TEACHING AND EXAMINATION REGULATIONS

BACHELOR OF SCIENCE APPLIED MATHEMATICS

A. UNIVERSITY SECTION
B. PROGRAMME-SPECIFIC SECTION

2019-2020 academic year

Introduction to the Teaching and Examination Regulations for Bachelor'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 university section, includes provisions that apply to all Bachelor's degree programmes. Section B contains the provisions that are specific to the particular Bachelor's degree programme.

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SECTION A: UNIVERSITY SECTION

SECTION 1 – General Provisions

Article 1.1 Applicability of these Regulations

1. The Teaching and Examination Regulations apply to all students who are enrolled in the educational programme in question.
2. Students attending courses offered by a different educational programme are subject to the assessment rules laid down in the relevant assessment schedule, in the TER of the relevant educational programme and in the rules and guidelines of the Examination Board of the relevant educational programme. The decision on special facilities in accordance with Article 6.2.5 may only be taken by the Examination Board of the relevant programme.
3. Each educational programme has its own programme-specific Appendix.
4. This general section of the Teaching and Examination Regulations and the programme-specific section jointly form the applicable Teaching and Examination Regulations for the relevant Bachelor's programme.
5. Both the general section and the programme-specific Appendix of the Teaching and Examination Regulations are adopted by the faculty board.
6. The institute section of the student charter includes a definition of what the University of Twente considers to be academic misconduct. The rules and guidelines of the Examination Board for the Bachelor's programme in question includes additional rules about academic misconduct, such as which measures the Examination Board may take if it establishes misconduct.
7. The rules and guidelines of the Examination Board of the educational programme includes provisions on order for tests and rules in case of emergencies.
8. The following applies to the language used in the general section and the programme-specific Appendix of the Teaching and Examination Regulations and the rules and guidelines of the Examination Board:
   a) English versions of the programme-specific Appendix of the Teaching and Examination Regulations and the Examination Board's rules and guidelines should be available for English-taught Bachelor's programmes.
   b) Where the programme-specific Appendix of the TER and the Examination Board's rules and guidelines are available in both Dutch and English, each version must, for the sake of clarity, state which version is binding.
   c) An English translation of this general section is available for English-taught Bachelor's programmes. In case of uncertainty, the Dutch version of this general section is binding.
9. Requests for exemptions to provisions laid down in the Teaching and Examination Regulations may be submitted to the Examination Board or the Programme Board, depending on the subject matter. This depends on which body (Examination Board or Programme Board) is authorized or has the duty according to this regulation to take a decision on or make an exception to a provision in this regulation.
10. These regulations have been drawn up using the masculine personal pronouns 'he' and 'him' and 'his'. In these cases, 'she' 'her' and 'hers' may be substituted

Article 1.2 Definitions

The following definitions are used in these Regulations:

a. **Binding student progress evaluation (BSA):** A student progress evaluation as referred to in Section 7.8 (b), subsections 1 and 2 of the Higher Education and Research Act involving expulsion from the programme in accordance with Section 7.8 (b), subsection 3 of that Act, issued by the Programme Board on behalf of the institutional administration;

b. **Compulsory holiday**: Required day off work;

c. **Canvas**: University of Twente's digital learning environment;

d. **Personal Circumstances Committee**: A committee convened by the institutional administration to advise the institutional administration in individual cases regarding the validity, duration and severity of a specific student's extenuating personal circumstances;

e. **Credit**: a unit of 28 study load hours, in accordance with the European Credit;

f. **Transfer System**. A full-time academic year consists of 60 credits, equal to 1680 hours of study (Section 7.4 of the Higher Education and Research Act);

g. **Examination**: A degree programme is concluded with an examination. If the study units in the degree programme have been completed successfully, then the examination will be deemed to have been completed. The Examination Board may require a supplementary examination;

h. **Examination Board**: The Examination Board is the body that objectively and professionally assesses whether a student meets the conditions laid down in the Teaching and Examination Regulations regarding the knowledge, understanding and skills required to obtain a degree;

i. **Examiner**: The individual appointed by the Examination Board to administer examinations and tests and to determine the results, in accordance with Section 7.12 (c) of the Higher Education and Research Act;

j. **Faculty Board**: Head of the faculty (Section 9.12 of the Higher Education and Research Act);

k. **Honours Programme**: Institution-wide Bachelor's Honours programme;

l. **Institution**: University of Twente;

m. **Institutional administration**: Executive Board, except as otherwise specified;

n. **Module**: a study unit worth 15 credits;

o. **Module coordinator**: The individual responsible for the module, as appointed by the Programme Board;

p. **Module-examiner**: The individual appointed by the Examination Board to determine the results of the study unit;

q. **Module component:** Component of a module;

r. **Study unit:** A programme component as defined in Section 7.3, subsections 2 and 3 of the Higher Education and Research Act. Each study unit is concluded with an interim examination;

s. **Curriculum:** The aggregate of required and elective study units constituting a degree programme as laid down in the programme-specific Appendix;

t. **Programme:** Bachelor's degree programme as referred to in the programme-specific Appendix to these Teaching and Examination Regulations;

u. **Programme Board:** The body appointed by the Faculty Board to administer the programme;

v. **Programme Committee:** Programme Committee as referred to in Section 9.18 of the Higher Education and Research Act;

w. **Osiris:** System designated by the institutional administration for registration and for providing information on all relevant data related to the students and the university, as described in the Higher Education and Research Act;

x. Practical exercise: A practical exercise as referred to in Section 7.13, subsection 2 (d) of the Higher Education and Research Act is a study unit or a study unit component emphasizing an activity that the student engages in, such as:
   a) carrying out literature research, completing an assignment or preparing a preliminary design, writing a thesis, article or position paper, or giving a presentation in public;
   b) carrying out a design or research assignment, doing tests and experiments, participating in practical classes, practicing skills;
   c) internship, fieldwork or excursions;
   d) participating in other educational activities deemed necessary and aimed at achieving the required skills, such as targeted practice of clinical skills in a specifically equipped skills lab;

y. Student: Anyone enrolled in a programme in accordance with Sections 7.34 and 7.37 of the Higher Education and Research Act;

z. Study Adviser: Person appointed by the faculty board who acts as contact between the student and the university, and in this role represents the interests of the students, as well as fulfilling an advisory role;

aa. Study workload: The study workload is expressed in course credits according to the European Credit Transfer System. The study workload for one academic year is 60 credits. 60 credits is equal to 1680 hours of studying;

bb. Interim examination: an investigation of students' knowledge, understanding and skills, and an assessment of the outcomes of that investigation, (Section 7.10 of the Higher Education and Research Act); an interim examination may consist of a number of tests;

cc. Test: Part of an interim examination. If the interim exam for a study unit consists of a single test, then the result of that test will count as the result of the interim exam. A test can be split into components and administered during multiple sessions;

dd. Test result: A result that is part of the final result for a module;

ee. Assessment schedule: A schedule showing the method of assessment for a module;

ff. UT: University of Twente;

gg. Working day: Any day from Monday to Friday with the exception of official holidays and the prearranged compulsory holidays ('brugdagen') on which the staff are free;

hh. Higher Education and Research Act: The Higher Education and Research Act (abbreviated in Dutch to WHW), Bulletin of Acts and Decrees 1992, 593, and its subsequent amendments;

The definition of all other terms used in these regulations is in accordance with the definition accorded by statute.

SECTION 2 – ADMISSION

Article 2.1 Prerequisites
Admission will be granted to the programme if the prerequisites for enrolment in university education have been met in accordance with the Higher Education and Research Act, Sections 7.24, 7.25 and 7.28. Further details are available on the University of Twente website[1].

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[1] https://www.utwente.nl/onderwijs/bachelor/toelating-en-inschrijving/ or http://www.utwente.nl/en/education/bachelor/admission/

Article 2.2 Bachelor's programme language requirement for holders of a non-Dutch qualification

Applicants in possession of qualifications obtained outside the Netherlands may only enrol:
1. If the programme is taught in Dutch: after complying with the Dutch language proficiency requirement by passing the state examination in Dutch as a second language, level 2, or earning the certificate Dutch as a Foreign Language, 'Profiel Academische Taalvaardigheid' (PAT) or 'Profiel Taalvaardigheid Hoger Onderwijs' (PTHO), and
2. If the programme is taught in English: after complying with the English language proficiency requirement, involving proficiency at a level commensurate with the Dutch pre-university (VWO) exam. Passing one of the following tests also serves as proof of the required proficiency:
     o IELTS (International English Language Testing System), academic module. The minimum required IELTS score (overall band) is: 6.0;
     o TOEFL (Test Of English as a Foreign Language). The minimum required TOEFL score is: 80 (internet-based test);
     o Cambridge EFL (English as a Foreign Language) Examinations, with one of the following certificates:
          • Cambridge Certificate in Advanced English;
          • Cambridge Certificate of Proficiency in English;
3. The educational programme may impose additional requirements for Dutch or English language proficiency. These additional requirements are specified in the programme-specific Appendix.

Article 2.3 Entrance Examination ('Colloquium Doctum')

If the applicant fails to meet the requirements set in Articles 2.1 and 2.2, the institution may provide an exemption based on an entrance examination in accordance with Section 7.29 of the Higher Education and Research Act. Further details are available on the University of Twente website[2]

SECTION 3 – CONTENTS AND STRUCTURE OF THE PROGRAMME

Article 3.1 Aim of the Programme

The aims and attainment targets (Section 7.13 subsection 2c Higher Education and Research Act) are described in the programme-specific Appendix.

Article 3.2 Structure of the Programme
1. The programme consists of 180 credits:
     a. In addition to a core programme of up to 120 credits, students also take minors totalling at least 30 credits and they complete a graduation phase of a total of 15 credits. The programmes Advanced Technology and Technical Medicine are an exception;
     b. The educational programme consists of modules;
     c. A module is a study unit of 15 credits, in which the student develops his programme-specific knowledge, skills and attitudes in a coherent manner;
     d. A module is a study unit of 15 credits, in which the student develops his programme-specific knowledge, skills and attitudes in a coherent manner;
     e. The programme offering the minor module may set prerequisites for admission to the minor module;

    f. The student's own programme may set conditions for the number of credits to be earned for admission to the minor module. These conditions are specified in the relevant programme-specific Appendix;

    g. The student is limited in his choice of minor by the provisions of (e) and (f). The range of programmes can be consulted on the website https://www.utwente.nl/onderwijs/keuzeruimte/minor/

    h. Generally speaking, the second semester of the third year of studies is devoted to the graduation phase (which comprises a minimum of 15 credits);

    i. The student is to complete the core of the Bachelor's programme prior to embarking on the graduation phase;

    j. The Examination Board[2] is authorized to deviate from Article 3.2.1 (f), (g) and (h) if strict adherence to those provisions would result in an unacceptable delay in study progress. In consultation with the Study Advisor, the student may submit a proposal to the Examination Board;

2. The programme-specific Appendix to these Teaching and Examination Regulations describes the degree programme in accordance with Section 7.13, subsection 2 (a to e, g, i, l, s, t, v) of the Higher Education and Research Act.

