

TEACHING AND EXAMINATION REGULATIONS (TER)

2020-2021

**(In accordance with article 7.13 of the Higher
Education and Research Act)**

MASTER'S DEGREE PROGRAMME BIOMEDICAL ENGINEERING

DELFT UNIVERSITY OF TECHNOLOGY

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Paragraph 1 - General

Article 1 – Applicability of the regulations

1. These regulations apply to the teaching and examinations of the Master's programme Biomedical Engineering, hereinafter referred to as 'the programme'.
2. The programme is provided under the responsibility of the faculty Faculty of Mechanical, Maritime and Materials Engineering (3mE) of Delft University of Technology, hereinafter referred to as the faculty.

Article 2 - Concepts

1. The following concepts apply in this Regulation:
 - a. first academic year: the first period in the programme with a study load of 60 credits, as specified in Article 7.8b Section 8 of the Act;
 - b. degree audit: the test, in which, in accordance with Article 7.10 of the Act, the Board of Examiners determines whether all examinations in the courses of the degree programme have been successfully completed;
 - c. negative binding recommendation on continuation of studies: not applicable
 - d. programme: the Master's degree programme, as stipulated in Article 7.3a, Section 1 in the Act;
 - e. Osiris: the education information system;
 - f. practical exercise: course or component of a course aimed at the acquisition of particular skills. The following can be understood as practical exercises:
 - writing a thesis,
 - conducting a project or experimental design,
 - carrying out a project or a design/research assignment,
 - completing an internship,
 - participating in field work or an excursion,
 - conducting tests and experiments, and/or
 - participating in other educational activities that are considered essential and that are aimed at acquiring particular skills;
 - g. bridging programme: a deficiency programme aimed at moving up to a Master's degree programme, as stipulated in Article 7.30e or Article 7.57i of the Act;
 - h. semester: the term, consisting of two quarters, during which one or several courses are taught
 - i. student: a person enrolled at Delft University of Technology in order to receive education and take the examinations and the degree audit in the degree programme;
 - j. credit: credit in accordance with the European Credit Transfer System (ECTS); one credit equals a nominal study load of 28 hours;
 - k. study guide: the digital guide for the degree programme containing specific information on the courses included in the degree programme (www.studiegids.tudelft.nl);
 - l. examination: investigation of the student's knowledge, insight and skills with regard to a course, along with the assessment of that investigation;
 - m. track: major, as stipulated in Article 7.13, Section 2, Subsection b of the Act;
 - n. course: a unit of study within the programme, as stipulated in Article 7.3, Sections 2 and 3 of the Act, with which an examination is associated;
 - o. working day: Monday through Friday, with the exception of recognised holidays and the collective closure days;
 - p. Act: the Higher Education and Scientific Research Act (abbreviated to WHW), Bulletin of Acts and Decrees 593 and any amendments since its introduction.
2. The other concepts in these regulations are used in the sense in which they appear in the Act.
3. In these regulations, the term 'examination' also refers to 'interim examination', with the exception of Article 19, Section 1, first two complete sentences.

Paragraph 2 - Admission and prior education

Article 3- Admission to the Master's degree programme (Art. 7.30b WHW) BoS advisory powers

1. Individuals holding one of the following degrees have access to the education of the Master's degree programme in Biomedical Engineering on the condition that all of the stated requirements have been met.

a. Specific university Bachelor's degree

Direct admission with a Bachelor's degree in Mechanical Engineering, Marine Technology, Applied Physics, Electrical Engineering, Aerospace Engineering, Civil Engineering, Applied Earth Sciences, Nanobiology, Biomedical Engineering/Technology (RUG-TU/e-UT), Medical Sciences and Technology (TU/e-UT), Physics, Astrophysics, Advanced Technology (UT), Human Movement Sciences (VUA), and Industrial Engineering and Management (RUG).

b. Other university Bachelor's degree (not including those listed in Subsection a)

The following applies to this category:

Successful completion of the stated bridging programme for admission to the Master's degree programme:

- University Bachelor's degree in Computer Sciences and Engineering, Applied Mathematics, Molecular Sciences and Technology, Life Science and Technology, Industrial Design Engineering, Clinical Technology (TUD), Medical Natural Sciences (VUA), Human Movement Sciences (RUG), Medicine, and Biomedical Sciences (UvA).

For more information about the Bridging programme, visit the website:

<https://www.tudelft.nl/onderwijs/opleidingen/masters/bme/msc-biomedical-engineering/admission-and-application/>

A bridging programme is completed when all courses are passed with a minimum final mark 6.0.

c. Higher professional education degree

The following applies to this category:

Successful completion of the stated bridging programme for admission to the Master's degree programme and, if applicable, the language requirement

- higher professional education degree in Werktuigbouwkunde, Luchtvaart- en Ruimtevaarttechniek, Technische Natuurkunde, Elektrotechniek and Bewegingstechnologie.

For more information about the Bridging programme, visit the website:

<https://www.tudelft.nl/onderwijs/opleidingen/masters/bme/msc-biomedical-engineering/admission-and-application/>

A bridging programme is completed when all courses are passed with a minimum final mark 6.0.

d. Foreign degree

This category is subject to the general selection requirements of Delft University of Technology with regard to prior foreign education, based on a Cumulative Grade Point Average of at least 75% of the maximum number of points that could be earned, included in the table of countries (see website) and meeting the requirements for satisfactory linguistic mastery of English, as stated in the appendix.

