TEACHING AND EXAMINATION REGULATIONS

(OER)

(from 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 Mechanical, Marine and Materials Engineering 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 subjects of the degree programme have been successfully completed;

c. negative binding recommendation on continuation of studies: the rejection linked to the recommendation on the continuation of studies at the end of the first year of enrolment as specified in Article 7.8b Section 3, first sentence;

d. programme: the Master's degree programme, as stipulated in Article 7.3a, Section 1, Subsection a in the Act;

e. Osiris: the education information system;

f. practical exercise: subject of component of a subject 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, 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. 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;

i. credit: credit in accordance with the European Credit Transfer System (ECTS); one credit equals a study load of 28 hours;

j. study guide: the digital guide for the degree programme containing specific information on the subjects included in the degree programme (www.studiegids.tudelft.nl);

k. examination: investigation of the student's knowledge, insight and skills with regard to a subject, along with the assessment of that investigation;

l. track: major, as stipulated in Article 7.13, Section 2, Subsection b of the Act;

m. subject: 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;

n. working day: Monday through Friday, with the exception of recognised holidays and the collective closure days;

o. 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 Articles 19, 22 and 25.

Paragraph 2 - Admission and prior education

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

ONLY FOR MASTER'S DEGREE PROGRAMMES

BoS advisory powers; SC advisory powers 2018-2019 (amendment RIB)

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

- Bachelor's degree in Mechanical Engineering, Applied Physics, Electrical Engineering and Clinical Technology

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 Industrial Engineering

Bridging programme to be followed:

COURSE CODE	COURSE NAME	ECTS
To be filled in		

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 Mechanical Engineering, Aerospace Engineering, "Bewegingstechnologie", Applied Physics and Electrical Engineering a bridging programme to be followed:

COURSE CODE	COURSE NAME	ECTS
ME/ AE /BT - Track Musculoskeletal Biomechanics + Track Medical Devices & Bioelectronics		
WB3240	Systeem- en Regeltechniek	6
WB2630	Advanced Mechanics	6
WB2631 T2 S	Finite Element Methods	1
WI1708TH1	Analyse 1	3
WI1708TH2	Analyse 2	3
WI1708TH3	Analyse 3	3
WI1807TH1	Lineaire Algebra 1	3
WI1909TH	Differentiaalvergelijkingen	3
AP - Track Medical Physics		
TN2054	Elektromagnetism	6
TN2345	Introduction to Waves	3
TN2421	Optics	3
TN2545	Systemen en Signalen	6
WI1142TN	Linear Algebra Part 1	3
TN2244WI	Lineaire Algebra and Differential Equations	6

EE - Track Medical Devices & Bioelectronics only for focus area Bioelectronics & Bioelectricity		
EE3C11	Elektronica	5
EE3P11	Elektromagnetisme	5
ET8027	Solid State Physics	3
EE2S11	Signals & Systems	5
WB3240	Systeem- en Regeltechniek	6
WI1708TH1	Analyse 1	3
WI1708TH2	Analyse 2	3
WI1708TH3	Analyse 3	3
WI1808TH1	Lineaire algebra 1	3
WI1808TH2	Lineaire algebra 2	3

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
BoS advisory powers

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 fulfill 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)
BoStudies right of approval

The Master's degree programme has the following tracks, with the stated content in the appendix:

- Musculoskeletal Biomechanics
- Medical Devices and Bioelectronics
- 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; FSCl right of approval, BoS advisory powers

1. The programme includes the Master's degree audit, with a study load of 120 credits.

2. Students following two simultaneous Master's degree programmes at TU Delft must earn at least 60 additional unique credits in addition to a complete Master's degree programme of 120 credits.

3. Subjects that were 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 subject. If an elective module of the degree programme has already been completed in the aforementioned Bachelor's degree programme, the student will select an alternative elective module.

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.

5. The degree programme is described in the appendix, along with the subjects, including the study load, number of contact hours and form of examination of each subject, as well as the programming of the examination and the language.

6. The actual design of the education is elaborated in greater detail in the study guide.

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
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 Bachelor's 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 subject 'Critical Reflection on Technology', UD2010, 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 subjects 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, without prejudice to the authority of the Board of Examiners to 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.

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 and withdrawal from examinations

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 make exceptions to 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 l 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 subject no more than twice in one academic year.

4. In special cases, the Board of Examiners will deviate from the provisions of this Article in favour of the student.

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 subject 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 subject 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 the last section 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).
FS 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 subject 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 where 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.

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 subject 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. He 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; ONLY FOR BACHELOR'S DEGREE PROGRAMMES

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 subject within a degree programme is cancelled, four additional opportunities for taking the examination in this subject shall be offered after it has been taught for the last time: the examination at the end of the teaching of the subject, 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 shall enter into force on 1 September 2018.