Article 3.3 Programme's Language of Tuition

1. The educational programme's language of tuition is specified in the programme-specific Appendix;

2. If programme components deviate from the language of tuition, then this is to take place in accordance with the UT Code of Conduct for Languages of the UT and Section 7.2 of the Higher Education and Research Act;

3. Bachelor's programmes taught in Dutch will generally use study materials in English or Dutch, and study units or components of study units may be taught and assessed in English, if:

    a. a lecturer or tutor in the unit of study does not speak Dutch, or;

    b. students from the relevant Bachelor's programme take the module together with student's from an English-taught Bachelor's programme, or;

    c. educational programme the degree programme considers it necessary in order to fulfil one of its aims in the area of English language communication skills.

Article 3.4 Exemption

1. The Examination Board may grant an exemption to a student at his request for one or more full study units. To this end, the student must demonstrate completion of a component of a higher education programme that is equivalent in content, scope and level, or that he has acquired expertise and skills through work or professional experience with regard to the relevant study unit;

2. The Examination Board has the authority to make exceptions to the provision in paragraph 1 and to grant an exemption to a student for components of a study unit;

3. A student may also be exempted from practical exercises if he can demonstrate that a required practical exercise will likely give rise to a personal moral dilemma. In such cases the Examination

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[2] It is important that the student is still able to achieve the attainment targets of the programme. In light of this consideration, this authorization has been formally conferred to the Examination Board, as they are the ones to ensure that only students who achieve the attainment targets are able to graduate. It is conceivable that a programme / faculty may opt to confer the authorization referred to in (j) to the Programme Board.

Board will decide whether the component can be completed in another manner to be determined by the Examination Board.

Article 3.5 Elective Programme

The Examination Board of the programme decides on requests for permission to take an elective programme as referred to in Section 7.3 (d) of the Higher Education and Research Act. The Examination Board assesses whether an elective programme is appropriate and consistent within the domain of the educational programme and whether the level is high enough in light of the attainment targets of the programme.

SECTION 4 – TEACHING AND ASSESSMENT

Article 4.1 General

1. The institutional administration is responsible for the practical organization of interim and other examinations;
2. Each study unit concludes with an interim examination;
3. The interim exam may consist of a number of tests[3];
4. A test can be split into components and administered during multiple sessions. The results of these components are not included in Osiris but must be announced to the students through the Gradebook in Canvas;
   a. The student has the right to inspect recent model test questions or model tests, or old tests and their keys, along with the norm for assessment;
   b. The time allotted to administering a test may not exceed three hours[45];
   c. If the examiner wishes to use a form of assessment that takes more than three hours, he may ask the Examination Board for approval to deviate from the preceding paragraph. The request must be submitted at least four weeks before the start of the course period in order to comply with the provisions of paragraph 11 about timely notification of various aspects of teaching and testing;
5. Test results are expressed as a whole number from 1 to 10 or a number from 1 to 10 with a single decimal, or as 'pass' / 'fail';
6. Interim exam results are rounded to the nearest whole number;
7. Interim exam results are expressed as a whole number from 1 to 10. Interim exam results of 6 or higher are a pass;
8. The module examiner consults with any other examiners involved in the module prior to determining the interim exam results for the module (Article 4.2). This consultation should preferably take place during a module assessment meeting;
9. The 15 credits will be awarded only once a module has been passed. No credits are awarded for components of a module;
10. If more than one authorized result has been established for one and the same unit of study, the highest result will apply. This also applies to tests and components of tests;

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[3] A test may take the following forms: a written test, an assignment, an oral test, the assessment of practical exercises as referred to in Article 1.2 or a combination of the above.

[4] If a test consists of several components, administered during multiple sessions, the maximum time applies to each component. Article 7.1 paragraph 10 includes a provision on the maximum extra time allotted to students with dyslexia.

[5] An interim exam result of 5.49 is rounded down to 5 (fail). An interim exam result of 5.50 is rounded up to 6 (pass).

11. The Programme Board publishes the following details in Osiris: scope, course objectives and content of the study unit, language of tuition, language of assessment, prerequisites, required and recommended study materials, design of teaching methods and assessment.

Article 4.2 Modules

1. Each module has a module coordinator and a module examiner. This is preferably the same person;
2. The Examination Board appoints the examiners for the module components and a module examiner for each module.

Article 4.3 Registration for study units and tests

1. Registration in Osiris is required prior to participating in the study unit;
2. Upon registering for the study unit, the student will automatically be registered for the regular assessments associated with the study unit;
3. Information on registration for resits is indicated in the assessment schedule.

Article 4.4 Description of modules and assessment schedule

1. The programme-specific Appendix contains a description of each module
2. The module description must include:
   a. the learning objectives of the module and the module components;
   b. the module components;
   c. the number of credits and weighting ratio of the module components;
   d. the language of tuition and assessment;
3. After the module coordinator has drawn up the assessment schedule, it will be adopted by the Programme Board. The Examination Board issues its advisory opinion on the assessment schedules;
4. The assessment schedule must be published in Canvas at least two weeks prior to the start of the module;
5. The assessment schedule must include:
   a. under which conditions the module can be passed;
   b. how the learning objectives of the module and the module components are assessed;
   c. the period of validity of the result of the test or tests for a module component;
   d. when the tests are taken;
   e. any required minimum mark per test; a minimum mark for a test may not be set higher than 5.5;
   f. when the resit options take place and which conditions are attached to take part; each module component must offer at least one resit option within the same academic year. An exception may be made for practical exercises[6];
   g. any compensation schemes for test results within the module;
   h. any pass-fail regulation for test results from different modules[7];
   i. the marking period for each test; this must not exceed 10 working days with due observance of Article 4.6.8 of this regulation;
6. The Programme Board may modify the assessment schedule during the study unit;

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[6]See the definition of terms in Article 1.2. These include projects and practical classes.

[7]The Examination Board has the legal right to determine that a student may pass while not have achieved only passes. This is referred to as the 'pass/fail regulation'.

    a. The assessment schedule may only be changed in consultation with the module coordinator. Students are to be informed immediately of the change;

    b. If the change involves nothing more than moving tests or test components to a timeslot other than as shown in the timetable, the Programme Board will inform the Examination Board of the decision to make the change at the next examination meeting;

7. Changes to the assessment schedule may not put students at an unreasonable disadvantage. The Examination Board may take special measures in individual cases.

Article 4.5 Oral Examinations

1. Oral examinations are to be administered in public, unless the Examination Board decides otherwise due to extraordinary circumstances;

    a. If the student or the examiner actually wishes a third party to be present when administering the oral examination, then a request to this end must be submitted to the Board of Examiners at least fifteen working days prior to the oral examination. The student and the examiner are notified of the Programme Board's decision no later than 5 working days in advance. The Programme Board must inform the Examination Board of the decision at the next examination meeting. Public graduation symposia, public presentations and group tests are excluded from this provision;

    b. If the Examination Board has decided that members of the Examination Board or an observer on behalf of the Examination Board is to be present during the administration of an oral examination, then the Examination Board is to make this known to the examiner and the student at least two working days prior to the oral examination.

Article 4.6 Assessment deadline, interim examination and test date

1. The examiner is to inform the student of the result of an oral examination within one working day;

2. The provisions of paragraph 1 do not apply if the oral examination is part of a series of oral examinations of the same study unit which are administered on more than one working day. In that case, the examiner is to determine the result within one working day following the conclusion of the series of oral examinations;

3. The deadline for determining and disclosing the results of a written test (or other kind of assessment) is to be included in the assessment schedule of the study unit;

4. The examination result of a study unit, determined in accordance with Article 4.1.8, is to be disclosed to the student within ten working days after the conclusion of the teaching period during which the study unit is offered. If the student fails an interim exam and the module examiner has determined that the student meets the conditions for participation in the repair option (in accordance with Article 4.4.5 (f), then this decision is to be made known the student within ten working days after the conclusion of the teaching period;

5. This interim exam date is the date on which the test is taken with which the student definitively passes the interim exam;

6. The test date is the date on which a written or oral test is taken;

7. If a test assessment is dependent on completing one or more assignments or writing a paper or thesis, then the test date will be the deadline of submission of the final component;

8. If a second test is planned shortly after the first, the results of the first test will be published at least five working days prior to the second test to give the student time to prepare;

9. Should the examiner not be able to meet the deadline as stated in Article 4.6, paragraphs 1, 2, 4 and 8 due to exceptional circumstances, then he is to notify the Programme Board and the Examination Board, providing reasons for the delay. The Programme Board is to inform the students involved of the delay immediately, and of the term within which the results will 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 exam at the request of the Programme Board.

Article 4.7 Period of validity

1. The results of an exam that has been passed remain valid indefinitely. The period of validity of an interim examination that was passed may only be limited if the tested knowledge or understanding is demonstrably outdated or the tested skills are demonstrably outdated;
2. The period of validity of the result of the test or tests for a module component is set out in the programme-specific Appendix and in the assessment schedule of the module.

Article 4.8 Right of inspection and discussion

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

Article 4.9 Retention period of tests

1. The retention period for test assignments, keys and the assessments of written tests is two years;
2. De retention period for final Bachelor's projects is a minimum of seven years.

Article 4.9 Teaching evaluation

1. The Programme Board is responsible for monitoring the quality of the educational programme;
2. The Programme Board is responsible for evaluating the programme;
3. The programme-specific Appendix details how the tuition in the programme is evaluated.

SECTION 5 - EXAMINATIONS

Article 5.1 Examination Board
1. The Faculty Board appoints an Examination Board for each educational programme or group of programmes;
2. The Faculty Board convenes the Examination Board and appoints the members based on their expertise in the field of the relevant programme or group of programmes;
3. It is the responsibility of the Faculty Board to ensure that the Examination Board is independent and functions as an expert professional body;
4. Examination Boards determine the rules and guidelines for the examiners, interim examinations and examinations without further consultation (Higher Education and Research Act, Section 7.12b). These are set out in a separate document 'Examination Board Rules and Guidelines';
5. The statutory authority of the Examination Board applies to all study units comprising the student's degree programme.