2. Access to the education of the Master's degree programme in Biomedical Engineering is open to individuals who have demonstrated to the admissions committee that they possess knowledge, insight and skills at the level of the Bachelor's degree mentioned Subsections 1a, or of a university Bachelor's degree, in addition to the further requirements mentioned in Subsections 1b and 1c.

**Article 4 - University entrance examination (Art. 7.29 Section 2 WHW)
ONLY FOR BACHELOR'S PROGRAMMES**

Paragraph 3 - Content and composition of the programme

**Article 5 - Goal of the programme (Art. 7.13 Section 2, Subsection c WHW)
BoS right of approval**

1. The programme is intended to educate students to earn a Master of Science degree in Biomedical Engineering, providing them with such a level of knowledge, insight and skills in the area of Biomedical Engineering, that graduates can fulfil positions on the labour market at the Master's level.
2. Graduates must also meet the specific final attainment levels for each degree programme, as defined in the appendix.

Article 6 - Track (Art. 7.13 Section 2, Subsection b WHW)

BoS right of approval

The Master's degree programme has the following tracks:

- Neuromusculoskeletal Biomechanics
- Medical Devices
- Medical Physics

**Article 7 - Composition of the programme and degree audits
(Art. 7.13 Section 2, Subsections a, e and g of the WHW); BoS advisory powers (a); right of approval (e and g)
(Art. 7.13 Section 2, Subsection x WHW; FSC right of approval, BoS advisory powers**

1. The programme includes the Master's degree audit, with a study load of 120 credits. Subsection e and g
2. Following approval from the two Boards of Examiners concerned, a student may take an individual double degree programme in which two Master's programmes are combined simultaneously to create a programme of at least 180 credits. Upon completion the student is awarded two Master's diplomas. The student must earn at least 60 unique credits for each Master's degree programme.
3. A course that was part of the Bachelor's degree programme that qualified a student for admission to the Master's degree programme may not be included in the Master's degree programme. If a compulsory component has already been completed in the aforementioned Bachelor's degree programme, the Board of Examiners will designate an alternative course. If an elective course of the degree programme has already been completed in the aforementioned Bachelor's degree programme, the student will select an alternative elective course. Subsection a
4. The Master's degree audit is concluded with a final test or assignment. This test or assignment demonstrates that the student possesses and is able to apply the knowledge, insight and skills acquired in the degree programme. Subsection a
5. The degree programme and its courses are described in the appendix, including the study load, number of contact hours and form of examination of each course, as well as the programming of the examination and the language. Subsection e and x
6. The actual design of the educational programme is elaborated in greater detail in the study guide.
subsection x

Article 8 - Form of the programme (Art. (7.13 Section 2, Subsection i WHW)
FSC right of approval, BoS advisory powers

The programme is offered exclusively as full-time.

Article 9 - Language (art. 7.2 WHW)
FSC right of approval, BoS advisory powers

The teaching is in English, and the examinations are administered in English.

Article 10 – Honours Programme
FSC right of approval, BoS advisory powers

1. Based on the criteria referred to in the Honours Programme, students will be selected and admitted to the Master's Honours Programme by the Honours Coordinator.
2. The Master's Honours Programme comprises at least 20 credits.
 - a. At least five credits must be completed in the institution-wide component of the Master's Honours Programme: the course 'Critical Reflection on Technology', UD2010 or the course " Business Leadership for Engineers", UD2012 and
 - b. At least 15 credits must be completed in the faculty component of the Master's Honours Programme, the composition of which (including its content and options) is described in the Honours Programme.
3. All students selected for participation in the Honours Programme must submit their options for the faculty component for approval to the Honours Coordinator.
4. The Board of Examiners will be responsible for assessing whether all the requirements of the Honours Programme have been met.
5. Any student who has successfully completed the Honours Programme will be awarded a certificate signed by the chair of the Board of Examiners and the Rector Magnificus.

Article 11 – (Compulsory) participation in the programme (Art. 7.13 Section 2, Subsection t WHW)
FSC right of approval, BoS advisory powers

1. All students are expected to participate actively in the programme for which they are registered.
2. If necessary, there will be an obligation to participate in practical exercises, with a view to admission to the related examination. The Board of Examiners may grant an exemption from this obligation, with or without imposing a substitute requirement.
3. Any supplementary obligations are described by component in the course description in the study guide.

Article 12 - Programme evaluation (Art. 7.13 Section 2, Subsection a1 WHW)
BoS right of approval

1. The Director of Studies is responsible for the evaluation of the education.
2. The manner in which the education in the programme is evaluated is documented in the Quality Assurance Manual of 3mE, which is submitted for advice to the Faculty Student Council and the Board of Studies.
3. The Director of Studies informs the Board of Studies concerning the outcomes of the evaluation, the intended adjustments based on these outcomes and the effects of the actual adjustments.