Adopted by the Dean of the faculty on 20 August 2018

APPENDIX to Art. 3 of the Model TER (for Master's degree programmes)

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

The English language, through the successful completion of one of the following tests:
- A TOEFL iBT (Test of English as a Foreign Language internet-Based Test) with an overall band score of at least 90, or
- an IELTS (academic version) with an overall Band score of at least 6.5, or
- a proof of completion of the 'Certificate of Proficiency in English' (CPE) or the 'Certificate in Advanced English' (CAE), both of the University of Cambridge

Certificates must have been completed successfully before the start of the bridging programme.

The following candidates shall be exempted from the requirement to pass an English language test:
- Nationals from the USA, UK, Ireland, Australia, New Zealand or Canada
- Applicants with a Dutch Pre-university (VWO) certificate
- Applicants who have obtained a higher professional education degree in an English-language programme.

Language level for individuals holding a foreign degree (d)

The English language, through the successful completion of one of the following tests:
- A 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, or
- an IELTS (academic version) with an overall Band score of at least 6.5 and a minimum score of 6.0 for each section, or
- a proof of completion of the 'Certificate of Proficiency in English' (CPE) or the 'Certificate in Advanced English' (CAE), both of the University of Cambridge

Certificates older than two years shall not be accepted.

The following candidates shall be exempted from the requirement to pass an English language test:
- Nationals from the USA, UK, Ireland, Australia, New Zealand or Canada
- Applicants who have obtained a Bachelor's degree in one of the countries mentioned.

APPENDIX to Article 5 of the Model TER - Final Qualifications MSc Biomedical Engineering

3TU-criteria

1. Competent in the scientific discipline Biomedical Engineering

A graduate in Biomedical Engineering is able to…

1A. …apply advanced physics and mathematics to biomedical problems.
1B. …apply knowledge of anatomy and physiology to biomedical problems.
1C. …design, carry out and evaluate experiments.
1D. …reflect on standard methods, propose adjustments and estimate their implications.

2. Competent in doing research

A graduate in Biomedical Engineering is able to…

2A. …study a topic by critically selecting relevant scientific literature.
2B. …write a scientific report about own research.
2C. …draw upon other disciplines, especially those from the medical field, in own research.
2D. …generate knowledge within the field of Biomedical Engineering.

3. Competent in designing

A graduate in Biomedical Engineering is able to…

3A. …systematically design complex biomedical systems.
3B. …formulate new research questions on the basis of a design problem.
3C. …draw upon other disciplines, especially those from the medical field, in own design.
3D. …generate innovative contributions to the discipline of Biomedical Engineering.

4. A scientific approach

A graduate in Biomedical Engineering is able to…

4A. …critically examine existing theories, models or interpretations within Biomedical Engineering.
4B. …reason logically and recognize modes of reasoning within the field of Biomedical Engineering.
4C. …manage own scientific research independently.
4D. …analyse problems and use modelling, simulation, design and integration towards solutions.

5. Basic intellectual skills

A graduate in Biomedical Engineering is able to…

5A. …analyse and solve technological problems in a systematic way.
5B. …plan and execute research and design in changing circumstances.
5C. …integrate knowledge in an R&D project, considering ambiguity, incompleteness and limitations.
5D. …identify and acquire lacking expertise.
5E. …critically reflect on own knowledge, skills and attitude.
5F. …remain professionally competent.
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. …present and report in good English.
6C. …explain and defend outcomes from the research area to academia and industry, to specialists and laymen.

7. Considering the temporal and social context

A graduate in Biomedical Engineering is able to…

7A. …evaluate and assess the technological, ethical and societal impact of own work.
7B. …act responsibly with regard to sustainability, economy and social welfare.
7C. …apply medical ethics and medical statistics in own work.
7D. …interact effectively within clinical and pre-clinical settings with clinicians and medical researchers.
7E. …implement the regulatory procedures required for certification of medical devices relevant to the discipline of Biomedical Engineering.

Appendix belonging to Articles 6, 7 and 16 of the TER model Programme (MSc)