Article 5.2 Examination
1. In accordance with Section 7.10, subsection 2 of the Higher Education and Research Act, the Bachelor's examination is considered to be complete when the student has passed all study unit exams in the Bachelor's programme;
2. The Examination Board will issue a degree certificate as proof that the student has satisfied all the requirements of the Bachelor's exam once the institutional administration has confirmed that the procedural requirements for issuing the degree certificate have been met. The Examination Board will append a supplement to the degree certificate. The date indicated on the degree certificate (i.e. the date of the examination) is the day on which the student completed the final study unit of his degree programme (Section 7.11 of the Higher Education and Research Act);
3. A student may submit a written request to the Examination Board to postpone the examination, and thus to delay the awarding of the degree certificate. The student should indicate the duration of the postponement in his request. The requested postponement may not exceed 12 months;
4. If the student has requested postponement based on the provisions of paragraph 3, then the date of the examination will be the date on which the Examination Board decides that the student has passed the examination subsequent to the postponement;

Article 5.3 Degree
1. Students who have successfully met all requirements for the Bachelor's examination will be awarded a Bachelor of Science (BSc) degree;
2. The degree conferred is stated on the degree certificate. The student's average mark (GPA) is mentioned on the degree supplement. An annex to the degree supplement indicates how the GPA is calculated.

Article 5.3 Degree certificate
1. The Examination Board will award a degree certificate as evidence that the student has met all of the requirements of the Bachelor's examination. The degree certificate will be signed by the Chair of the Examination Board. If the Chair is absent, one of the members of the Examination Board may also sign the degree certificate;
2. The following information is to be mentioned on the certificate (in accordance with Section 7.11 of the Higher Education and Research Act):

    a.   the student's name and date of birth;

    b.   the name of the institution and the degree programme as stated in the register as referred to in Section 6.3 of the Higher Education and Research Act;

    c.   the date on which the examination was completed;

    d.   the components[8] of the Bachelor's examination;

    e.   If the student has successfully completed an honours programme while on the Bachelor's programme, then this fact will be stated on the degree supplement as an extracurricular programme;

    f.   the degree conferred (in accordance with Section 7.10 (a) of the Higher Education and Research Act);

    g.   where appropriate, the specific qualifications associated with the degree (with due consideration for Section 7.6, subsection 1 of the Higher Education and Research Act);

    h.   the date on which the programme was last accredited or the date on which the programme passed the new programme assessment as referred to in Article 5a.11, paragraph 2;

3.   An International Diploma Supplement is to be appended to the degree certificate (Section 7.11, subsection 4 of the Higher Education and Research Act). This supplement is intended to provide insight into the nature and content of the degree programme to promote the international recognition of the programme, among other aspects. The supplement is to include the following minimum information:

    a.   the name of the programme and the name of the university;

    b.   that the programme was offered at an institution for academic education;

    c.   a description of the programme content; an indication of any specialization and/or minor, if applicable;

    d.   the study load of the programme;

    e.   the modules, the module components and their assessment;

    f.   interim exams passed by the student that are not part of the final examination;

4.   If the Examination Board[9] has awarded a specific distinction (e.g. cum laude) to the student, then this is to be mentioned on the degree certificate;

5.   Students who have successfully completed more than one exam but cannot be awarded a degree certificate as referred to in paragraph 1, will receive, at their own request, a statement prepared by the Examination Board which in any case will state the results of the exams the student has passed (Section 7.11, subsection 5 of the Higher Education and Research Act).

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[8] 'Components' in the Act means the study units of which the Bachelor's examination consists. At the University of Twente these are almost always the modules of which Bachelor's programme consists.

[9] There has long been discussion about the question if the Programme Board or the Examination Board should award the designation 'with distinction'. Both situations exist and minimum conditions / guidelines have been drawn up either in the Examination Board's rules or in the TER itself. a. Many of the faculties consent with the current text. b. A degree programme / faculty may modify the text if they wish. c. An alternative phrasing might be 'If a specific distinction has been awarded to the student, etc.'.

SECTION 6 – STUDENT GUIDANCE AND BINDING RECOMMENDATION

Article 6.1 Study progress overview

1. If needed, the student can request a certified study progress report from the Student Services desk.

Article 6.2 Student guidance

1. The Faculty Board is responsible for student guidance, including informing students of opportunities for academic endeavour within the programme and via extracurricular avenues;
2. Each student is appointed a Study Adviser;
3. The Study Adviser supervises the student and advises him on study-related matters, as well as personal problems that may be affecting the student's studies;
4. If a student wishes to make use of his right to specific supervision or special facilities, they must contact the Study Adviser. The Study Adviser records the agreements made with the student;
5. The following applies to the entitlement to special facilities:
    a. demonstrable circumstances beyond the student's control or extenuating personal circumstances;
    b. if necessary and where possible, dispensation from participation in exams or tests and/or the availability of special facilities for exams and tests. Such dispensation and additional opportunities for tests may only be granted by the Examination Board;
6. An introductory interview will be held with each student before 1 November of the first year of enrolment in the programme;
7. Each student will receive a preliminary student progress evaluation by week 52 at the latest of his first year of enrolment in the programme. This also applies to students in their second year of enrolment in the degree programme whose student progress evaluation has been postponed. This preliminary student progress evaluation is not binding;
8. Each student will receive a second student progress evaluation on the continuation of studies by week 10 at the latest of their first year of enrolment in the programme. This also applies to students in their second year of enrolment in the degree programme whose student progress evaluation has been postponed. This preliminary student progress evaluation is not binding;
9. Students who receive a negative preliminary progress evaluation will be invited for an interview with the Study Advisor to discuss their study methods and review their choice of specialization.

Article 6.3 Binding recommendation

1. Each student receives a written student progress evaluation at the end of the first year of enrolment in the programme about continuing his studies within the programme, notwithstanding Article 6.4. This progress evaluation is based on the student's results. The student may be allowed to continue on the programme, or may be required to leave the programme, with due regard to Articles 6.4 and 6.5;
2. The institutional administration mandates the Programme Board to issue student progress evaluations, as referred to in paragraph 1;
3. The student progress evaluation includes the results of the module components that remain valid the following academic year:
    a. Only the credits from modules and module components in the first year of the programme count toward the threshold for the student progress evaluation;

     b. The exemptions for components of the first year awarded to the student count towards determining the number of credits;

     c. The Programme Board may set down subject-specific requirements which must be met. These requirements are specified in the programme-specific Appendix[10];

4. The student progress evaluation as referred to in paragraph 1 may include a rejection, if the student in the opinion of the Programme Board is not deemed suitable for the degree programme because the student has passed fewer than three modules in which:

     a. the student has passed in total less than 75% of the study load of the first year, or;

     b. the student has passed 75% or more of the study load of the first year but does not meet the programme-specific requirements (as referred to in paragraph 3 (c) of this Article). A student progress evaluation that involves expulsion is referred to as a binding student progress evaluation (BSA);

5. When considering a BSA involving expulsion, the Programme Board will take the student's personal circumstances into account at the student's request. The Programme Board will only take personal circumstances into account that have been reported to the Study Advisor as soon as can reasonably be expected following their onset;

     a. Personal circumstances include illness, physical, sensory or other functional disability or pregnancy of the student involved, extenuating family circumstances, participation in top-level sports or arts and membership of the University Council, Faculty Council, Programme Committee or a Category 3 or 4 board in accordance with the FOBOS Regulations;

     b. In consultation with the academic adviser, the personal circumstances are to be submitted to the Personal Circumstances Committee (CPO) and accompanied by supporting documentation;

     c. The CPO will assess the validity and severity of the personal circumstances. The CPO will report its findings to the Programme Board and the relevant Study Adviser;

     d. The Programme Board will take the CPO's findings into account when assessing the student's request;

6. Before issuing a BSA, the Programme Board must first issue a warning to the student giving him a reasonable term in which to improve the course results, to the Programme Board's satisfaction. In addition, students have the right to a hearing with the Programme Board prior to receiving a BSA (Higher Education and Research Act Section 7.8b, subsection 4);

7. The Programme Board's decision regarding the BSA will make mention of the applicable appeals procedure. Expulsion following a BSA may be appealed within six weeks by lodging an appeal with the Examination Appeals Board;

8. If a student receives a BSA, he/she may not enrol in the same degree programme for a period of three consecutive academic years;

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[10] Subject-specific requirements may not state that <u>all</u> module components of a certain type must be completed. 'The student must pass all mathematics module components from the B1 programme' is not permitted, whereas 'The student must pass three of the four mathematics components from the B1 programme' is permitted.

9. If a student re-enrols in the relevant Bachelor's programme after the period referred to in paragraph 8, this enrolment is designated as a first-year enrolment and the relevant provisions of this section apply in full.

Article 6.4 Discontinuation of the programme

1. The programme is considered to be discontinued if the student stops taking courses or any form of tests for the programme, and where the student:
   a. submits a request with the University of Twente to terminate the enrolment, or;
   b. de-enrols for the programme at the University of Twente, with the student enrolling in another programme at the University of Twente and thus switching to another programme at the University of Twent, or;
   c. continues his studies at another institute of higher education with a proof of tuition fees paid;
2. If in his first year of enrolment for the degree programme a student submits a request through Studielink by 31 January to terminate enrolment and he is de-enrolled before or on 1 February and he does not re-enrol for the same programme in that same academic year, a student progress evaluation as referred to in paragraph 1 of Article 6.3 will not be issued. If this student does re-enrol in the relevant Bachelor's programme, this enrolment is designated as his first-year enrolment;
3. Students who are de-enrolled after 1 February for the degree programme at the University of Twente, will receive a student progress evaluation as referred to in Article 6.3 paragraph 1 from the programme they discontinued.

Article 6.5 Postponement of student progress evaluation

1. The student progress evaluation as referred to in Article 6.3 paragraph 1 may be postponed if:
   a. the student has enrolled in the degree programme on or after 1 October of the relevant academic year and on 31 August at the latest has not met the norm set in Article 6.3, paragraph 3, or;
   b. if personal circumstances preclude an assessment of a student's academic capacities at the end of the first year of enrolment in the degree programme, or;
   c. the student switches from one degree programme at the University of Twente to another on or after 1 October of the first year, whereby the student de-enrols for one programme (discontinuation in the sense of Article 6.4, paragraph 1 under b) and enrols in another programme;
2. If this student, whose progress evaluation as referred to in Article 6.3 (1) has been postponed based on that article, re-enrols in a subsequent academic year in the relevant programme, then a student progress evaluation will be issued at the end of that subsequent academic year. The same norm as set out in Article 6.3 (3) applies to this progress evaluation;
   a. The student whose progress evaluation as referred to in Article 6.3 (1) has been postponed based on Article 6.5 (1)(a), will be notified in writing within 6 weeks of the date of enrolment before which date the programme will issue the final progress evaluation;
   b. The student whose progress evaluation as referred to in Article 6.3 (1) has been postponed based on Article 6.5 (1)(b), will be notified in writing within 6 weeks of the

date of enrolment before which date the programme will issue the final progress evaluation;

c. For students whose progress evaluation as referred to in Article 6.3 (1) has been postponed based on Article 6.5 (1)(c), the end of the second year of enrolment in the relevant programme applies as the new deadline for the final student progress evaluation. The student progress evaluation is issued by the degree programme in which the student is newly enrolled;

3. If a student transfers to another UT degree programme prior to 1 October, then the norm will not be adjusted as referred to in Article 6.3, paragraph 3 and the evaluation will not be postponed based on transfer.