Paragraph 4 – Registration for courses and examinations

Article 12a – Compulsory registration for courses

FSC right of approval, BoS advisory powers

Not applicable

Article 12b – withdrawal from a course

Not applicable

Article 13 - Registration for written examinations

FSC right of approval; BoS advisory powers

1. Registration to participate in a written examination is compulsory and is done by entering the requested data into Osiris no later than 14 calendar days before the examination. Students receive examination tickets by email as confirmation of their registration.
2. Students who have not registered within the term specified in Section 1 may request registration for that examination after this term until no later than three calendar days before the examination by entering the requested data into Osiris. The request will be honoured providing that places are available in the room or rooms where the examination is scheduled to take place. Students receive examination tickets by email as confirmation of their registration.
3. In the event of circumstances beyond a student's control resulting in the student being unable to register for an examination, the Board of Examiners may nevertheless permit the student to participate in the examination.
4. Students who have not registered for the examination and are therefore not included on the list of examinees can report on the day of the examination to the invigilator beginning 15 minutes before the start of the examination until the actual start. They will be admitted to the examination room, in the order that they reported to the invigilator, 30 minutes after the start of the examination, if sufficient places are available. The loss of 30 minutes of examination time cannot be compensated. Students who have been granted late access to the examination will be added to the list of examinees. The student participates in the examination subject to the validation of entitlement to participate in the examination.
5. In the situation described in the previous section, if it is found that a student was not entitled to participate in the examination, the examination work will be deemed invalid, it will not be marked and it will not count towards a result. The student may subsequently submit an appeal to the Board of Examiners, accompanied by reasons, requesting that the examination work that has been deemed invalid be declared valid and to have it assessed. The Board of Examiners will approve the request only in case of extenuating circumstances.

Article 14 - Registration for other examinations

FSC right of approval; BoS advisory powers

1. Registration for participation in an examination other than a written examination is compulsory, and it is done in the manner and within the term that is stated in the study guide for the relevant examination.
2. In special cases, the Board of Examiners may deviate from the registration term stated in Section 1, but only in favour of the student.
3. Students who have not registered on time will not be allowed to participate in the examination. The Board of Examiners can nevertheless admit a student to the examination, but only in case of special circumstances.
4. In the event of unauthorised participation in an examination, the Board of Examiners may declare the result invalid.

Article 15 - Withdrawal from examinations
FSC right of approval; BoS advisory powers

1. Students can withdraw from an examination through Osiris up to three calendar days before the examination.
2. Any student who has withdrawn from an examination should re-register on a subsequent occasion, in accordance with the provisions of Articles 13 and 14.

Paragraph 5 – Examinations

Article 16 - Form of the examinations and the manner of testing in general (Art. 7.13 Section 2, Subsections h and I WHW)
FSC right of approval, BoS advisory powers

1. Examinations (oral, written or otherwise) are taken in the manner described in the appendix.
2. The appendix contains a description of the moments at which and the numbers of times that examinations can be taken, along with their frequency, without prejudice to the provisions of these regulations concerning written and oral examinations.
3. A student may participate in an examination for a course no more than twice in one academic year.
4. In special cases, the Board of Examiners may deviate from the provisions of the above sections 1 to 3 in favour of the student.
5. Well before a written examination, the teacher or examiner will give students the opportunity to familiarise themselves with sample questions and answers.

Article 17 – Times and number of written examinations (Art. 7.13 Section 2, Subsection j WHW)
FSC right of approval, BoS advisory powers

1. Two opportunities to take written examinations will be offered each academic year:
 - at the end of the teaching period in which the course is taught, and
 - in the fifth week or at the end of the next teaching period or during the resit period in the months of July and August.
2. An annual timetable is issued detailing when written examinations may be taken, and it is published before the start of the relevant teaching period.
3. Contrary to the provisions in Section 1, the opportunity to take the written examination for a course that is not taught in a certain academic year must be given at least once in that year.

Article 18 - Oral examinations (Art. 7.13 Section 2, Subsection n WHW)
FSC right of approval, BoS advisory powers

1. For oral examinations, no more than one student shall be tested at a time, unless determined otherwise by the examiner.
2. Oral examinations shall be public, except in special cases in which the Board of Examiners has decided otherwise, or if the student has filed an objection to the publicity of the examination.
3. The oral examination is administered by at least two examiners.

Article 19 - Determination and announcement of results (Art. 7.13 Section 2, Subsection o WHW)
FSC right of approval, BoS advisory powers

1. The examiner determines the result of a written examination as quickly as possible but by no later than 15 working days after the examination. The results of written interim examinations shall be announced no later than five working days before the next written interim examination.
2. The examiner determines the result of an oral examination immediately after it is administered and issues the student with a written statement of this result.
3. The examiner records the results of the assessment of a practical exercise as quickly as possible, but no later than 15 working days after the completion of the practical exercise at the designated time. In Osiris, the result will be dated on the date of completion of the practical exercise. With regard to a series of practical exercises in which the knowledge acquired in a previous practical exercise is important to the subsequent practical exercise, the result of the previous practical exercise shall be announced before the subsequent practical exercise. If this is not possible, the examiner shall schedule a timely discussion of the previous practical exercise.
4. The examiner is responsible for the registration and publication of the results in Osiris, with observance of the student's privacy. When the result of an examination is announced, the student is informed about the right of perusal as stipulated in Article 20 as well as about the possibility of appealing to the Examinations Appeals Board.
5. Contrary to the previous provisions, results achieved in the resit period in August shall be registered and published no later than the last working day of the week following the examination week in August.
6. If special circumstances prevent the examiner from registering the results on time, the examiner will report this to the Board of Examiners, accompanied by reasons, and notify the students and student administration as quickly as possible.

Article 20 - Right to inspect results (Art. 7.13 Section 2, Subsection p WHW)
FSC right of approval, BoS advisory powers

1. Upon request, students will have the right to inspect their assessed work during a period of at least 20 working days after the announcement of the results of a written examination or the assessment of a practical exercise. Students intending to appeal against the assessment of their work will be issued with a copy of the assessed work.
2. During the period mentioned in Section 1, all students who have participated in the examination can become acquainted with the questions and assignments of the relevant examination, as well as with the standards that form the basis of the assessment.
3. The examiner can determine that the inspection or cognizance intended in Sections 1 and 2 will take place at a pre-established place and at a pre-established time.
4. Students proving that they were unable to appear at such an established place and time because of circumstances outside of their control will be offered another possibility, if possible within the period mentioned in Section 1. The place and times mentioned in the first sentence will be made known in good time.

