

# TEACHING AND EXAMINATION REGULATIONS

## MASTER OF SCIENCE ELECTRICAL ENGINEERING

A. FACULTY SECTION

B. PROGRAMME-SPECIFIC SECTION

*2019-2020 academic year*

## **Introduction to the Teaching 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 (*Wet op het hoger onderwijs en wetenschappelijk onderzoek*, WHW) of 1993 requires a broad outline of the teaching programme and examining for each degree programme to be recorded in the Teaching and Examination Regulations (TER (Dutch: OER)).

In accordance with Section 7.13, Paragraph 1, of the WHW, the TER 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 TER with respect to procedures, rights and responsibilities relating to the teaching 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 TER.

The model TER is subdivided into two sections (Section A and Section B), which together form the TER. 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.

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## SECTION A: FACULTY SECTION

### A1. General provisions

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

1. These Regulations apply to teaching 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 teaching and examinations for all the Master's programmes at EEMCS. Section B contains programme-specific provisions. Together, Sections A and B form the Teaching 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 Teaching and Examination Regulations may include additional general provisions for the relevant programme.
6. The general provisions and the programme-specific provisions to the Teaching and Examination Regulations have been authorized by the Dean.
7. 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.

#### 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 Dean, 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. **Bridging programme or pre-Master's 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 7.30 of the WHW;
- d. **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);
- e. **Course:** a study unit of the programme, as defined by the WHW;
- f. **Dean:** head of the faculty;

- g. **Disability:** any condition which is (at least for the period in question) chronic or long-term in nature and which constitutes an on-going disadvantage for the affected student when receiving education, taking examinations or taking part in practical exercises;
- h. **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;
- i. **EC:** European Credit. A unit involving 28 hours of study, as used in relation to the European Credit Transfer System (ECTS), whereby a full academic year consists of 60 ECs or 1,680 hours (Article 7.4 WHW);
- j. **Examination programme:** all study units of a study programme counting towards the degree;
- k. **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 Teaching and Examination Regulations regarding the knowledge, insight and skills required in order to obtain a degree from the programme concerned;
- l. **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;
- m. **Executive Board:** Executive Board of the University of Twente;
- n. **Final degree audit:** a Master's degree programme concludes with a final degree audit. A final degree audit is deemed to have been completed successfully if the study units associated with the relevant programme have been achieved. The final degree audit may also include an additional assessment by the Examination Board;
- o. **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.
- p. **Homologation:** a programme that can be offered to students who can be admitted to the Master's programme but who nevertheless have insufficient knowledge, understanding or skills, according to Article 7.30 of the WHW;
- q. **Examination, also exam:** an assessment of the student's knowledge, understanding and skills relating to a course. The assessment is expressed in terms of a final grade. An examination may consist of one or more tests (*in Dutch: toetsen*);
- r. **Joint degree:** a degree awarded by an institution together with one or more institutions in the Netherlands or abroad, after the student has completed a degree programme (a degree programme, a major or a specific curriculum within a degree programme) for which the collaborating institutions are jointly responsible;
- s. **Learning Management System (LMS)** e.g. Canvas;
- t. **Master's programme or programme:** the Master's degree programme, as referenced in Article 7.3a Paragraph 1 subparagraph b of the Act: the entirety of the course components, teaching activities/methods, contact hours, testing and examination methods and recommended literature;
- u. **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;
- v. **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.
- w. **Premaster:** the combination of courses to be followed by a student in order to be eligible for enrolment in a Master's programme.
- x. **Programme Board:** the committee charged by the Dean with managing the programme;
- y. **Programme Committee:** the Programme Committee as referred to in Article 10.3c WHW;
- z. **Quarter or quartile:** a part of a semester as specified in the academic calendar (*jaarcirkel*) of the university;
- aa. **Semester:** half an academic year, as specified in the academic calendar (*jaarcirkel*) of the university
- bb. **Student Information System (SIS):** the system used by the institutional administration to register and record information relating to particular students and study data, as stipulated in the WHW, in this case Osiris;
- cc. **Student:** any person enrolled for a programme in accordance with Articles 7.34 and 7.37 of the WHW;
- dd. **Student's chair: Research chair of the student's supervisor for the final project**
- ee. **Study Adviser:** staff member appointed by the Dean of the Faculty to act as an intermediary between the student and the programme and, in this capacity, to represent the interests of the students and provide advice to the students;
- ff. **Study load:** the study load associated with a study unit to which an examination applies, expressed in terms of ECs (the study load for one academic year (1,680 hours) totals 60 ECs);
- gg. **Study Programme:** all study units followed by the student as part of his/her Master's programme;
- hh. **Test:** part of an examination (*toets*);
- ii. **University:** the University of Twente (UT);
- jj. **WHW:** the Dutch Higher Education and Research Act (*Wet op het hoger onderwijs en wetenschappelijk onderzoek*).