SECTION 7 – STUDYING WITH A FUNCTIONAL IMPAIRMENT

Article 7.1 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 Faculty Board, 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 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 Adviser 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 Board reject 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 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.

SECTION 8 – AMENDMENTS, TRANSITIONAL ARRANGEMENTS, APPEALS AND OBJECTIONS

Article A8.1 Conflicts with the regulations

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

Article A8.2 Administrative errors

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

Article A8.3 Amendments to the regulations

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

Article A8.4 Transitional arrangements

1. In the case of amendments to the Teaching and Examination Regulations, the Faculty Board may decide to put a transitional arrangement in place.
2. Any such transitional arrangement will be published on the degree programme's website.
3. General principles for the transitional arrangement in the case of changes to the curriculum:
   a. Changes to the curriculum are to be announced prior to the academic year in which the changes take effect;
   b. No guarantee can be made that all programme study units that were part of the curriculum when a student enrolled in a programme will continue to be part of the curriculum. The final Bachelor's exam is to be based on the curriculum most recently adopted by the Faculty Board;
4. The transitional arrangement will always include:
   a. the study units that are equivalent to study units or components of study units from the current curriculum as indicated in the programme-specific Appendix;
   b. an indication that if a teaching unit that does not involve a practical is dropped from a programme, then students are to have at least two opportunities in the following year to take a written or oral exam or to undergo another form of assessment;
   c. an indication that if a study unit with practical exercises is dropped from the programme and there is no opportunity in the subsequent academic year to complete the practical exercise, then at least one study unit will be designated that may be completed as a substitute for the study unit that has been dropped;
   d. the period of validity of the transitional arrangement;

5. The transitional arrangement must be approved by the Examination Board with regard to the provisions of paragraphs 4a and 4c;
6. In exceptional cases and to the student's benefit, the Examination Board may deviate from the prescribed number of opportunities to sit exams related to study units that have been dropped from the curriculum.

Article 8.5 Assessment of the Teaching and Examination Regulations

1. The Faculty Board is responsible for the regular assessment of the Teaching and Examination Regulations and is to take into account the time involved for the student for the purposes of monitoring and adjusting the study load, if necessary;
2. Based on Section 9.18 of the Higher Education and Research Act, the Programme Committee has a partial right of approval of and a partial right to be consulted on the Teaching and Examination Regulations;
3. The Programme Committee is responsible for the annual assessment of the manner in which the Teaching and Examination Regulations are implemented.

Article 8.6 Appeal and objections

An objection against a decision by the Examination Board or by an examiner or an appeal against a decision by the Faculty Board based on these Regulations 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.

Article 8.7 Hardship clause

The Examination Board or the Programme Board may allow derogation from the provisions of these Regulations in the event of demonstrably compelling unreasonableness or unfairness. This depends on which body (Examination Board or Programme Board) is authorized or has the duty according to this regulation to take a decision on or make an exception to a provision in this regulation.

Article 8.8 Notification

The Teaching and Examination Regulations and the Examination Board's rules and guidelines are to be published on the degree programme's website.

Article 8.9 Entry into force

These regulations enter into force on 1 September 2019 and replace the regulations dated 1 September 2018.

Adopted by the faculty board of the Faculty of Electrical Engineering, Mathematics & Computer Science, having regard to Section 9.5, 9.15, first subsection under a, Section 7.13, first and second subsection, Sections 9.38, under b, and 9.18, first subsection under a, and Section 7.59 of the Higher Education and Research Act, in due consideration of the recommendations of the Programme Committee, and following approval or advice from the Faculty Council.

Enschede, August 31, 2019

SECTION B: PROGRAMME-SPECIFIC SECTION

BACHELOR APPLIED MATHEMATICS (B-AM)

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 university section, includes provisions that may apply for all EEMCS Bachelor's degree programmes. Section B contains the provisions that are specific to the particular degree programme, in this case the Bachelor's programme in Applied Mathematics.

SECTION B – PROGRAMME-SPECIFIC SECTION APPLIED MATHEMATICS

1. CONTENTS AND STRUCTURE OF THE PROGRAMME[11]

(including the Programme Intended Learning Outcomes (PILOs))

a. The content of the programme and the associated examinations

Students who started the programme on September 1st 2018 or later will pass the final Bachelor's degree audit for Applied Mathematics once they have passed all study units as listed in Table 0, Table 0 and Table 0 in the Appendix.

Students who started the programme between September 2013 and September 2017 will pass the final Bachelor's degree audit for Applied Mathematics once they have passed all study units as listed in Table 0, Table 0 and Table 0 in the Appendix.

Students who started the programme prior to September 1st 2013 will pass the final Bachelor's degree audit for Applied Mathematics once they have passed all study units as listed in Table 0, Table 0 and Table 0 in the Appendix. These study units are no longer offered, so these students will have to make use of the transitional arrangements in Section   of this Annex.

Table 2 in Annex 0 contains a curriculum that has been adjusted for the combined final degree audit for Applied Mathematics and Applied Physics. Annex 0 contains specific rules and regulations of the double degree Applied Mathematics and Applied Physics.

Table 1 in Annex 0 to this Annex contains a curriculum that has been adjusted for the combined final degree audit for Applied Mathematics and Technical Computer Science. Annex 0 contains specific rules and regulations of the double degree Applied Mathematics and Technical Computer Science.

b. The content of the specialisations offered by the programme

The programme offers a single specialisation. The content of this specialisation is listed in the Appendix to this Annex.

c. The Programme Intended Learning Outcomes

The programme covers four fields of competence:

a. domain expertise;

b. research and modelling skills;

c. professional skills;

d. academic reflection.

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[11] The letters associated with the various paragraphs refer to the corresponding letters in Article 7.13, paragraph 2 of the Higher Education and Research Act (WHW).

These fields of competence are specified further in eleven PILOs:

1. The graduate has thorough knowledge of mathematical theories in the areas of algebra, analysis, statistics, stochastics, and discrete mathematics, and an understanding of the application of these theories in technology, health care and business administration (associated with domain expertise).

2. The graduate can deal with abstraction, is capable of formal reasoning and can construct mathematical proofs (associated with domain expertise).

3. The graduate can use various research methods to answer research questions (associated with research and modelling skills).

4. The graduate can design and analyse mathematical models for problems of a multidisciplinary nature and assess their usefulness in practical situations (associated with research and modelling skills).

5. The graduate is proficient in using a computer to address the increasing size and complexity of mathematical problems. Computer algebra, numerical methods and simulations are key applications in this regard (associated with research and modelling skills).

6. The graduate is information literate. The graduate is adept at making the most of the library's resources, including advanced search methods in modern library networks (associated with research and modelling skills and professional skills).

7. The graduate is proficient in oral and written communication, and is able to work effectively in a team. The graduate is capable of continuously developing collaborative skills.

8. The graduate has insight into the position of the field of applied mathematics in society and has acquired a basic understanding of the philosophy of science (associated with academic reflection).

9. The graduate can shape his/her learning process, his/her competencies and develop his/her professional identity, by consciously choosing, motivating and completing study units that match personal capacities, skills, and motivation.

10. The graduate is aware of the opportunities for further specialisation in a Master's programme or for finding gainful employment (associated with academic reflection).

11. The graduate is interculturally competent.

d. Structure of practicals

Practicals are not subject to any specific provisions with regard to their structure.

e. Study load of the programme and of each of the study units in the programme

The study load of the study units is indicated in Table 0, Table 0, and Table 0.

f. Specific rules regarding Binding Recommendation (BSA)

Students pursuing a double degree in Applied Physics and Applied Mathematics are subject to an additional BSA provision: the BSA may involve exclusion from the Applied Mathematics programme if the student fails to earn 15 or more EC from the AM- study units associated with the double degree programme. See Table 2 in Annex 0 for the specific study units.

Students pursuing a double degree in Technical Computer Science and Applied Mathematics are subject to an additional BSA provision: the BSA may involve exclusion from the Applied Mathematics programme if the student fails to earn 15 or more EC from the AM-study units associated with the double degree programme. See Table 1 in Annex 0 for the specific study units.

g. Study load of the Master's programme
Not applicable.

h. The sequence of examinations
The sequence of examinations with relation to academic prerequisites is indicated in the Appendix of this Annex.

i. Programme format
The programme is offered on a full-time basis.

j. Sequence and periods for examinations and degree audits
The schedules indicate the tests that make up an examination. Degree audits are not restricted to specific periods.

k. Not applicable

l. Teaching method and assessment and examination formats
The teaching method for the various study units is indicated in the Appendix of this Annex. The following abbreviations are used:
Lec   Lecture,
Tu   Tutorial,
PR   Practical,
COL   Colstruction,
SS   Self Study.

The examination format for the study units is indicated in the Appendix of this Annex. The following abbreviations are used:
W   Written examination,
Or   Oral examination,
O   One or more assignments: the student submits work (assignments, reports, essays, other documents) and the examiner assesses it without the student being present,
P   Practical assignment: the student creates and submits a product that can be activated and subsequently assessed on behaviour and/or function and/or usability (e.g. a working program or a functioning prototype),
Pj   Project: the student participates in a number of group activities. The student will be assessed both on his individual contribution to the activities and the group's products (report, presentation, program),
Ps   Presentation: the student gives a presentation to the examiner and a group of interested people, generally fellow students.

These codes indicate the nature of assessment, without prescribing any rules for assessment.

m. See Guideline, Article 7.1.

n. See Guideline, Article 4.5.

o. See Guideline, Article 4.6.

p. See Guideline, Article 4.8.

q. See Guideline, Article 4.8.3.

r. See Guideline, Article 3.4.

s. Admission standards for examinations and practicals
The admission standards are listed in the Appendix of this Annex.

t. Required participation in a practical exercise as a component of an examination
The 'form of assessment' column in Table 0, Table 0, and Table 0 in the Appendix to this Annex shows whether participation is required in a practical exercise as a component of an examination.

u. See Guideline, Articles 6.1 and 6.2.

v. Not applicable

2. BRIEF DESCRIPTION OF MODULES 1-8, 11, 12

For each module we mention the *module intended learning outcomes.* For the more detailed intended learning outcomes for the module parts we refer to Osiris and the Learning Management System.