Article 21 - Discussion of the results of examinations (Art. 7.13 Section 2, Subsection q WHW)
FSC right of approval, BoS advisory powers

1. Students who have taken a written examination or who have received the assessment of a practical exercise can ask the relevant examiner for a discussion of the results during a period of 20 working days after the announcement of the results. The discussion will take place within a reasonable period, at a place and time to be determined by the examiner.
2. At the request of the student or at the initiative of the examiner, a discussion justifying the assessment will take place between the examiner and the student as soon as possible after the announcement of the result of an oral examination.

3. If a collective discussion is organised by the examiner, students may submit requests as referred to in section 1 only if they have been present at the collective discussion and have motivated their requests, or if they were unable to be present at the collective discussion because of circumstances outside their control.
4. The Board of Examiners may allow deviation from the provisions in Sections 2 and 3.

Article 22 - Period of validity for examinations (Art. 7.13 Section 2, Subsection k, Art. 7.10, Section 4 WHW).

FSC Council right of approval, BoS advisory powers

1. The period of validity of the results of an examination is indefinite. The Dean can restrict the period of validity of a successfully completed examination only if the knowledge or insight that was examined has become outdated or if the skills that were examined have become outdated.
2. In cases involving a limited period of validity based on the first section, the period of validity shall be extended at least by the duration of the acknowledged delay in studies, based on the TU Delft Profiling Fund Scheme.
3. In individual cases involving special circumstances, the Board of Examiners can extend periods of validity that have been limited based on the first section or further extend periods of validity that have been extended based on the second section.
4. If a course consists of interim examinations, the period of validity of the interim examination for which no credits are assigned shall be restricted to the academic year in which the results have been obtained.

Article 23 - Exemption from an examination or obligation to participate in a practical exercise (Art. 7.13 Section 2, Subsection r WHW)

FSC right of approval, BoS advisory powers

1. After having obtained recommendations from the relevant examiner, the Board of Examiners may grant exemptions to students:
 - a. who have successfully completed an examination or degree audit in a system of higher education within or outside the Netherlands that corresponds to the examination for which the exemption has been requested in terms of content and level, or
 - b. who demonstrate that they possess sufficient knowledge and skills that have been acquired outside the system of higher education.
2. After having obtained recommendations from the relevant examiner, the Board of Examiners may grant exemption from the requirement to participate in a practical exercise with a view to admission to the related examination, possibly subject to alternative requirements.

Article 24 - Periods and frequency of degree audits (Art. 7.13 Section 2 WHW)

FSC right of approval, BoS advisory powers

In principle, the opportunity to take the Master's degree audit will be offered once each month. The dates for the meetings of the Board of Examiners shall be published before the beginning of the academic year.

Article 24a – invalidation of examination (Art. 7.12 and 7.12b WHW)

FSC right of approval, BoS advisory powers

The Board of Examiners is authorised to declare invalid an examination or part thereof if a proper assessment of the knowledge, insight and skills of the student has not proved reasonably possible based on the examination or the part thereof. The Board of Examiners may draw up further rules for this.

Paragraph 6 – Studying with a disability

Article 25 - Adjustments to the benefit of students with disabilities or chronic illnesses

(Art. 7.13 Section 2, Subsection m WHW)

FSC right of approval, BoS advisory powers

1. Upon a written and substantiated request to that effect, students with disabilities or chronic illnesses may be eligible for adjustments in teaching and examinations. These adjustments are coordinated to the situations of the students as much as possible, but they may not alter the quality or level of difficulty of a course or the study programme. Facilities to be provided may include modifications to the form or duration of examinations and/or practical exercises to suit individual situations or the provision of practical aids.
2. Requests as mentioned in Section 1 must be accompanied by a recent statement from a physician or psychologist or, in cases involving dyslexia, from a testing office registered with BIG, NIP or NVO. If possible, this statement should include an estimate of the extent to which the condition is impeding the student's academic progress.
3. Decisions concerning requests for adjustments relating to educational facilities are taken by the Dean or by the Director of Studies on the Dean's behalf. Decisions concerning adjustments relating to examinations are taken by the Board of Examiners.
4. Adjustments to examinations can involve the following or other matters:
 - form (e.g. replacing a written test with an oral test or vice versa, testing the required material in the form of interim examinations or granting exemptions to the attendance requirement);
 - timing (e.g. additional time for an examination, wider staggering of examinations across the examination period, granting exemptions to admission requirements or extending the period within which a component must be completed);
 - aids permitted during testing (e.g. English-Dutch dictionaries for students with dyslexia);
 - location (taking the examination in a separate, low-stimulus space).
5. Adjustments in educational facilities could include:
 - providing modified furniture in teaching and examination spaces;
 - providing special equipment (e.g. magnification or Braille equipment for students with visual impairments and blindness or loop systems and individual equipment for students with hearing impairments and deafness);
 - providing more accessible course material;
 - providing special computer facilities (e.g. speech-recognition or speech-synthesising software);
 - providing a rest area.

Paragraph 7 - Study support and (binding) recommendation on the continuation of studies

Article 26 – Study support and Monitoring of student progress

(Art. 7.13 Section 2, Subsection u WHW)

FSC right of approval, BoS advisory powers

1. The Dean is responsible for providing individual study supervision to students registered for the degree programme, partly for their orientation towards potential study options within and outside the degree programme. The Dean will also ensure that effective support and supervision is provided to students in making choices related to their studies.
2. The examination and study programme applying to each student is documented in Osiris.
3. The Student Administration is responsible for ensuring that all students are able to review and check their results in the Osiris student-information system.