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 Dean. The Dean 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 (*UT Klachtenloket*) 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 Dean 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 he/she is unsuitable either for practising one or more of the professions for which the programme in question would prepare him/her 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 Dean will initiate an inquiry, and the student will be informed of this promptly. The Examination Board or the Dean 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.
3. The pre-Master's programme is assembled by the Programme Director together with 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 one academic year unless otherwise specified. There are two opportunities to take the examination for each part of the programme.
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.

### 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 Higher Education and Research Act) 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. Upon receiving a written request from a student, the Examination Board may exempt the student from taking one or more examination components, if the student:
  - a. has successfully completed a course component as part of a previous university or higher professional education programme that is equivalent in terms of both content and level;  
or
  - b. has demonstrated through his/her work and/or professional experience that he/she has sufficient knowledge and skills with regard to the relevant course component.
2. Students may be exempted from the requirement to participate in practical exercises if they can demonstrate that they have reason to believe that doing so will give rise to a moral dilemma. In such cases, the Examination Board will decide whether the component can be carried out in another manner to be determined by the Board.
3. Exemptions may be granted to a maximum of 30 EC. The Examination Board may in extraordinary circumstances decide to grant exemptions in excess of 30 EC.
4. If an exemption is granted, the examination board can decide that the course in question must be substituted by another course so that the total number of credits achieved in the programme remains at least 120 ECs..

#### 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 7.3d 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 should 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 composition of combined programmes:

1. 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 three 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**.
2. The combined programme as described in paragraph 1 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.
3. If a single combined final project is included in and is relevant to both Master's programmes, as referred to in 1a and 1b, the study load of the final project should 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.
4. If a single combined internship is included that satisfies the requirements of both programmes as referred to in 1a, the study load of the internship should equal the load of the internship with the highest number of ECs.
5. Approval for the combined study programme is required from the Examination Boards of both Master's programmes.

#### *Passing the final degree audit for a combined programme*

Students who complete a study programme as described above 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 double degree programme.
6. Programme-specific regulations regarding the final project are stipulated in Section B.

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

1. The assessment committee is formed by a minimum of two examiners. The committee is chaired by an associate or full professor from the student's chair. The daily supervisor is a member of the assessment committee. One of the two examiners is a member of another chair. The examiners hold the PhD degree and have completed UTQ or equivalent. The committee may also have an advisory member, for instance a company supervisor.
2. In the event that the assessment committee cannot meet the above specifications, a motivated request to the Examination Board to assign a chairman who is not a full or associate professor but is sufficiently experienced 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.

#### 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. The student must register with the EEMCS Internship Office at least three months before starting his/her internship.
5. The daily supervisor for the internship is the company supervisor: a member of the organization where the internship is carried out. He/she 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, he/she 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 should submit the report to the UT supervisor within two months of finishing the internship.

#### Article A3.10 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 should be made by the examiner before the start 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. 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.

#### Article A3.11 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.
4. The test schedule must be published in the Learning Management System (LMS) at least two weeks prior to the start of the study unit.
5. The assessment schedule must include:

- a. the learning objectives;
- 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;

#### Article A4.2 Type of examination

1. The course catalogue stipulates how a study unit is to be assessed and the form of any examinations.
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 A4.3 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.