2.1 Module 1. Structures and Models

This module is the first acquaintance with studying Applied Mathematics. The ingredients are: abstract and formal reasoning (Calculus I, Prooflab I, Linear Structures I), programming and modelling (project with MATLAB) and calculus (Calculus I). None of the ingredients can be missed without significantly sacrificing one or more aspects of Applied Mathematics. Therefore, the core of the module coincides with the module itself.

The intended learning outcomes are: After successful completion of the module, the student:

- is aware of what it means to study applied mathematics at an academic level.
- knows and can apply the very basics of mathematics and modelling in about every subsequent module.

2.2 Module 2. Mathematical Proof Techniques

This module is primarily about abstraction and formal reasoning, studied from different perspectives: Linear Structures II, Analysis and Linear Optimization. A second binding factor is the project: Prooflab II. Furthermore, Calculus II and Analysis are strongly connected. Therefore, the core of the module coincides with the module itself.

The intended learning outcomes are: After successful completion of the module the student:

- is proficient in abstract and formal reasoning in basis mathematics.
- has an overview of proof techniques.
- is able to assess and understand complex proofs and is able to derive proofs in a systematic way.

2.3 Module 3. Fields and Electromagnetism

This module is centred around vector calculus and its applications in physics. The module is a joint effort of Applied Mathematics and Applied Physics. In the project students build electromagnetic devices from a historical perspective using modern materials. The module has a strong cohesion as almost all parts are intertwined. Therefore, the core of the module consists of all subjects except for the Presentation Skills. In presentation skills the students gain tools for presenting mathematical topics.

The intended learning outcomes are: After successful completion of the module the student:

- is able to use vector calculus in basic electromagnetic problems, both on a theoretical and a practical level.
- is able to concisely convey mathematical concepts using presentation skills.

2.4 Module 4. Signals and Uncertainty

This module has two building blocks. One is an introduction in the mathematical foundation of probability theory and the other is the introduction to frequency domain based tools to analyse signals as well as differential equations.

These building blocks are connected through the project. Collaboration in relatively large groups is a focus point of the project. The project is chosen such that both core topics play a crucial role. The goal of the project is to make a prediction of signals where the modelling requires frequency domain tools but the accuracy of the prediction can only be assessed using probability theory. For the project it is important that the student follows the module as a whole.

The intended learning outcomes are: After successful completion of the module the student:

- has knowledge of and insight into probability models, and is able to analyse them and interpret the outcomes.
- has knowledge of and insight into frequency domain analysis and ability to understand both signals and differential equations better using frequency domain tools.
- is able to analyse large amounts of data, using, in particular, frequency domain tools and, working together, obtain predictions and understand the accuracy of those predictions.

2.5 Module 5. Statistics and Analysis

The core of this module is formed by Mathematical Statistics and the project. The project deals with regression analysis. There are two standalone subjects in the module: the second part of Analysis and Reflection. Analysis II is part of the learning line in Analysis and Linear Structures. Reflection is part of the Reflection learning line.

The intended learning outcomes are: After successful completion of the module, the student:

- is able to derive mathematically the standard techniques for statistical data analysis and apply them properly.
- is able to work with infinite series of real numbers and functions, with metric spaces and with differentiability of functions in *n*-dimensional Euclidean spaces.

2.6 Module 6. Dynamical Systems

This module is about dynamic phenomena, their mathematical representations, computational aspects and applications in control problems. The subjects of the module are Ordinary Differential Equations (ODEs), Systems & Control and Numerical Analysis. For the project, students model a human movement and study it regarding stability and control, applying the material from the subjects. As the model has to be an ODE, this renders the core of the module to be the module itself.

The intended learning outcomes are: After successful completion of the module, the student

- is able to analyse and control solutions of systems of ODEs.
- can model a physical system with ODEs.
- is able to use various numerical and analytical techniques to study the model.

2.7 Module 7. Discrete Structures and Efficient Algorithms

This module deals with discrete problems as encountered in various practical problems and solutions thereof using efficient algorithms. The module is a joint effort of Applied Mathematics and Technical Computer Science. Central in the module is a project about graph isomorphisms. The theoretical parts that are used and needed in this project are Discrete Structures & Algorithms and Algebra & Finite Automata. The module also contains a training in Python. The core of the module coincides with the module itself.

The intended learning outcomes are: After successful completion of the module the student:

- has knowledge of and insight into discrete structures as studied in mathematics and computer science.
- is able to apply the techniques to analyse these structures and to solve relevant problems through appropriate algorithms.
- is able to deduce the complexity and efficiency of such algorithms.

2.8 Module 8. Modelling and Analysis of Stochastic Processes for Math

This module is about modelling situations with uncertainty using stochastic processes. The module is a joint effort of Applied Mathematics, Industrial Engineering and Management and Civil Engineering. The theoretical parts are closely connected (Stochastic Models being focused on applicability, while Markov Chains is more in depth), and Project Stochastic Models is closely related to Stochastic Models itself. Furthermore, all three projects are about the same context, the final project serving to integrate all acquired knowledge. Therefore, the core of the module coincides with the module itself.

The intended learning outcomes are: After successful completion of the module the student:

- knows how to recognise when a situation or system should be modelled using stochastic models.
- is able to select the most appropriate models.
- has knowledge of and insight into methods to analyse and/or simulate such models.
- is able to interpret the outcomes of the analysis or simulation.

2.9 Modules 11 and 12

The last semester of the programme contains the Reflection on Mathematical Research, Bachelor's Assignment, and Electives. Reflection on Mathematical Research II is the preparation of the actual Bachelor's Assignment. These parts are inseparable. Reflection on Mathematical Research I forms prior knowledge for the Bachelor's Assignment. The Electives and Complex Function Theory do not have a direct relation to the other parts.

3. SPECIFIC CHARACTERISTICS OF THE PROGRAMME

3.1 Language of tuition
English is the language of tuition - the examinations are administered in English. Exam and test questions have to be answered in English. Answers in any other language will be ignored and therefore not marked.

3.2 Transitional arrangement for cohorts 2015 and earlier
Students from cohort 2015 or earlier are entitled to language support.

3.3 Educational prerequisites
The following additional provisions apply with regard to the educational prerequisites in Article 2.1 of the general section of these Teaching and Examination Regulations.

Students with a first-year certificate from a technology programme at a university of applied sciences may be admitted to the Bachelor's programme in Applied Mathematics if they satisfy the following conditions:

- Colloquium doctum examinations for both Mathematics B and English
- Taking part in an Applied Mathematics matching activity. The programme's recommendation following the matching activity is binding.

3.4 Registration of results
- Exemptions for tests are indicated with the code 'VR'. They are assigned a numerical value of 6 for weighting purposes. Exemptions for modules are also indicated with the code 'VR', but they are not assigned a numerical value.
- The student thus has the option of requesting an exemption with the consequence that the exemption be assigned a value of 6 for weighting purposes, or the student may decide to take the test and possibly earn a higher mark.
- The results of complete (V) and incomplete (NVD) have no numerical values.
- The highest mark achieved counts. This also applies to tests.

3.5 Pass/Fail regulation
Students who meet the following requirements will pass the Bachelor's final degree audit for the Applied Mathematics programme:

- The student has received an assessment for all study units of the Bachelor's final degree audit;
- The student's marks are 6 or higher for all study units;

In all other cases, the student will not pass the final degree audit.

3.6 Cum Laude (with distinction)
A student may pass the Bachelor's final degree audit with distinction (cum laude). As a guideline for determining whether to award a degree with distinction, all of the following conditions should be met:

1. The student passes the Bachelor's final degree audit within four years after initial enrolment (performance requirement);
2. The student's average mark is 8.0 or higher (non-numeric assessments not included). This is a weighted average based on the corresponding number of ECs per study unit.

3. Mark 6 for at most one study unit.
4. The Bachelor's Assignment receives a mark of 8 or higher.

In exceptional cases and at the student's request, the Examination Board may award the distinction of cum laude if the student has met all requirements with the exception of the performance requirement, due to extenuating circumstances. These circumstances may involve delays recognised and provided for by the institution. It should be noted that the distinction of cum laude is never awarded automatically.

3.7 Period of validity of exam results

The following applies to Modules 1, 2,4, 6, 7 and 8:

- Test results are only valid in the academic year in which they are obtained.
- The following applies to Module 3:
- Presentation skills pass grade remains valid indefinitely.

The following applies to Module 5:

- If the results for Mathematical Statistics and Project are both a pass, then these results remain valid indefinitely. Pass grades for Analysis II and Prooflab Revisited remain valid indefinitely.
- For Module 9 and 10, the minor, the rules of the organising programme apply.
- The following applies to Modules 11 and 12:
- The test result for Reflection on Mathematical Research I, the Electives, and Complex Function Theory, see Table 0, remain valid indefinitely. The results of Reflection on Mathematical Research II and Bachelor's Assignment remain valid indefinitely only if they both are a pass.

3.8 BSA rules

The programme uses the Osiris BSA module in its entirety.

- The binding recommendations (BSA) are issued based on the results of the modules. At the conclusion of Module 1, the recommendation may be positive, negative or neutral.
- There are two types of official recommendations: an interim recommendation and a final recommendation.
- These official recommendations are issued by the Programme Board.
- The letters containing the binding recommendations are based on the 'Guideline for Teaching and Examination Regulations for Bachelor's Programmes' and the recommendations referred to above.
- The letters containing the binding recommendations are sent digitally.
- A digital signature is automatically appended to the binding recommendation letters.

3.9 Compensation scheme

The Compensation scheme applies to a number of clusters as defined in this regulation. These clusters may be confined to individual modules, but they may also extend over multiple modules.

Cluster I: Linear Structures I from Module 1 (201800135), Linear Structures II and Analysis I from Module 2 (201800136)

Cluster II: Module 4 (201800138)

Cluster III: Module 5 (201800139)

Cluster IV: Module 6 (201500103)

Cluster V: Module 7 (201800141)

Cluster VI: Module 8 (201400434)

In each cluster, a student must:

- Achieve a weighted average mark of at least 5.5;
- Have no more than one mark lower than 5.5;
- Have no marks lower than 4.5;
- Achieve a weighted average mark of at least 5.5 for both modules in the case of compensation in cluster I;
- Meet the condition that the weighted average mark of Analysis I and Analysis II is at least 5.5 and the weighted average mark of Probability Theory and Mathematical Statistics is at least a 5.5 in the case of compensation in cluster III.

If the Compensation scheme is applied to a module, the final mark for that module is the weighted average of the components calculated according to the formula used if all components have been passed with a mark of at least 5.5.

The Compensation scheme may be applied once in the first academic year of the Bachelor's programme.

The Compensation scheme may be applied once in the second academic year of the Bachelor's programme.