Article 27 – (Negative) binding recommendation on the continuation of studies

Not applicable.

Paragraph 8- Final provisions

Article 28 - Conflicts with the regulations

In the case of conflict between provisions in the study guide or other document concerning the relevant teaching and examination education and study programme and these regulations, the provisions of these regulations shall take precedence.

Article 29 - Amendments to the regulations

1. Amendments to these regulations are adopted separately by the Dean.
2. Amendments that are applicable to the current academic year will be made only if they would not reasonably damage the interests of students.
3. Amendments to these regulations may not lead to disadvantageous changes to any decisions that have been made with regard to individual students.

Article 30 - Transitional measures

1. If the composition of the degree programme undergoes substantive changes, transitional measures will be established and published through the Dean.
2. These transitional measures shall include at least the following:
 - a. an arrangement regarding exemptions that may be obtained based on examinations that have already been passed;
 - b. the period during which the transitional arrangement shall be valid.
3. Students shall follow the degree programme as it applied or applies during the first academic year of their enrolment, unless components of the programme are no longer offered. In such cases, students must transfer according to the applicable transitional measures. Deviations require the approval of the Board of Examiners. Before submitting a request to this end, the student must have first obtained recommendations from an academic counsellor.
4. If a course within a degree programme is cancelled, four additional opportunities for taking the examination in this course shall be offered after it has been taught for the last time: the examination at the end of the teaching of the course, a resit in the same academic year and two resits in the following academic year.

Article 31 - Announcement

1. The Dean is responsible for ensuring a suitable announcement of these regulations and any amendments to them.
2. In any case, the Teaching and Examination Regulations are to be posted on the programme's website.

Article 32 - Entry into force

These regulations will enter into force on September 1 2020. These regulations shall remain in force until they are replaced by other regulations.

Adopted by the Dean of the faculty on 31 August 2020.

APPENDIX to Art. 3

Language level for individuals holding a higher professional education degree (c)

The following candidates are exempted from the English language test requirement:

- Students with a Bachelor's degree from a Dutch university
- Students with a VWO diploma or VWO English certificate
- Students with an HBO (University of Applied Sciences) degree from a degree programme taught entirely in English
- Students who hold the nationality of one of the following countries: USA, UK, Ireland, Australia, New Zealand or Canada

Sufficient competence in the English language can be demonstrated by passing one of the following tests:

- TOEFL iBT (Test of English as a Foreign Language internet-Based Test) with an overall band score of at least 90
- IELTS (academic version) with an overall band score of at least 6.5
- Cambridge Assessment English:
 - C1 Advanced (Certificate of Advanced English) with an overall score of at least 176.
 - C2 Proficiency (Certificate of Proficiency in English) with an overall score of at least 180.

If a bridging programme needs to be completed before a candidate can be admitted to a Master's programme, the certificate should be obtained before the start of the bridging programme.

Language level for holders of a non-Dutch diploma (d)

Competence in the English language as demonstrated by passing one of the following tests:

- TOEFL iBT (Test of English as a Foreign Language internet-Based Test) with an overall band score of at least 90 and a minimum score of 21 for each section
- IELTS (academic version) with an overall band score of at least 6.5 and a minimum score of 6,0 for each section
- Cambridge Assessment English:
 - C1 Advanced (Certificate of Advanced English) with an overall score of 176 and a minimum score of 169 for each section.
 - C2 Proficiency (Certificate of Proficiency in English) with an overall score of 180 and a minimum score of 169 for each section

Certificates more than two years old will not be accepted.

The following candidates are exempted from the English language test requirement:

- Students who hold the nationality of one of the following countries: USA, UK, Ireland, Australia, New Zealand or Canada;
- Students who hold a Bachelor's degree from one of the above countries;

APPENDIX to Article 5

Final Qualifications MSc Biomedical Engineering

4TU-criteria

1. Competent in the scientific discipline Biomedical Engineering

A graduate in Biomedical Engineering is able to...

- 1A. ...apply a broad and profound knowledge of engineering sciences (mathematics and applied physics) to biomedical problems.
- 1B. ...apply general and more advanced but specialized knowledge of anatomy and physiology to general and selected biomedical problems.
- 1C. ...apply the knowledge of engineering sciences at an advanced level in at least one Biomedical Engineering specialization.
- 1D. ...design, perform, and evaluate experiments.
- 1E. ...reflect on standard methods and their presuppositions and to questions these, propose adjustments, and to estimate their implications.
- 1F. ...independently spot gaps in own knowledge and to independently revise and extend it through study.

2. Competent in doing research

A graduate in Biomedical Engineering is able to...

- 2A. ...independently generate new scientific knowledge and new insights within the field of Biomedical Engineering.
- 2B. ...assess research, including scientific literature, within Biomedical Engineering on its scientific value.
- 2C. ...individually produce and execute a research plan and to choose the appropriate level of abstraction.
- 2D. ...deal with the changeability of the research process.
- 2E. ...apply a broad knowledge of research ethics.
- 2F. ...exercise the best practises in data stewardship and reproducibility.

3. Competent in designing

A graduate in Biomedical Engineering is able to...

- 3A. ...systematically design complex biomedical systems.
- 3B. ...generate innovative contributions to the discipline of Biomedical Engineering.
- 3C. ...independently produce and execute a design plan, and to choose the appropriate level of abstraction.
- 3D. ...deal with the changeability of the design process.
- 3E. ...draw upon other disciplines, especially those from the medical field, in own design.
- 3F. ...formulate new research questions on the basis of a design problem.