#### Article A4.4 Examination results

1. Examination results are expressed with a numerical grade or as a 'pass'/'fail'.
2. Numerical grades are given on a scale from 1 to 10, with no decimal.
3. ECs will only be awarded for the study unit if an examination has been completed with a grade of 6 or higher or a pass. No ECs will be awarded for individual components of study units and/or individual tests.
4. If a student receives more than one authorized result for the same study unit, the highest grade will apply.

#### 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, he/she 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 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 result of an oral examination is made known to the student within one working day in the form of authorized proof of the result by the examiner.
3. If 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. Should the examiner be unable to meet the terms described in Paragraphs 1 and 2 due to extraordinary circumstances, he/she 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 Validity period for results

1. The period of validity for the results of an examination that has been passed is indefinite, unless the knowledge or skills tested have been scientifically invalidated or are proven to have lost their relevance.
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 A4.8 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 A4.9 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, he/she 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. 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 arithmetic mean of the grades for all study units of the Master's examination programme, excluding the Master's thesis (final project), 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 or higher;
  - e. No more than one study unit of the examination programme has been graded at 6;
  - f. 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 Dean 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.

## A7. Studying with a functional impairment

1. A functional impairment is a physical, sensory or other functional disorder that might limit the student's academic progress.
2. The Study Advisor and the student will discuss the most effective facilities for the student as referred to in Article 2 of the Equal Treatment of Disabled and Chronically Ill People Act (WGB h/cz).
3. Facilities are to be aimed at removing specific barriers in the teaching programme or when it comes to taking exams. Where necessary, these facilities may be related to access to infrastructure (buildings, classrooms and furnishings) and study materials, adjustments to the form of assessment, alternative learning pathways or a customized study plan. The facilities are to ensure the student's chances of achieving the programme intended learning outcomes.

4. Based on the interview referred to in paragraph 2, the student is to submit a request for facilities to the Dean, preferably three months before the student is to participate in classes, exams and practical exercises for which the facilities 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 Dean 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. Should the faculty Dean reject the request in full or in part, the Dean is to inform the student of the justification for the rejection and the possibilities for lodging an objection and an appeal. A written objection must 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. Should extra facilities be granted, the period of validity will also be indicated. The applicant and the Study Advisor will evaluate the facilities before the end of this period. During this evaluation, parties will discuss the effectiveness of the facilities provided and whether they should be continued.
10. If a student is dyslexic, he/she will be granted a maximum of 15 extra minutes for each hour that a test or exam is officially scheduled..

## **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 Teaching and Examination Regulations, the present document (Teaching 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 Teaching and Examination Regulations are determined by the Dean 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 Teaching and Examination Regulations, the Dean 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 Dean 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 Appeal and objections

Any appeals against decisions made by the Examination Board or an examiner, and any objections to decisions made by the Dean 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 A8.6 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 A8.7 Publication

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

Article A8.8 Commencement

These Regulations take effect on 1 September 2019 and supersede the Regulations dated 1 September 2018.

## SECTION B PROGRAMME-SPECIFIC SECTION

# ELECTRICAL ENGINEERING (M-EE)

### **About this Section**

The Teaching and Examination Regulations (TER) are subdivided into two sections (Section A and Section B), which together form the TER. 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 programme, in this case the Master's programme in Electrical Engineering.

## SECTION B – PROGRAMME-SPECIFIC SECTION ELECTRICAL ENGINEERING

### 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

A Master of Science in Electrical Engineering has the following competencies:

- A Master has specialized advanced knowledge in at least one of the specialisations of Electrical Engineering as described below.
- A Master has experience in working in industry-related projects and has acquired the ability to be effective in a multidisciplinary environment.
- A Master is able to work at the frontier of research and design, and is innovative, contributing to breaking the frontiers of current technology or understanding.
- He/she defines his/her own design/research goals within the limits of his/her project, judges which parts of the problem need further analysis, carries out these analyses on an abstract level, proposes experiments and carries them out in a methodologically correct way.
- A Master is able to understand, on a general level, areas adjacent to his/her own area of specialization and use this understanding in the context of his/her own work. He/she is able to appreciate new knowledge of other disciplines (if necessary also of non-technical areas) and to integrate this in his/her work.
- A Master can carry responsibility as a leading member of a multidisciplinary design (or research/development) group and develops a broad scope, e.g., with respect to the economic aspects of his/her work, or the impact of technological innovation on society. He/she is a serious partner in discussions on aspects regarding the setting and societal environment of his/her work.