The Compensation scheme may only be invoked for modules in which all components are completed in the course of a single academic year.

3.10 Study units available to students as Electives

Table 0 shows the electives available to students who joined the programme on or after September 1st 2013.

Table 0, Table 0 and Table 0 show the electives available to students who joined the programme prior to September 1st 2013. Exams are no longer held for the electives in Tables 0, 0 and 0.

The Minor profile is in Table 0. See Paragraph 0 for more information.

3.11 Minor profile

Students may choose from among the minors offered by the University of Twente, or they may compose their own proposal and submit it to the Examination Board for approval. The proposal for the minor must meet the following conditions:

- The minor's academic level must be assured (to be assessed by the Examination Board).
- The minor's components are to be cohesive.

3.12   Secondary school teaching certificate

Students who pass the 30-EC minor *Leren Lesgeven*[12] receive, alongside a Bachelor's degree in Applied Mathematics, a mathematics teaching qualification for the initial years of senior general secondary education (HAVO), pre-university education (VWO), and the theoretical learning pathway of pre-vocational secondary education (VMBO) in the Netherlands.

3.13   Bachelor's Assignment confidentiality

Reports of Bachelor's Assignments are public documents except in the cases listed below.

The Programme Board may deem a report to be confidential for a specific period based on a detailed request:

   a.   The first supervisor must submit a request to the Programme Board prior to the start of the final assignment.
   b.   The confidential report must be accessible/available to the committee responsible for assessing the Bachelor's Assignment, the Programme Board, and representatives of bodies that have a statutory duty of overseeing the quality of the assessment or the programme as a whole.
   c.   The parties mentioned above are required to respect confidentiality with regard to the report.

3.14   Double Degree programmes

The programme offers two double degrees: Applied Mathematics combined with Applied Physics, and Applied Mathematics combined with Technical Computer Science.

A tailored curriculum applies to students pursuing a double degree in Applied Physics and Applied Mathematics, as detailed in Annex 0, Table 2.

The table lists the components of the study units. In each quarter, the components listed under Applied Mathematics form a cohesive study unit, as do the components under Applied Physics. See Annex 0 for the specific rules and regulations of the double degree Applied Mathematics and Applied Physics.

A tailored curriculum applies to students pursuing a double degree in Technical Computer Science and Applied Mathematics, as detailed in Annex 0**,** Table 1. The table lists the components of the study units. In each quarter, the components listed under Applied Mathematics form a cohesive study unit, as do the components under Technical Computer Science. See Annex 0 for the specific rules and regulations of the double degree Applied Mathematics and Technical Computer Science.

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[12] The minor *Leren Lesgeven* is only available in Dutch.

3.15   Evaluation of education

To monitor and to improve the quality of teaching, the AM BSc programme uses information about the students' learning experiences. This information is obtained from:

- Internal evaluations
- SEQ (Student Experience Questionnaire)
- Panel discussions with students and teachers
- External sources
- National Student Survey (NSE)
- National Alumni Survey
- International Student Barometer

4. TRANSITIONAL ARRANGEMENTS

4.1 Transitional arrangements for students of cohorts 2009 and earlier

A student who started the programme in September 1st 2009 and earlier and who passed the course Random Signals and Systems (191571080) may use this course as the elective course Random Signals and Filtering (201200135).

4.2 Transitional arrangements for students of cohorts 2012 and earlier

4.2.1 Bachelor's Assignment

The Bachelor's Assignment is an individual assignment combined with Reflection on Mathematical Research. Together, this amounts to 17 EC. Students of cohort 2012 cohort or earlier may submit a substantiated request to the Examination Board if they wish to deviate from the current structure involving an assignment combined with Reflection on Mathematical Research.

4.2.2 Minor

Students in the 2012 cohort or earlier are allowed to take a minor of a study load between 15 and 30 EC.

4.2.3 Discontinued courses

Students who still need to complete courses for which exams are no longer offered and for which there is no transitional arrangement provided, must contact the Study Advisor. An attempt will then be made to find study units from the current curriculum that cover the missing learning goals. The replacement has to be approved by the Examination Board.

4.2.4 Bachelor's degree audit

Students who started the programme on September 1st 2012 or earlier will pass the Bachelor's degree audit once they have satisfied the following conditions:

- All study units from the first year of a Bachelor's curriculum from before September 1st 2013 have been completed with a mark of 5 or higher and no more than one 5;
- All study units from the second and third year of a Bachelor's curriculum from before September 1st 2013 have been completed with a mark of 5 or higher and no more than one 5;
- The average of all marks is greater than or equal to 6;
- The mark for the Bachelor's Assignment is 6 or higher.

4.3 Transitional arrangements for students of cohort 2018 and earlier

1. A student who has not completed Module 1, has to follow the current version of Module 1 and the Intercultural Communicator workshop in Module 5.
2. A student of cohort 2017 or a previous academic year, who has not completed Module 2, has to follow the current version of Module 2.
3. A student of cohort 2017 or a previous academic year, who has not completed the module Fields and Electromagnetism, has to follow the current version of Module 3.
4. A student of cohort 2017 or a previous academic year, who has not completed the module Signals and Uncertainty, has to follow the current version of Module 4.

APPENDIX I: BACHELOR PROGRAMME AM

Table 1[13]: the first academic year

Components	Study load in EC	Teaching method	Form of assessment
201800135 M1 Structures and Models			
Calculus I (including Prooflab I)	4 EC	Lec +Tu	W+O
Linear Structures I	6 EC	Lec +Tu	W
Project: Programming and Modelling	5 EC	Lec + PR	Pj+P
& Intercultural communicator workshop (practice)			
201800136 M2 Mathematical Proof Techniques			
Calculus II	4 EC	Lec +Tu	W
Linear Structures II	3 EC	Lec +Tu	W
Analysis I	3 EC	Lec +Tu	W
Linear Optimization	3 EC	Lec +Tu	W
Prooflab II	2 EC	SS + Tu	O
201800137 M3 Fields and Electromagnetism			
Vector Calculus	2 EC	Lec +Tu	W
Prooflab III	1 EC	Lec +Tu	O
Electromagnetism	5 EC	Lec +Tu	W
Mathematica	1 EC	PR	P
Analytical Programming	1 EC	PR	P
Presentation Skills	2 EC	PR	Ps
Project	3 EC	Pj	P
201800138 M4 Signals and Uncertainty			
Signals & Transforms Probability Theory	5 EC	Lec + Tu	W W
Project	5 EC	Lec + Tu	Pj+P
	5 EC	Lec + PR	
Entire academic year	**60**		

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[13] Article 1.1 explains the abbreviations used in the columns 'teaching method' and 'form of assessment'.

Table 2: the second academic year

Components:	Study load in EC	Teaching method	Form of assessment
201800139 M5 Statistics and Analysis Mathematical Statistics Analysis II Project Prooflab Revisited Intercultural communicator workshop (Theory)	6 EC 5 EC 2 EC 2 EC	Lec+Tu Lec+Tu Lec+PR Lec	W W Pr Pj + Ps
201500103 M6 Dynamical Systems Differential Equations & Numerical Methods Systems Theory and Numerical Methods Numerical Methods practical Project	4,5 EC 4,5 EC 2,25 EC 3,75 EC	Lec+Tu Lec+Tu Lec+PR PR	W W W+P Pj
201800141 M7 Discrete Structures & Efficient Algorithms Algorithms and Data Structures + Discrete Mathematics Languages & Machines Algebra Project	5 EC 3,5 EC 3,5 EC 3 EC	Lec+Tu Lec+Tu Lec+Tu PR	W W W Pj
201400434 M8 Modelling & Analysis of Stochastic Processes for Math Stochastic Models Stochastic Models Project Markov Chains Stochastic Simulation Project Multidisciplinary Project	5 EC 1,5 EC 2,5 EC 4 EC 2 EC	Lec+Tu PR Lec+Tu PR PR	W Pj W Pj+P Pj
Entire academic year	**60**		

Table 3[14]: the third academic year

Components	Study load in EC	Teaching method	Form of assessment	Sequence requirements
Minor profile M9 + M10	**30 EC**			1
201500379 M11 Bachelor's Assignment &				2
Electives:				
Reflection on Mathematical Research I	5 EC	Lec	O	
Electives: Two of the following four components must be included in the student's exam programme:				
Graph Theory	5 EC	Lec+Tu	W	
Mathematical Optimization	5 EC	Lec+Tu	W	
Random Signals & Filtering	5 EC	Lec	W	
Introduction to PDE	5 EC	Lec+Tu	W	
201500380 M12 Finalising Thesis –				2
Bachelor's Assignment				
Complex Function Theory	3 EC	Lec+Tu	W O	
Reflection on Mathematical Research II	2 EC	Lec PR	P+Ps	
Bachelor's Thesis	10 EC			
Entire academic year	**60**			

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[14] Article 1.l explains the abbreviations used in the columns 'teaching method' and 'form of assessment'. Numbers in the column 'sequence requirements' refer to the text following the table.

Sequence requirement 1 (see table above): students may only participate in this study unit once they have gained at least 75 ECs.

Sequence requirement 2 (see table above): students may participate in this study unit once they have completed the first eight modules of the Applied Mathematics bachelor's programme. Students who have almost completed the first eight modules, may register for the electives in Module 11 and Complex Function Theory in Module 12 after approval by the AM Examination Committee.

Table 4[15]: the first academic year for cohorts 2013 until 2017

Components	Study load in EC	Teaching method	Form of assessment
201700118 Structures and Models Mathematics A + β1 Linear Structures I Programming and Modelling Includes: Intercultural Communicator workshop	4 EC 6 EC 5 EC	Lec+Tu Lec+Tu Lec+PR	W W Pj+P
201700140 Mathematical Proof Tehcniques Mathematics β2 Linear Structures II Analysis Linear Optimization Prooflab	3 EC 3 EC 3 EC 2 EC 4 EC	Lec+Tu Lec+Tu Lec+Tu Lec+Tu PR	W W W W O
201300182 Signals and Uncertainty Signals & Transforms Probability Theory Project Includes: Intercultural Team workshop	5 EC 5 EC 5 EC	Lec+Tu Lec+Tu PR	W W Pj
201400535 Fields and Electromagnetism Vector Calculus Electromagnetism Project	5 EC 5 EC 5 EC	Lec+Tu Lec+Tu Lec+PR	W W Pj+P
Entire academic year	**60**		

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[15] Article 1.1 explains the abbreviations used in the columns 'teaching method' and 'form of assessment'.

