Faculty of Science and Technology

UNIVERSITY OF TWENTE.

Programme-specific supplement of the programme section of the student charter including the education and examination regulations of the master's programme of Biomedical Engineering (BME)

(art. 7.13 and 7.59 WHW)

Contents

Preamble

1. The regulations in this supplement apply to the full-time Biomedical Engineering master's programme (CROHO number 66226).

2. Together with the general section (TNW21.679/jg), this programme-specific supplement forms the programme section of the student charter including the education and examination regulations of the Biomedical Engineering master's programme of the Faculty of Science and Technology of the University of Twente.

3. In the event of a discrepancy, the Dutch version of this supplement takes precedence over the English version.

4. The legislation referred to herein is the Dutch Higher Education and Research Act (WHW).

Date: 21 July 2021
Reference: TNW/21.694

Article 1 Definitions

The terms that are used in this regulation and which are referred to in the Higher Education and Research Act (WHW) are defined in accordance with the law.

Article 2 Admission board

1. The dean of the TNW faculty forms an admission board for the purpose of admitting students to the master's programme who are not directly admissible in accordance with article 4.1.

2. The authority to admit or reject students has been delegated to the admission board referred to in section 1 by the Executive Board (reference S&C/387.191/lk).

3. The admission board consists of at least two members, including:
    a. the programme director;
    b. the professor or a delegated representative of the chair where the student wishes to graduate;
    c. for foreign students, the coordinator of internationalisation;
    d. for higher-education students, the higher-education transfer coordinator;
    The programme director serves as chair of the admission board.
    If the chair of the board deems this necessary, the programme coordinator and/or the student adviser and/or the secretary of the examination board may be added to the admission board.

4. The admission board can ask the examination board for advice.

Article 3 Aims and attainments of the programme

The Biomedical Engineering master's programme allows students with a bachelor's degree in Biomedical Technology or a comparable degree to further specialise at the master's level in a specific area of the wider field of biomedical technology, in accordance with the individual student's specific competences and interests. Although students' final qualifications may differ, they must at minimum include the competences listed below:

The Master of Science Biomedical Engineering (BME)

1. Specialises in a specific aspect of the field of biomedical technology;
2. Possesses the necessary knowledge and skills to conduct research;
3. Possesses design skills;
4. Possesses a scientific mindset;
5. Possesses intellectual knowledge;
6. Is able to collaborate and communicate with specialists working in their chosen track, as well as other stakeholders;
7. Possesses the ability to integrate insights into medical and social contexts.

(k = knowledge, s= skill, a= attitude) The master of science BME:

1. Is competent in the discipline of Biomedical Technology

Specialises in a specific field of biomedical technology. A master of science BME is familiar with existing scientific knowledge and has the competence to expand their knowledge through study.

- Has mastered aspects of the relevant fields of biomedical technology that touch upon the forefront of the knowledge (the latest theories, methods, techniques, current questions). [ks]
- Actively searches for structure in and coherence between in the relevant fields of Biomedical Technology. [ksa]
- Possesses the skill and attitude to apply these methods independently in the context of more advanced ideas or applications. [ksa]
- Is able to reflect on standard methods and their presuppositions; is able to question these; is able to propose adjustments and assess their scope. [ksa]
- Is able to independently spot gaps in their own knowledge and revise and expand their knowledge through study. [ksa]

2. Is competent in research

Possesses knowledge of conducting research and the skills to conduct their own research. A master of science BME has the competence to acquire new scientific knowledge through research. In this context, research means developing new knowledge and new insights in a purposeful and methodical manner. They are able to reformulate poorly structured research problems. In doing so, they also involve the system limits. They can defend their new interpretation before the parties involved for problems of a more complex nature. [ksa]

- Is perceptive and possesses the creativity and the ability to discover certain connections and new perspectives in seemingly trivial situations. They can utilise these perspectives for new applications.[ksa]
- Is able to independently draw up and execute a research plan. [ks]

- Chooses the right level of abstraction, given the process phase of the research problem. [ksa]
- Is able to and has the attitude to, where necessary, draw upon other disciplines in their own research. [ksa]
- Is able to deal with the changeability of the research process as a result of external circumstances or advancing insights. Is able to steer the process accordingly. [ksa]
- Is able to assess the scientific value of research conducted in the field of biomedical technology. [ksa]
- Is able to independently contribute to the development of scientific knowledge in one or more fields of Biomedical Technology. [ksa]

3. Is competent in design

In addition to conducting research, students will also learn to design; this depends in part on their chosen specialisation. In this context, designing is a synthetic activity aimed at the realisation of new or modified artefacts or systems with the intention to create value in accordance with predefined requirements and desires (e.g. mobility, health).