4. A scientific approach

A graduate in Biomedical Engineering is able to...

- 4A. ...identify and take in developments in the Biomedical Engineering domain.
- 4B. ...critically examine existing theories, models, or interpretations within Biomedical Engineering.
- 4C. ...analyse problems and use modelling, simulation, design and integration towards solutions.
- 4D. ...document adequately the results of research and design, and to publish these results as to contribute to the development of knowledge in the Biomedical Engineering field and beyond.
- 4E. ...reason logically within the field of Biomedical Engineering and beyond, to recognize modes of reasoning, and to recognize fallacies.

5. Basic intellectual skills

A graduate in Biomedical Engineering is able to...

- 5A. ...analyse and solve technological problems in a systematic way.
- 5B. ...identify and acquire lacking expertise.
- 5C. ...critically reflect on own knowledge, skills and attitude.
- 5D. ...plan and execute research in changing circumstances.
- 5E. ...integrate new knowledge in an R&D project, considering ambiguity, incompleteness and limitations.
- 5F. ...remain professional with a selflearning ability.
- 5G. ...take a standpoint with regard to a scientific argument within the research area.

6. Competent in operating and communicating

A graduate in Biomedical Engineering is able to...

- 6A. ...work both independently and in multidisciplinary teams.
- 6B. ...explain and defend outcomes from the research area to academia and industry, to specialists and peers.
- 6C. ...present and report in good English.

7. Considering the temporal and social context

A graduate in Biomedical Engineering is able to...

- 7A. ...apply a broad knowledge of ethics and statistics in own work.
- 7B. ...understand and potentially implement the regulatory procedures required for certification of medical devices relevant to one biomedical engineering specialization.
- 7C. ...evaluate and assess the technological, ethical and societal impact of own work.
- 7D. ...act responsibly with regard to sustainability, economy and social welfare.
- 7E. ...take a note of effective interaction within clinical and pre-clinical settings with clinicians and medical researchers.

F Final Qualifications MSc Biomedical Engineering – Neuromusculoskeletal Biomechanics Track

1. Competent in the scientific discipline Biomedical Engineering – Neuromusculoskeletal Biomechanics

A graduate in Biomedical Engineering – Neuromusculoskeletal Biomechanics is able to...

- 1a. ...apply specialized knowledge of tissue biomechanics, biophysical models of muscles and joints, human motion control, interactions between the biological systems (including brain) and (electro)mechanical devices.
- 1b. ...apply an assessment of the effects of sports equipment on the resultant performance.
- 1c. ...apply medical technologies for the diagnostic and therapeutic purposes of clinical practice on the basis of an integration of knowledge, skills, competence planning and reflection.
- 1d. ...apply engineering techniques of biomechatronics and biomechanics to the neuromusculoskeletal body.

2. Competent in doing research

A graduate in Biomedical Engineering – Neuromusculoskeletal Biomechanics is able to...

- 2a. ...apply research skills for solving complex challenges associated with human movement and control.
- 2b. ...formulate research questions and generate innovative solutions in the field of neuromusculoskeletal biomechanics.

3. Competent in designing

A graduate in Biomedical Engineering – Neuromusculoskeletal Biomechanics is able to...

- 3a. ...develop innovative rehabilitation and treatment procedures and devices based on biomechatronic/biomechanical principles.
- 3b. ...develop innovative sports technology or equipment based on biomechatronic/biomechanical principles.

4. A scientific approach

A graduate in Biomedical Engineering – Neuromusculoskeletal Biomechanics is able to...

- 4a. ...design and perform experiments involving human subjects using sound scientific principles.
- 4b. ...critically analyse a complex neuromusculoskeletal problem and translate it into a biomechatronic/biomechanical solution.

5. Basic intellectual skills

A graduate in Biomedical Engineering – Neuromusculoskeletal Biomechanics is able to...

No additional qualifications

6. Competent in operating and communicating

A graduate in Biomedical Engineering – Neuromusculoskeletal Biomechanics is able to...

- 6a. ...create/maintain a respectful subject-experimentalist relationship within the bounds of human subject-experimentalist interaction.

7. Considering the temporal and social context

A graduate in Biomedical Engineering – Neuromusculoskeletal Biomechanics is able to...

- 7a. ...optimize the interaction between biological and mechanical systems and generate new/innovative technical solutions.

Final Qualifications MSc Biomedical Engineering – Medical Devices

1. Competent in the scientific discipline Biomedical Engineering – Medical Devices

A graduate in Biomedical Engineering – Medical Devices is able to...

- 1a. ...apply a broad and profound knowledge of design, biomedical materials, experimental methods, manufacturing technologies, biomedical microsystems and biomedical electronics to medical devices.
- 1b. ...apply general and more advanced but specialized knowledge of anatomy and physiology to medical devices.
- 1c. ...apply the knowledge of engineering sciences at an advanced level in at least one type of medical device.
- 1d. ...apply the methodologies for medical device development and approval (regulatory issues).

2. Competent in doing research

A graduate in Biomedical Engineering – Medical Devices is able to...

- 2a. ...independently generate new scientific knowledge regarding the interaction of medical devices with the human body.

3. Competent in designing

A graduate in Biomedical Engineering – Medical Devices is able to...

- 3a. ...translate a complex clinical challenge in an elegant multifunctional technical solution.
- 3b. ...can apply and evaluate the various steps involved in the whole cycle of medical device design.
- 3c. ...apply medical device design in clinically relevant areas.