Table 5[16]: the second academic year for cohorts 2013 until 2017

Components	Study load in EC	Teaching method	Form of assessment
201400218 Statistics and Analysis Mathematical Statistics Analysis II Presentation Skills Project	6 EC 5 EC 2 EC 2 EC	Lec+Tu Lec+Tu Lec+PR PR	W W Pr Pj
201500103 Dynamical Systems Differential Equations & Numerical Methods Systems Theory and Numerical Methods Numerical Methods practical Project	4,5 EC 4,5 EC 2,25 EC 3,75 EC	Lec+Tu Lec+Tu Lec+PR PR	W W W+P Pj
201600270 Discrete Structures & Efficient Algorithms Discrete Structures & Algorithms Algebra & Finite Automata Research project: Similarity	5 EC 6,5 EC 3,5 EC	Lec+Tu Lec+Tu PR	W W Pj
201400434 Modelling & Analysis of Stochastic Processes for Math Stochastic Models Stochastic Models Project Markov Chains Stochastic Simulation Project Multidisciplinary Project	5 EC 1,5 EC 2,5 EC 4 EC 2 EC	Lec+Tu W PR Lec+Tu PR PR	Pj W Pj+P Pj
Entire academic year	**60**		

Table 6[17]: the third academic year for cohorts 2013 until 2017

Components:	Study load in EC	Teaching method	Form of assessment	Sequence requirements
Minor profile	**30**			1
201500379 Bachelor's Assignment prep Reflection on Mathematical Research I	5 EC	Lec	O	2
Two of the following four components must be included in the student's exam programme: Graph Theory Mathematical Optimization Random Signals and Filtering Introduction to PDE	10 EC 5 EC 5 EC 5 EC 5 EC	Lec+Tu Lec+Tu Lec Lec+Tu	W W W W	
201500380 Bachelor's Assignment Complex Function Theory Reflection on Mathematical Research II Bachelor's thesis	3 EC 2 EC 10 EC	Lec+Tu Lec PR	W O P+Ps	2
Entire academic year	**60**			

With reference to sequence requirement 1 (see table above): students may only participate in this study unit once they have gained at least 75 EC.

With reference to sequence requirement 2 (see table above): students may only participate in this study unit once they have passed the first eight modules of the Applied Mathematics programme.

Table 7[18]: the first academic year for cohorts starting prior to September 1st 2013

Components:	Study load in EC	Form of assessment
201100103 Calculus	5 EC	W+P
201100104 Vector Calculus	4 EC	W+P
201100100 Linear Structures I	5 EC	W
201100101 Linear Structures II	5 EC	W
191521611 Discrete Mathematics I	4 EC	W
191521631 Discrete Mathematics II	4 EC	W
191530370 Probability	5 EC	W
201100102 Analysis I	5 EC	W
191560123 Ordinary Differential Equations	4 EC	W
191580751 Deterministic Models in the OR	4 EC	W
191521501 Mathematical Modelling I	5 EC	Pj+O
191540160 Algorithms and Programming I	2 EC	P
194113000 Great minds in the history of science	3 EC	W or O
Elective: ***191403021 Dynamics*** ***191580612 Introduction to Mathematical Economics***	5 EC	W W+P
Entire academic year	**60**	

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[18] Article 1.l explains the abbreviations used in the columns 'teaching method' and 'form of assessment'.

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Table 8[19]: the second academic year for cohorts starting prior to September 1st 2013

Components:	Study load in EC	Teaching method	Form of assessment
201100109 Signals and Transforms	5 EC	Lec +Tu+PR	W
191515603 Intr. to investment theory	5 EC	Lec+Tu	W
191530382 Mathematical Statistics	5 EC	Lec+Tu	W
191530651 Markov Chains	5 EC	COL	W
191540270 Numerical Math. and Modelling	5 EC	Lec+Tu+PR	W+P
191505001 Presenting a mathematical topic	2 EC	Ps	Pr
191540170 Algorithms and Programming II	3 EC	COL + PR	P
191560561 Intro to mathematical systems theory	5 EC	Lec+Tu+PR	W+P
191505271 Mathematical Modelling II	5 EC	Lec+PR	Pj+O
191521400 Analysis II	5 EC	Lec+Tu	W
191511410 Algebra and security	5 EC	Lec+Tu	W
Elective: *191403033 Dyn. Modelling and Simulation* *191530881 Stochastic models in OM*	5 EC	Lec+PR Lec+Tu	W+P W
Elective: *191403051 Electricity and Magnetism* *192111801 Basic models in computer science*	5 EC	Lec+Tu Lec+Tu+PR	W W+P
Entire academic year	**60**		

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[19] Article 1.l explains the abbreviations used in the columns 'teaching method' and 'form of assessment'.

Table 9[20]: the third academic year for cohorts starting prior to September 1st 2013.

Components:	Study load in EC	Teaching method	Form of assessment
191530821 Stochastic Simulation Project	5 EC	Lec	P+Or
Elective: **191561620 Optimal control** **201200135 Random Signals and Filtering**	5 EC	Lec Lec	W W
Elective: **191520751 Graph Theory** **191550105 Theory of Partial Differential Equations**	5 EC	Lec+Tu Lec+Tu	W W
191530440 Regression and ANOVA	5 EC	Lec+PR	W+P
191520252 Complex Function Theory	5 EC	Lec+Tu	W
191580251 Mathematical Programming	5 EC	Lec+Tu+PR	W or Or
191599220 Bachelor's Assignment	10 EC		Pj+O
Minor	20 EC		
Entire academic year	**60**		

Requirements for the Bachelor's Assignment:
A student may only participate in this study unit once he has gained his first-year certificate and at least 60 EC from the second and third years of the Bachelor's curriculum, excluding the minor. Furthermore, the student must have completed the subjects listed as prerequisites for the relevant assignments, and he must have passed Mathematical Modelling II.

Requirements for the Minor:
At a specific date, to be announced in advance, the student must have gained at least 80 EC. The credit total includes the results of examinations from the fourth quarter (or directly subsequent to the fourth quarter), whereas results of examinations during the summer break will not be included. The Examination Board may grant dispensation from the 80-credit requirement in individual cases.

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[20] Article 1.I explains the abbreviations used in the columns 'teaching method' and 'form of assessment'.

ANNEX TO THE TEACHING AND EXAMINATION REGULATIONS FOR THE DOUBLE DEGREE PROGRAMME APPLIED MATHEMATICS AND APPLIED PHYSICS

This annex contains the following paragraphs:

1. Double Degree Programme
2. Curriculum Study programme AM - AP
3. Transitional arrangements
4. Safety
5. Minor and Bachelor's Assignment
6. Binding Recommendation

1. Double Degree Programme

Students can choose to follow a double degree programme. The studying requirements are based on the Rules of the Examination Board AM and the AP Examination Board[21].

2. Curriculum

The tailored programme for the double degree programme for cohort 2018 and later is summarised below:

First academic year (79 EC)		
	***Applied Mathematics** components*	***Applied Physics** components*
Quartile 1 *(21 EC)*	Linear Structures I (6 EC) Calculus I including Prooflab I (4 EC)	Dynamics & Relativity (5 EC) Experimentation 1 (1,5 EC) Programming & data processing 1 (2 EC) Project (2,5 EC)
Quartile 2 *(20 EC)*	Calculus II (4 EC) Linear Structures II (3 EC) Analysis I (3 EC) Linear Optimization (3 EC) Prooflab II (2 EC)	Thermodynamics (4 EC) Programming & data processing 2 (1 EC)
Quartile 3 *(18 EC)*	Prooflab III (1 EC) Presentation skills (2 EC)	Electromagnetism (5 EC) Vector Calculus (2 EC) Instrumentation (4 EC) Project (3 EC) Analytical programming (1 EC)
Quartile 4 *(20 EC)*	Probability Theory (5 EC) Signals and Transforms (5 EC) Project (5 EC)	Quantum Matter (5 EC)

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[21] In the event of a change to the double degree programme as stated in Article 1, individual agreements will be made with the students by the examination committees of both programmes.

Second academic year (81,5 EC)		
	Applied Mathematics *components*	**Applied Physics** *components*
Quartile 5 (20,5 EC)	Mathematical Statistics (6 EC) Analysis II (5 EC) Prooflab revisited (2 EC)	Models (4,5 EC) Project (3 EC)
Quartile 6 (21 EC)	Differential Equations & Numerical Methods (4,5 EC) Systems Theory and Numerical Methods (4,5 EC) Numerical Methods practical (2,25 EC) Project (3,75 EC)	Quantum Mechanics (6 EC)
Quartile 7 (21 EC)	Discrete Math & Algebra (6 EC)	Solid State Physics (7 EC) Statistical Physics (6 EC) PDE (2 EC)
Quartile 8 (19 EC)	Markov Chains (4 EC)	Physics of Fluids (7 EC) Electrodynamics (6 EC) Num. Meth. for PDE (2 EC)

Third academic year (67 EC)

Quartile 9 (15 EC)	*Minors*
	https://www.utwente.nl/en/education/electives/minor/

Quartile 10 (17 EC)		
	Applied Mathematics *components*	**Applied Physics** *components*
	Electives selection (10 EC)	
		Optics (7 EC)

Quartile 11		
(15 EC)	**Bachelor's Assignment**	
	Applied Mathematics components	*Applied Physics* components
	Reflection on Mathematical Research I (5 EC) 10 EC of Electives: (other elective courses are possible in consultation with the programme)	
	Graph Theory (5 EC)	Heat and Mass Transfer (5 EC) Introduction to
	PDE (5 EC)	Physical Materials Science (5 EC) Random
	Signals and Filtering (5 EC)	Technical Optics (5 EC)
	Mathematical Optimization (5 EC)	Computational Physics 1 (2,5 EC)
		Computational Physics 2 (2,5 EC)
		Intro. Instrumentation Comp (2,5 EC/5 EC)

Quartile 12	
(20 EC)	**Thesis**
	Complex Function Theory (3 EC)
	Reflection on Mathematical Research II (2 EC)
	Bachelor's Assignment (15 EC)

3. Transitional arrangements
   a. If the study programme described in Article 2 of this Annex is changed, the new Education and Examination Regulations replace the old ones; a transitional arrangement is established and announced by the Programme Board.
   b. For the third year of cohort 2017 and earlier please refer to Table 0 of this Annex.
   c. Curricula per year and accompanying transitional arrangements are published on the Applied Mathematics site: https://www.utwente.nl/en/bam/education-programme/

4. Safety

Safety requirements are compulsory while working in a laboratory. The student is obliged to follow these rules.

Safety requirements are compulsory while working in a laboratory. The student is obliged to follow these rules.