MASTER BIOMEDICAL ENGINEERING 2018-2019 - director Amir Zadpoor - coordinator Julian Apachitei																	
last updated 4-5-2018			CONTACT HOURS AND EXAMS PER PERIOD YEAR 1					CONTACT HOURS AND EXAMS PER PERIOD YEAR 2									
COURSE CODE	COURSE NAME	ECTS	Q1	Q2	Q3	Q4	H	Q1	Q2	Q3	Q4	H	ASSESSMENT	RESPONSIBLE LECTURER(S)	LECTURER(S)		
OBLIGATORY COURSES FOR ALL TRACKS																	
BM41045	Experimental Design, Statistics & the Human	2			4								Home work assignments	De Winter	Dodou		
BM41055	Anatomy & Physiology (only for students with technical background)	4	2	2W	W								Weekly blackboard tests, Written exam	Dankelman	Meeuwsen		
BM41065	Medical Technology I (Diagnostic Devices) & Health Care Systems	5	3	2W	W								Written digital exam, Reports/essays	Van der Helm			
WM1401TU	Ethics of Healthcare Technologies	3			x								Report	Robbins-Wynsberghe			
OBLIGATORY FOR YEAR 2																	
BM51015	BME Research Internship	15						x	x				Report				
BM51045	BME MSc Thesis, Colloquium & Defence	45							x	x	x		Report, Presentation, Defence				
	TOTAL OBLIGATORY FOR ALL TRACKS	**74**															
A. MUSCULOSKELETAL BIOMECHANICS (MB) TRACK - coordinator ?																	
OBLIGATORY COURSES TRACK MB																	
BM41040	Neuromechanics & Motor Control	5			4	4W	W						Written exam, Computer tests, Assignments	Mugge	Van der Helm, Schouten, Veeger		
BM41090	Computational Mechanics of Tissues and Cells	6			3	3W	W						Written exam, Report	Zadpoor	Weinans		
ME41045	Tissue Biomechanics of Bone, Cartilage and Tendon	3	2W	W									Written exam	Weinans	Weinans		
ME41065	System Identification & Parameter Estimation	7	2	2W	W								Written exam, Assignments	Schouten	Van der Helm, Mugge		
ME41085	Biomechatronics	4			2	2W	W						Assignments, Written exam	Plettenburg	Van der Helm		
	TOTAL OBLIGATORY MB TRACK	**25**															
Three additional courses from the following list are obligatory:																	
BM41035	Biomaterials	4		4W	W								Written exam	Apachitei, Fratila			
BM41155	3D Printing	4			4W	W							Reports, Written exam	Zadpoor, Zhou			
ME41035	Special Topics in Sports Engineering	3				4							Portfolio	Veeger			
ME41055	Multibody Dynamics B	4			2	2							Homework (electronically submitted) & Computer exam	Schwab			
ME41070	The Human Controller	3				4W	W						Written exam	Abbink			
ME41075	Biomedical Engineering Design	4		2									Project	Plettenburg			
ME41080	Man-machine Systems	4		4W	W								Written exam, Assignments	De Winter			
SC42000/42015	Control System Design (or extended course)	3/6	4W	W									Written exam	Van den Boom			
B. MEDICAL DEVICES & BIOELECTRONICS (MD&B) TRACK - coordinator Wouter Serdijn																	
OBLIGATORY COURSES TRACK MD&B																	
BM41035	Biomaterials	4		4W	W								Written exam	Apachitei, Fratila			
BM41050	Applied Experimental Methods	4				2							Final presentation, Written report	Van den Dobbelsteen			
BM41095	Medical Instruments A: Clinical Challenges and Engineering Solutions	3	4W	W									Written assignments, Presentation	Dodou	Dankelman, Van den Dobbelsteen		
BM41155	3D Printing	4			4W	W							Reports, Written exam	Zadpoor, Zhou			
EE4555	Active Implantable Biomedical Microsystems	5				4							Presentations	Serdijn	Giagka, Lotfi, Strydis		
ET4127	Themes in Biomedical Electronics	4			4								Minithesis, Homework	Bossche	French, Serdijn		
	TOTAL OBLIGATORY MD&B TRACK	**24**															
Three additional courses from the following list are obligatory																	
BM41075	Regenerative Medicine	4				4W	W						Written exam	Fratila, Zadpoor			
BM41090	Computational Mechanics of Tissues and Cells	6			3	3W	W						Written exam, Report	Zadpoor	Weinans		
BM41100	Medical instruments B: Quality Assurance in Design	3			3								Presentation, Assignment report	Loeve			
ME41045	Tissue Biomechanics of Bone, Cartilage and Tendon	3	2W	W									Written exam	Weinans			
ME41065	System Identification & Parameter Estimation	7	2	2W	W								Written exam, Assignments	Schouten	Van der Helm, Mugge		
ME41075	Biomedical Engineering Design	4		2									Project	Plettenburg			
EE4C02	System Engineering	3			4	4W	W						Written exam, Assignments, Presentation	Yarovyi			
EE4C09	Structured Electronic Design	5	4W	W									Written exam	Verhoeven			
ET4130	Bioelectricity	3			3W	W							Written exam	Giagka			
ET4257	Sensors and Actuators	4		3W	W								Written exam, Essay or oral	French			

