lot of initiative, was able to adjust his/her own schedule and figured out most practical issues by him/herself.
- 9: The assignment and planning were defined by the student and the project was executed according to the planning.
- 10: The assignment was initiated, defined and planned by the student. The project was executed according to the planning and unexpected events did not lead to delays. The candidate contributed to the work of other students as well..

### **Communication (30%)**

- 4: The report was essentially written by the supervisors. The supervisors did not recognize the work in the presentation. In some cases questions were not understood, even after reformulation and wrong answers were given.
- 5: Several report versions have been necessary. The final version is not coherent and contains serious spelling and grammatical errors. Presentation was badly structured. Some of the answers during the Q&A session were incorrect.
- 6: Several versions of the report have been necessary to arrive at an acceptable result. The structure needs some improvements but the quality of the content is sufficient. The presentation made sense to the supervisors, but others had a hard time following it. Most of the questions were answered correctly but some were not addressed appropriately.
- 7: The structure of the report was determined in consultancy with the supervisors and limited advise concerning readability was given. The presentation was a valid representation of the work. Some answers during the Q&A session could have been answered in a better way.
- 8: The structure of the report was mainly determined by the student. Some changes were required in formulations, charts, etc. The presentation was enjoyable for both experts and others. Questions were answered well in almost all cases.
- 9: The structure of the report was completely determined by the student and only marginal corrections concerning readability were needed. The presentation gave new insights to both experts and non-experts. In the Q&A session, the questions were answered well.

- 10: report was made essentially without relevant feedback by the supervisors. The presentation was given with great style, clarity and effectiveness. The Q&A session convincingly showed that the student masters the subject matter with strong argumentations.

APPENDIX BIV - FINAL QUALIFICATIONS, AS OBTAINED FROM THE MEIJERS CRITERIA AND THE DOMAIN SPECIFIC FRAME OF REFERENCE

Meijers criteria A graduate:	Domain Specific Frame of Reference	Intended Learning Outcomes
<b>Meijers 1</b> Is competent in one or more scientific disciplines	<b>DSFR 1-3: knowledge and understanding</b>	Graduates have an in-depth knowledge in advanced fundamentals of mathematics and natural sciences
		have in-depth knowledge in advanced subject-specific fundamentals of electrical engineering
		have in-depth knowledge in one of the mentioned primary fields of application based on subject-specific fundamentals
	<b>DSFR 7: engineering practice and product development</b>	judge applicable methods and their limits
<b>Meijers 2</b> Is competent in doing research	<b>DSFR 4: engineering analysis</b>	can evaluate new complex modelling, measuring, design and test methods concerning their relevance, effectiveness and efficiency and can develop independently new methods.
	<b>DSFR 6: investigations and assessment</b>	can develop suitable methods to make concepts, carry out and evaluate detailed research concerning technical topics
	<b>DSFR 7: engineering practice and product development</b>	(also Meijers 3) use and to develop their knowledge and skills in order to gain practical power for the solution of problems, for the organizing of research and the development of systems and processes
<b>Meijers 3</b> Is competent in designing	<b>DSFR 5: engineering design</b>	have specific skills for the design, development and operation of complex technical systems and services, thereby they are capable to assembly the best components of these systems optimally as well as to evaluate the interaction of the systems with their environment, (taking into account technical, social, economical and ecological aspects)

	<b>DSFR 7: engineering practice and product development</b>	(also Meijers 2) use and to develop their knowledge and skills in order to gain practical power for the solution of problems, for the organizing of research and the development of systems and processes
<b>Meijers 4</b> Is able to work according to a scientific approach	<b>DSFR 7: engineering practice and product development</b>	classify knowledge methodically in different areas, to combine information elements systematically, and to handle the phenomena of complexity
	<b>DSFR 8: Transferable skills</b>	take over responsibility for scientific contributions to professional knowledge and to professional practice
<b>Meijers 5</b> Has basic intellectual skills	<b>DSFR 7: engineering practice and product development</b>	familiarize quickly, methodically and systematically with new and unknown tasks
	<b>DSFR 8: Transferable skills</b>	control and organise complex, changing inter-relations of work and learning which require new strategic approaches
		check the strategic capacity of teams
<b>Meijers 6</b> Is competent in co-operating and communicating.	<b>No DSFR: Topics are from Meijers</b>	Is able to communicate in writing and verbally about research and solutions to problems with colleagues, non-colleagues and other involved parties.
		Is able to debate about both the field and the place of the field in society.
		Is characterised by professional behaviour. This includes: drive, reliability, commitment, accuracy, perseverance and independence.
		Is able to perform project-based work: is pragmatic and has a sense of responsibility; is able to deal with limited sources; is able to deal with risks; is able to compromise.
		Is able to work within an interdisciplinary team.
		Has insight into, and is able to deal with, team roles and social dynamics.
<b>Meijers 7</b> Takes account of the temporal and social context	<b>DSFR 5: engineering design</b>	(also Meijers 3) are capable to assembly the best components of these systems optimally as well as to evaluate the interaction of the systems with their environment, <b>taking into account technical, social, economical and ecological aspects</b>

	<b>DSFR 7: engineering practice and product development</b>	Reflects systematically (on) non-technical implications of engineering work and to integrate the results responsibly in their actions to develop marketable products for the global market
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