5.   Minor and Bachelor's Assignment
   a.   The minor consists of 15 EC (a quartile); The permitted minor offer is stated on the minor website https://www.utwente.nl/en/education/electives/minor/
   b.   Before the beginning of a unit of study, the student is expected to meet the prior knowledge requirements of that unit of study, as described in the minor's course catalogue.
   c.   At the start of a minor, the student must have obtained at least 75 EC (5 modules) from the B1 and B2 programs of the Bachelor's programme.
   d.   The student can only register for the Bachelor's Assignment examination component if he has fully passed the first year programme and if he obtained a minimum of 60 EC from the second and third year programme excluding the minor.
   e.   After the advice of the Examination Board, at the request of the student, the Programme Board may grant exemption from the condition referred in Paragraph a, Paragraph b, Paragraph c and Paragraph d of this article. This may cause a delay in the study progress.

6.   Binding Recommendation (BSA)
With reference to the Teaching and Examination Regulations for the Bachelor's programme in Applied Mathematics Article 1.f: Students pursuing a double degree in Applied Physics and Applied Mathematics are subject to an additional BSA provision: the BSA may involve exclusion from the Applied Mathematics programme if the student fails to earn 15 or more EC from the AM-study units associated with the double degree programme. See Table 2 for the specific study units.

Table 7: Transitional arrangements Third year Cohort 2017

Quartile 9	
(15 EC)	*Minors*
	https://www.utwente.nl/en/education/electives/minor/

Quartile 10		
(15 EC)	***Applied Mathematics*** *components*	***Applied Physics*** *components*
	Differential Equations & Numerical Methods (4,5 EC)	
	Systems Theory and Numerical Methods (4,5 EC)	
	Numerical Methods practical (2,25 EC)	
	Project (3,75 EC)	

Quartile 11		
(20 EC)	**Bachelor's Assignment**	
	Applied Mathematics *components*	***Applied Physics*** *components*
	Reflection on Mathematical Research I (5 EC) 15 EC of Electives:	
	(other elective courses are possible in consultation with the programme)	
	Graph Theory (5 EC)	Heat and Mass Transfer (5 EC)
	Introduction to PDE (5 EC)	Physical Materials Science (5 EC)
	Random Signals and Filtering (5 EC)	Technical Optics (5 EC)
	Mathematical Optimization (5 EC)	Computational Physics 1 (2,5 EC)
		Computational Physics 2 (2,5 EC)
		Intro. Instrumentation Comp (2,5 EC/5 EC)

Quartile 12

(20 EC)   **Thesis**

Complex Function Theory (3 EC) Reflection on
Mathematical Research II (2 EC)
Bachelor's Assignment (15 EC)

ANNEX TO THE TEACHING AND EXAMINATION REGULATIONS FOR THE DOUBLE DEGREE PROGRAMME APPLIED MATHEMATICS AND TECHNICAL COMPUTER SCIENCE

This annex contains the following paragraphs:

1. Study programme AM – TCS
2. Extra requirements for double degree AM - TCS
3. Elective section
4. Sequence requirements
5. Teaching evaluation
6. Pass/Fail Regulations
7. Cum Laude
8. Binding Recommendation
9. AM – TCS double degree programme cohort 2016 and 2017

1. Table 1: Study programme AM – TCS

The tailored programme for the double degree programme for cohort 2018 and later is summarised below:

Course-code	Course name	Q	EC	Division	Prerequisites
B1-fase (Year 1)					
201300312	Linear Structures I	1A	6	AM	
201700139	Introduction to Mathematics + Calculus 1A	1A	4	AM/TCS	
201700139	Pearls of Computer Science	1A	11	TCS	
201500112	Programming Theory & Project	1B	8	TCS	
201500365	Calculus 1B	1B	3	AM/TCS	
201300229	Analysis	1B	3	AM	
201400424	Prooflab II	1B	2	AM	
201300230	Linear Structures II	1B	3	AM	201300312
201400514	Network Systems	2A	12	TCS	
201400606	Vector Calculus EE + AT	2A	3	AM	
201400360	Presentation skills	2A	3	AM	
201400479	Signals & Transforms	2B	5	AM	
201400489	Probability Theory AM	2B	5	AM/TCS	
201600174	Data & Information	2B	12	TCS	201500112
B2-fase (Year 2)					
201800316	(Mathematical) Statistics	1A	6	AM/TCS	201400489
201800144	Project Statistics	1A	2	AM	
201900874	Computer Systems (Partial)	1A	12	TCS	
201400429	Systems Theory	1B	4	AM	
201400428	Differential Equations	1B	4	AM	201500365
201800421	Intelligent Interaction Design	1B	12	TCS	
201600061	Introduction Mathematical Modelling	2A	1	AM	
201600270	Discrete Structures & Efficient Algorithms	2A	15	AM/TCS	201400210

201400434	Modelling and Analysis of Stochastic Processes	2B	15	AM	
201600062	Project Signals & Uncertainty	2B	5	AM	
B3-fase (Year 3)					
201400358	Analysis II	1A	5	AM	
201400365	Discrete Mathematics (from Module 5, Computer Science)	1A	3	TCS	
201500566	Reflection I	1A	5	AM	
	Minor selection	1B	15	AM/TCS	All first year components
201500121	Design Project	2A	15	TCS	All components of 8 quartiles, included all first year components module 12: 201800155
	Elective AM selection	2A	5	AM	
201700274	Bachelor's Assignment double degree	2B	15	AM/TCS	
201500567	Reflection II	2B	2	AM	
201500405	Complex Function Theory	2B	3	AM	
	Total ECs	**224**			

2. Extra requirements for double degree AM – TCS:

The prospective student enrolled to the double degree programme AM – TCS must attend an extra intake / conversation to determine whether the student is motivated, ambitious and possess the skills needed to succeed in the double degree programme.

3. Elective section
   1. The Elective section consists of one elective course and one minor module;
   2. Available minors are listed on the minors site: **https://www.utwente.nl/en/education/electives/minor/**;
   3. For an individual minor approval of the AM examination board is needed.
   4. In the fourth quartile of the third year, one of the following courses must be included in the student's curriculum:
      a. Graph Theory
      b. Introduction to PDE
      c. Random Signals and Filtering
      d. Mathematical Optimization

4. Sequence requirements
    1. A student may enrol in the minor through the Minor Bureau once he has completed the B1-fase upon registration in Osiris;
    2. A student may only enrol in the Bachelor's Assignment once he has passed at least 8 quartiles of the complete programme. These 8 quartiles include all first-year components.

5. Teaching evaluation
    1. All components of the programme are parts of modules. The online Student Experience Questionnaire (SEQ) is used for evaluation purposes at the conclusion of modules;
    2. At least once a year there will be a panel of discussion with students participating in the double degree;
    3. Additionally, there will be an extra panel discussion after the first semester of the first year.

6. Pass/fail regulations
    1. Students who meet the following requirements will pass the Bachelor's final degree audit for the AM and the TCS programme:
        a. The student has received an assessment for all units of study of the double degree programme;
        b. The student's final results are 6 or higher for all units of study.
    2. In all other cases not specified under (1), the student will not pass the final degree audit for AM and TCS and will not receive the Bachelor's degrees.

7. Cum Laude
    1. A student may pass the Bachelor's final degree audit for TCS and AM with distinction (cum laude) upon meeting the following requirements:
        a. The student passes the Bachelor's final degree audit for TCS and AM within four years of initial enrolment (performance requirement);
        b. The student's weighted average is 8.0 or higher (non-numeric assessments and exemptions not included). The average is weighted based upon the amount of credits.
        c. The mark for the Bachelor's Assignment is 8.0 or higher.
    2. In exceptional cases and at the student's request, the Examination Board may award the distinction of cum laude if the student has met all requirements with the exception of the performance requirement, due to extenuating circumstances. These circumstances may involve delays recognised and provided for by the institution.

8. Binding Recommendation (BSA)
Students pursuing a double degree in Technical Computer Science and Applied Mathematics are subject to an additional BSA provision: the BSA may involve exclusion from the Applied Mathematics programme if the student fails to earn 15 or more EC from the AM-study units associated with the double degree programme. See Table 1 for the specific study units.

Table 9: Applied Mathematics - Technical Computer Science double degree programme cohort 2016 and 2017

First academic year: 81 EC

Quartile 1 (21 EC)	Applied Mathematics	Technical Computer Science
	Mathematics A & B1 (4 EC) Linear Structures I (6 EC)	Pearls of Computer Science (8 EC) Technical Computer Science Project (3 EC)
Quartile 2 (21 EC)	Applied Mathematics	Technical Computer Science
	Mathematics B2 (3 EC) Linear Structures II (3 EC) Analysis (3 EC) Prooflab (4 EC)	Programming Theory & Programming Project (8 EC)
Quartile 3 (20 EC)	Applied Mathematics	Technical Computer Science
	Signals & Transforms (5 EC) Probability part I (3 EC)	Network Systems (12 EC)
Quartile 4 (19 EC)	Applied Mathematics	Technical Computer Science
	Vector calculus (5 EC) Probability part II (2 EC)	Data and Information (12 EC)

Second academic year: 76 EC

Quartile 5 (20 EC)	Applied Mathematics	Technical Computer Science
	Statistics (5 EC)	Computer Systems (15 EC)
Quartile 6 (20 EC)	**Applied Mathematics**	**Technical Computer Science**
	Differential Equations (4 EC)	Intelligent Interaction & Design (12 EC)
	Systems theory (4 EC)	
Quartile 7 (21 EC)	**Applied Mathematics**	**Technical Computer Science**
	Discrete Struct & Algorithms (5 EC)	
	Algebra & Finite Automata (6,5 EC)	
	Research project: Similarity (3,5 EC)	
	Module 3 Project (5 EC) plus Intro to Math Modelling (1 EC)	
Quartile 8 (15 EC)	**Applied Mathematics**	**Technical Computer Science**
	Stochastic Models (5 EC)	
	Stochastic Models Project (1,5 EC)	
	Markov Chains (2,5 EC)	
	Stochastic Simulation Project (4 EC)	
	Multidisciplinary Project (2 EC)	

Third academic year: 55-65 EC

Quartile 9 (10 EC)	Applied Mathematics	Technical Science	Computer
	Analysis II (5 EC) Project (3 EC) Presentation Skills (2EC)		

Quartile 10 (15 EC)	Minor profile		
	http://www.utwente.nl/en/education/electives/minor		

Quartile 11 (15-20 EC)	Applied Mathematics	Technical Science	Computer
	one of the following four components must		
	be included in the student's exam programme:		
	Graph Theory (5 EC)	Design assignment (10 EC)	
	Introduction to PDE (5 EC)		
	Random Signals and Filtering (5 EC)		
	Mathematical Optimization (5 EC)		
	Reflection on Mathematical Research I (5 EC)		

Quartile 12 (15-20 EC)	Applied Mathematics	Technical Science	Computer
	Complex Function Theory (3 EC)		
	Reflection on Mathematical Research II (2 EC)		
	Bachelor's Assignment (10 EC)		