Compared to the bachelor level, a Master has more specialized knowledge and abilities, more industrial experience and has skills to independently solve relatively complex problems.

#### Article B2.3 Specialisations

There is only one Master's programme in Electrical Engineering and the field of specialization 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 specialization 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
Integrated Devices and Systems	Integrated Devices and Systems	IDS
Telecommunication Engineering	Telecommunication Engineering	TE
Power Electronics		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.
3. 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.

1. 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)
201500291	Calculus A	5
201500292	Linear Algebra	3
201500252	Digital Logic and Computer Organization	3
201500293	Calculus B	4
191231490	Linear Systems	6
191403070	Electricity & Magnetism HBO	5
201400279	Academic Research Skills	4
	<b>Total</b>	<b>30</b>

- 2. Small changes in the programme are possible. The final programme should be announced to the students before the start of the programme.
- 3. 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).
- 4. The conditions for admission to the Master’s programme are as stipulated in Article A2.7.
- 5. Students from a Dutch University of Applied Sciences may be allowed by the Admission Committee to follow 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 I.

### 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.

#### 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.
  - b. students must already have obtained at least 45 ECs of their examination programme, as mentioned in the study programme.
  - c. Students must have followed all compulsory specialization courses and must have participated in their examination.
  - d. Students must have followed the compulsory non-technical course mentioned in Article B4.3 and must have participated in their examination.
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.
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 director regards the project as being carried out by 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 Sequence of examinations

1. There are no general conditions regarding the sequence in which the course units have to be followed. 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 mark 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 doing it over in full.
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 examiner of the internship must justify his/her assessment by filling in the assessment form for the internship, shown in Appendix II.

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

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

7. Immediately after the final date of the project as recorded in the study plan, the graduation committee shall issue an opinion on how the project was carried out and determine the final mark.

8. If this final mark 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 by default to at most a 6. In exceptional cases a higher grade is possible.
9. This new final mark will be regarded as the result of a resit.
10. If the result of a resit is a fail, then the student shall have to carry out a new Master's final project.
11. The graduation committee of the Master's final project must justify its assessment by filling in the assessment form for the Master's final project, shown in Appendix III.
12. 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.

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 Double/combined programme

Regulations for a double/combined programme are stipulated in Article A3.6

## APPENDIX I - SPECIALISATIONS AND THEIR COMPULSORY COURSES

### BIOS 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 & Biomechanics

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

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)
192130200	Real-time systems 1	5
201800127	Security in Embedded Hardware	5

### Robotics & Mechatronics

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

Code	Course	Study load (EC)
xxxxxxxx	Digital Control Engineering	5
xxxxxxxx	Real-Time Software Development	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)
191211080	Systems Engineering	5
xxxxxxxx	Dynamics	5
xxxxxxxx	Robotics	5
191210910	Image Processing and Computer Vision	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	Basic Machine Learning	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

### Integrated Devices and Systems

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

Code	Course	Study load (EC)
191211300	Micro Electro Mechanical Systems Design	5
191210730	Technology	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)
191210740	Material Science	5
191210930	Measurement Systems for Mechatronics	5
191210750	System-on-Chip Design	10
193400141	Nanoelectronics	5
191211690	EMstatics	5
191210850	Advanced Analog IC Electronics	5
191211440	Integrated Circuit Technology	5
191131360	Design Principles for Precision Mechanisms	5
191211000	Advanced Semiconductor Devices	5

### Integrated Optical Systems

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

Code	Course	Study load (EC)
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
193530020	Advanced materials	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	Basic Machine Learning	5
191411291	Applied Quantum Mechanics	5
201600071	Advanced Machine Learning	5
191210730	Technology	5
191211440	Integrated Circuit Technology	5
191211000	Advanced Semiconductor Devices	5