- 3d. ...generate innovative contributions to the discipline of medical devices.
- 3e. ...optimize the interaction between biological, mechanical and electronic embedded systems.

4. A scientific approach

A graduate in Biomedical Engineering – Medical Devices is able to...
No additional qualifications

5. Basic intellectual skills

A graduate in Biomedical Engineering – Medical Devices is able to...
No additional qualifications

6. Competent in operating and communicating

A graduate in Biomedical Engineering – Medical Devices is able to...
No additional qualifications

7. Considering the temporal and social context

A graduate in Biomedical Engineering – Medical Devices is able to...

- 7a. ...apply the latest design strategies for circular medical products and developments.

Final Qualifications MSc Biomedical Engineering – Medical Physics

1. Competent in the scientific discipline Biomedical Engineering – Medical Physics

A graduate in Biomedical Engineering – Medical Physics is able to...

- 1a. ...apply a broad and profound knowledge of physical methods to biomedical engineering problems.
- 1b. ...apply general and more advanced but specialized knowledge of medical imaging, radiological health physics, image processing and radiotherapy to selected biomedical engineering problems.
- 1c. ...apply knowledge of anatomy and physiology, experimental design and statistics, to problems from the medical physics specialization/focus area.
- 1d. ...apply advanced methodologies of at least two subjects from the fields of medical visualization, nuclear medicine, optical imaging and machine learning to biomedical engineering problems.

2. Competent in doing research

A graduate in Biomedical Engineering – Medical Physics is able to...

- 2a. ...independently generate new scientific knowledge and new insights within the field of medical physics.
- 2b. ...assess research, including scientific literature, in relation to problems from the field of medical physics on its scientific value.

3. Competent in designing

A graduate in Biomedical Engineering – Medical Physics is able to...

- 3a. ... implement and evaluate physical solutions by designing appropriate experiments to do so.
- 3b. ...generate innovative contributions to the discipline of medical physics

4. A scientific approach

A graduate in Biomedical Engineering – Medical Physics is able to...
No additional qualifications

5. Basic intellectual skills

A graduate in Biomedical Engineering – Medical Physics is able to...
No additional qualifications

6. Competent in operating and communicating

A graduate in Biomedical Engineering – Medical Physics is able to...

No additional qualifications

7. Considering the temporal and social context

A graduate in Biomedical Engineering - Medical Physics is able to...