MASTER BIOMEDICAL ENGINEERING 2018-2019 - director Amir Zadpoor - coordinator Julian Apachitei

last updated 4-5-2018

COURSE CODE	COURSE NAME	ECTS	CONTACT HOURS AND EXAMS PER PERIOD YEAR 1					CONTACT HOURS AND EXAMS PER PERIOD YEAR 2					ASSESSMENT	RESPONSIBLE LECTURER(S)	LECTURER(S)
			Q1	Q2	Q3	Q4	H	Q1	Q2	Q3	Q4	H			
C. MEDICAL PHYSICS (MP) TRACK - coordinator Frans Vos															
OBLIGATORY COURSES TRACK MP															
AP3132 D	Advanced Digital Image Processing	6			4	4W	W						Written exam, Assignment	Rieger, Vos	
AP3232 D	Medical Imaging Signals and Systems	6			2	2							Assignment, Presentation, Exam	Vos	Van Dongen, Goorden, Niessen
AP3371TU D	Radiological Health Physics	6			8	8							Written exam, Essays	Schouwenburg	Van Bourgondien, Huitema, Dihalu
AP3582	Medical Physics of Photon and Proton Therapy	6			2	2W	W						Written/oral exam, Assignments	Lathouwers	Engelsman
	TOTAL OBLIGATORY MP TRACK	**24**													
Two additional courses from the following list are obligatory															
AP3121 D	Imaging Systems	6	4	4W	W								Written exam	Kalkman, Stallinga	
AP3531	Acoustical Imaging	6			2	2 O							Oral exam, Assignmnets	Verschuur	
IN4307	Medical Visualization	5	2+4Lab										Assignments, Written/oral exam	Vilanova Bartroli	
IN4320	Machine Learning	6			2	2							Reports, Assignments	Loog	Van Gemert, Kober, Tax
ELECTIVE COURSES FOR ALL TRACKS															
BM41060	Physiology and Engineering	3				2							Final presentation, Written report	Dankelman	
BM41070	Medical Device Prototyping (limited capacity)	6			2	2							Prototype, report and final presentation	Van den Dobbelsteen	Plettenburg
ME41095	Bio-inspired Design	4	4	4									Scientific paper writing, Pres., Fabr. demonstration model	Breedveld	
ME46085	Mechatronic System Design	4		4									Quizzes, Assignments ,Written examination	Hossein Nia Kani	
SC42090	Robot Motion Planning and Control	3			4								Homework, Written exam	Alonso Mora	
SC42095	Digital Control	3		4									Final quiz in class + project assignment	Keviczky	
CIE4353	Continuum Mechanics	6	4	4									Written exam and assignments	Kasbergen	Hicks, Scarpas
CIE5123	Introduction to the Finite Element Method	4			6								Written examination and assignments	Sluijs	
CIE5142	Computational Methods in Non-linear Solid Mechanics	3				4							Oral examination	Sluijs	
EE4C01	Profile Orientation and Academic Skills	3	2	2									Assignments	Kroes	Santoni De Sio, Schroten
EE4C03	Statistical Digital Signal Processing	5	4										Written exam, Report	Leus, Van der Veen	
EE4C08	Measurement and Instrumentation	5	4										Written exam, Homework, Practical assignment	Makinwa	Pertijs
EE4520	Analog CMOS Design I	3		3									Home work, Exam	Makinwa	Sebastiano
EE4585	Semiconductor Device Physics	5		4									Assignments, Examination	Van Swaaij	
ET4252	Analogue IC Design	4			3								Written exam	Serdijn	Urso
ET4260	Microsystem Integration	4				3							Assignments, Oral examination	Wolffenbuttel	
ET4277	Microelectronics Reliability	4			3								Written exam/Project	Bossche	Van Driel, Zhang
ET4289	Integrated Circuits and MEMS Technology	4			3								Written exam	Sarro	Van Zeijl
ET4386	Estimation and Detection	5		4									Written exam, Projects	Hendriks, Leus	
ET4399	Extra Project	<15	x	x	x	x							Project report	Janssen	
ID4010	Design Theory and Methodology	3	3										Assignments	Coimbra Cardoso	
IN4085	Pattern Recognition	6	6	6									Homework, Computer assignment, Written exam	Tax	
RECOMMENDED ELECTIVE COURSES RUL/EUR															
BM41000	301122000Y: Hersenen en Aansturing	7												Julian Apachitei	
BM41005	3112055PPY: Introduction into Neurosciences	6												Julian Apachitei	
BM41010	301220000Y: Vraagstukken Beweging	9												Julian Apachitei	
BM41015	301121000Y: Sturing en Stofwisseling	7												Julian Apachitei	
BM41020	301303100Y: Belly	8												Julian Apachitei	
BM41025	Surgery for Engineers	2												Julian Apachitei	
BM41080	Kvr7: General Course on Disorders of Environment & Interior	6												Julian Apachitei	
BM41160	3112065PPY: Design and Analysis of Biomedical Studies (DABS)	6												Julian Apachitei	