### Power Electronics

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

Code	Course	Study load (EC)
xxxxxx	Electronic Power Conversion	5
xxxxxx	Electrical Machines and Drives	5
191211040	Electromagnetic Compatibility	5

### Telecommunication Engineering

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 and Propagation	5

## APPENDIX II – ASSESSMENT FORM FOR THE INTERNSHIP

**Student Name:**

**Internship: 191211208**

**Student number:**

**MSc specialisation**

**Final assessment by the university supervisor**

**Grade:**

**Motivation**

  
(\* )

Formalities completed  
**(To be filled in by Internship Office EEMCS)**

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

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

Name of Examiner 1:

Name of Examiner 2:

Signature: .....

Signature: .....

**APPENDIX III– ASSESSMENT FORM FOR THE MASTER’S THESIS**

**MSc in Electrical Engineering – Master Thesis Project (191211219)**

<b>Student Name:</b>	
<b>Student Number:</b>	

<b>MSc Specialization:</b>	
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<b>Assessment Criteria</b>	<b>Grade and notes</b>
<p><b>Scientific Quality (50%)</b></p> <ul style="list-style-type: none"> <li>• Interpret problem and translate it to more concrete research questions.</li> <li>• Find and study relevant literature and HW/SW tools and critically assess their merits.</li> <li>• Work in a systematic way and effectively document findings.</li> <li>• Work in correspondence with the level of the elective courses.</li> <li>• Original work of sufficient depth, relevant to the research in the chair.</li> </ul>	
<p><b>Organization, planning, collaboration (20%)</b></p> <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 and handling unexpected developments, and finish in time.</li> </ul>	
<p><b>Communication (30%)</b></p> <ul style="list-style-type: none"> <li>• Write a Master thesis that motivates the work in a context and communicates the work and its results in a clear, well-structured way to peers.</li> <li>• Give an MSc presentation with similar qualities as the thesis, targeting both fellow students and chair members.</li> </ul>	
<b>Final Grade<sup>1</sup>:</b>	

**Names and Signatures of Committee Members:**

**Date:**

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<sup>1</sup> If any of the rubrics, "Scientific Quality", "Organization, planning, collaboration" or "Communication", has been assessed as insufficient (less than 5.5), the final grade cannot be higher than 5. The by default weighting factors are 50%-20%-30% as indicated in the rubrics.

*Basis for Grade Assessment and Normalization:*

- 1: very bad      2: bad              3: very insufficient      4: insufficient      5: almost sufficient
- 6: sufficient      7: amply sufficient      8: good              9: very good      10 : excellent
- A Master thesis should be state-of-the-art, and a chair in that field should determine whether it is.
- Mainly judge the 'first version' of the report (avoid grading the suggestions of the supervisor)

**Scientific Quality (50%)**

- 4: there are errors or omissions that could easily have 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 him/herself.
- 9: The supervisors are happy that they were allowed to be involved in this assignment.
- 10: The supervisors themselves have learned something.

**Communication (30%)**

- 4: The report was essentially written by the supervisors. The supervisors did not recognize the work in the presentation.
- 5: Several report versions have been necessary. The first version was unacceptable. Presentation was badly structured.
- 6: Several versions of the report have been necessary to arrive at an acceptable result. The first version needed substantial corrections. The presentation made sense to the supervisors, but others had a hard time following it.
- 7: The first version of the report needed some corrections in structure and was already quite readable. The presentation was a valid representation of the work.
- 8: The first version of the report was structured well. Changes were required in text, formulations, charts, etc. The presentation was enjoyable for both experts and others.
- 9: The first version of the report was very readable and only marginal corrections were needed. The presentation gave new insights to both experts and non-experts.
- 10: The first version of the report can serve as teaching material or a publication. The presentation was pure entertainment, while leaving everybody feeling that they learned a lot.

*Copied from "Assessment Standards Master Thesis Project Electrical Engineering" (version 120203)*