No additional qualifications

APPENDIX to Articles 7 and 16

MASTER BIOMEDICAL ENGINEERING (BME) 2020-2021 (Director A. Zadpoor - Coordinator I. Apachitei)							
COURSE CODE	COURSE NAME	DEPARTMENT	ECTS	CONTACT HOURS	START	EXAM PERIOD	ASSESSMENT
BME YEAR 1							
BME Obligatory courses (5 ECTS)							
WM1402TU	<i>Ethics of Healthcare Technologies</i>	external	5	2.0.0.0	1		Report
BME Obligatory Electives: select 1 out of 2, depending on your background (4 ECTS)							
BM41055	<i>Anatomy & Physiology</i> (only for students with technical background)	BMECHE	4	2.2.0.0	1, 2	2, 3	Digital exam + assignments
ME41095	<i>Bio Inspired Design</i> (only for students with biomedical/medical background)	BMECHE	4	4.4.0.0	1, 2	X	Report
BME Elective courses for all tracks							
BM41060	<i>Physiology and Engineering</i>	BMECHE	3	0.0.0.2	4		Written + Assignments + Report
BM41070	<i>Medical Device Prototyping*</i>	BMECHE	6	0.0.2.2	3		Report
BM41110	<i>Clinical patient safety</i>	BMECHE	2	0.2.0.0	2		Report
CIE4353	<i>Continuum Mechanics</i>	external	6	4.4.0.0			
CIE5123	<i>Introduction to the Finite Element Method</i>	external	4	0.0.6.0			
EE4520	<i>Analog CMOS Design I</i>	external	3	0.3.0.0			
EE4585	<i>Semiconductor Device Physics</i>	external	5	0.4.0.0			
EE4C01	<i>Profile Orientation and Academic Skills</i>	external	3	2.2.0.0			
EE4C03	<i>Statistical Digital Signal Processing and Modelling</i>	external	5	4.0.0.0			
EE4C08	<i>Measurement and Instrumentation</i>	external	5	4.0.0.0			
ET4252	<i>Course Title Analog Integrated Circuit Design</i>	external	4	0.0.3.0			
ET4260	<i>Microsystem Integration</i>	external	4	0.0.0.3			
ET4277	<i>Microelectronics Reliability</i>	external	4	0.0.3.0			
ET4289	<i>Integrated Circuits and MEMS Technology</i>	external	4	0.0.3.0			
ET4386	<i>Estimation and Detection</i>	external	5	0.4.0.0			
ET4399	<i>Extra Project</i>	external	15	x.x.x.x			
ME41035	<i>Special Topics in Sports Engineering</i>	BMECHE	3	0.0.0.4	4	4	Report
ME41095	<i>Bio Inspired Design</i>	BMECHE	4	4.4.0.0	1	2,3	Report
ME46085	<i>Mechatronic System Design</i>	PME	4	0.4.0.0			
SC42095	<i>Control Engineering</i>	DCSC	3	0.4.0.0			
BME Recommended Elective courses RUL/EUR							
BM41025	<i>Surgery for Engineers</i>	BMECHE	2	0.x.0.0	2		
TRACK A. NEUROMUSCULOSKELETAL BIOMECHANICS (NMB) - coordinator Dirkjan Veeger							
BME-NMB Obligatory (25 ECTS)							
BM41040	<i>Neuromechanics & Motor Control</i>	BMECHE	5	0.0.4.4	3	4, 5	Written + Assignments
BM41090	<i>Computational Mechanics of Tissues and Cells</i>	BMECHE	6	0.0.3.3	3	4, 5	Written + Report
ME41045	<i>Tissue Biomechanics of Bone, Cartilage and Tendon</i>	BMECHE	3	2.0.0.0	1	1, 2	Written
ME41065	<i>System Identification and Parameter Estimation</i>	BMECHE	7	4.4.0.0	1	2, 3	Written + Assignments
ME41085	<i>Biomechatronics</i>	BMECHE	4	0.0.2.2	3	3, 4	Assignments
BME-NMB Obligatory electives: Select 3 courses from the following list							
BM41035	<i>Biomaterials</i>	BMECHE	4	0.4.0.0	2	2, 3	Written
BM41155	<i>3D Printing</i>	BMECHE	4	0.0.4.0	3	3, 4	Written + Report
ME41005	<i>Musculoskeletal Modelling and Simulation</i>	BMECHE	3	0.0.0.6	4	4, 5	Written + Assignments
ME41035	<i>Special Topics in Sports Engineering</i>	BMECHE	3	0.0.0.4	4		Assignments
ME41055	<i>Multibody Dynamics B</i>	BMECHE	4	0.0.2.2	3		Assignments + Digital
ME41070	<i>The Human Controller</i>	BMECHE	3	0.0.0.4	4	4, 5	Written
ME41080	<i>Human-Machine Systems</i>	BMECHE	4	0.4.0.0	2	2, 3	Written + Assignments
SC42001	<i>Control System Design</i>	DCSC	5	4.0.0.0			
SC42015	<i>Control Theory</i>	DCSC	6	6.0.0.0			
TRACK B. MEDICAL DEVICES (MD) - coordinator Wouter Serdijn							
BME-MD Obligatory courses (24 ECTS)							
BM41035	<i>Biomaterials</i>	BMECHE	4	0.4.0.0	2	2, 3	Written
BM41050	<i>Applied Experimental Methods: Medical Instruments</i>	BMECHE	4	0.0.0.2	4		Assignments + Report
BM41095	<i>Medical Instruments A: Clinical Challenges and Engineering Solutions</i>	BMECHE	3	4.0.0.0	1	1, 2	Written
BM41155	<i>3D Printing</i>	BMECHE	4	0.0.4.0	3	3, 4	Written + Report
EE4555	<i>Active Implantable Biomedical Microsystems</i>	external	5	0.0.0.4			
ET4127	<i>Themes in Biomedical Electronics</i>	external	4	0.0.4.0			
BME-MD Obligatory electives: Select 3 courses from the following list							
BM41075	<i>Regenerative Medicine</i>	BMECHE	4	0.0.0.4	4	4, 5	Written
BM41090	<i>Computational Mechanics of Tissues and Cells</i>	BMECHE	6	0.0.3.3	3	4, 5	Written + Report
BM41100	<i>Medical instruments B: Quality Assurance in Design</i>	BMECHE	3	0.0.3.0	3		Assignments + Report
EE4109	<i>Structured Electronic Design</i>	external	5	0.4.0.0			
EE4C02	<i>Systems Engineering</i>	external	3	0.0.4.4			
ET4130	<i>Bioelectricity</i>	external	3	0.0.3.0			
ET4257	<i>Sensors and Actuators</i>	external	4	0.3.0.0			
ME41045	<i>Tissue Biomechanics of Bone, Cartilage and Tendon</i>	BMECHE	3	2.0.0.0	1	1, 2	Written
ME41065	<i>System Identification & Parameter Estimation</i>	BMECHE	7	4.4.0.0	1	2, 3	Written + Assignment
C. MEDICAL PHYSICS (MP) TRACK - coordinator Frans Vos							
BME-MP Obligatory courses (24 ECTS)							
AP3132	<i>Advanced Digital Image Processing</i>	external	6	0.0.4.2			
AP3232	<i>Medical Imaging Signals and Systems</i>	external	6	2.2.0.0			
AP3371	<i>Radiological Health Physics</i>	external	6	0.0.8.8			
AP3582	<i>Medical Physics of Photon and Proton Therapy</i>	external	6	0.0.2.2			
BME-MP Obligatory electives: Select at least 10 ECTS from the following list							
AP3531	<i>Acoustical Imaging</i>	external	6	0.0.2.2			
CH3763	<i>Nuclear Medicine</i>	external	3	0.0.4.0			
CS4240	<i>Deep Learning</i>	external	5	0.0.8.0			
IN4307	<i>Medical Visualization</i>	external	5	6.0.0.0			
NB4020	<i>High-resolution Imaging</i>	external	4	6.0.0.0			
BME YEAR 2							
BME Project / Electives - Select 1 out of 3: Internship, JIP or Elective Courses (15 ECTS)							
BM51015	<i>BME Research Internship</i>	BMECHE	15	x.x.0.0	1		Report
TUD4040	<i>Joint Interdisciplinary Project</i>	3ME	15	x.x.0.0	1		Report
BME Graduation Project Obligatory (45 ECTS)							
BM51010	<i>BME Literature Research</i>	BMECHE	10	x.x.x.x	1		Report
BM51035	<i>BME MSc Thesis</i>	BMECHE	35	0.0.x.x	3		Report