- Is able to reformulate poorly structured design problems. In doing so, they also involve the system limits. They can defend their new interpretation before the parties involved for design problems of a more complex nature. [ksa]
- Possesses creativity and synthetic skills with regard to design problems. [ksa]
- Is able to independently draw up and execute a design plan. [ks]
- Chooses the right level of abstraction, given the process phase of the design problem. [ksa]
- Is able to and has the attitude to, where necessary, draw upon other disciplines in their own design. [ksa]
- Is able to deal with the changeability of the design process as a result of external circumstances or advancing insights. Is able to steer the process accordingly. [ksa]
- Is able to formulate new research questions based on a design problem. [ks]
- Possesses the ability to make design decisions and justify and evaluate these in a systematic manner. [ksa]

4. Has a scientific approach

Has a scientific approach A master of science BME has a systematic approach, characterised by the development and use of theories, models and coherent interpretations, has a critical attitude and has insight into the nature of science and technology.

- Is able to identify and take in relevant developments. [ksa]
- Is able to critically examine existing theories, models and interpretations related to the area of their graduation subject. [ksa]
- Possesses ample skill in and a tendency towards using, developing and validating models; is able to make a conscious choice between modelling methods. [ksa]
- Has insight into the nature of science and technology (purpose, methods, differences and similarities between scientific fields, nature of laws, theories, explanations, role of the experiment, objectivity, etc.) and has knowledge of current debates about this. [k]
- Has insight into the scientific practice (research system, relation with clients, publication system, importance of integrity, etc.) and has knowledge of current debates about this. [k]
- Is able to adequately document the results of research and design with a view of contributing to the development of knowledge in the field of biomedical technology and beyond and is able to publish these results. [ksa]

5. Possesses basic intellectual skills

Possesses intellectual skills A master of science BME is competent in reasoning, reflection and forming a judgement. These are skills which are learned or sharpened in the context of a specific discipline and which are generically applicable henceforth.

- Is able to independently reflect critically on their own thinking, decision making and acting and adjust these on the basis of this reflection. [ksa]
- Is able to recognise fallacies. [ks]
- Is able to apply the modes of reasoning (induction, deduction, analogy, etc.). [ksa]
- Is able to ask adequate questions and has a critical yet constructive attitude towards analysing and solving more complex (real-life) problems in the field of health care. [ksa]
- Is able to form a well-reasoned opinion when faced with incomplete or irrelevant data, taking into account the manner in which these data were generated. [ks]
- Is able to adopt a position with regard to a scientific debate in the field of biomedical technology and can critically assess the value of this debate. [ksa]
- Possesses basic numerical skills and an understanding of orders of magnitude. [ksa]

6. Is competent in collaboration and communication

Is able to collaborate and communicate with specialists working in their chosen track, as well as other stakeholders. A master of science BME has the competence to work with and for others. This not only requires adequate interaction, a sense of responsibility and leadership, but also good communication with colleagues and non-

colleagues. He or she is also able to participate in a scientific or public debate.

- Is able to communicate in writing about research and solutions to problems with colleagues, non-colleagues and other involved parties in English. [ksa]
- Is able to communicate verbally about research and solutions to problems with colleagues, non-colleagues and other involved parties in English.
- [ksa]
- Is able to debate about both the field and its place in society. [ksa]
- Is characterised by professional behaviour. This includes reliability, commitment and independence. Respects the opinions of others. [ksa]
- Is able to perform complex project-based work: is pragmatic and has a sense of responsibility; is able to deal with limited sources; is able to deal with risks; is able to compromise. [ksa]
- Is able to work as part of a multidisciplinary team. [ksa]
- Is able to take on the role of team leader. [ks]

7. Takes the temporal and societal context into account.

Possesses the ability to integrate insights into medical and social contexts into their work. Life science and technology do not exist in isolation and always have a temporal and social context. Beliefs and methods have their origin; the decisions being made have social consequences over time. A master of science BME understand this and possesses the ability to integrate these insights into their scientific work.

- Understands relevant (internal and external) developments in the history of biomedical technology. This also includes integrating the interaction between the internal (ideas) development and the external (social) development into one's scientific work. [ksa]
- Is able to analyse the societal (economic, social, cultural) consequences of new developments in the field of biomedical technology, discuss these with colleagues and non-colleagues and integrate them into their scientific work. [ksa]
- Is able to analyse the consequences of scientific thinking and acting on health care, the environment and sustainable development and integrate these consequences into their scientific work. [ksa]
- Is able to analyse the ethical and normative aspects of the consequences and assumptions of scientific thinking and acting, discuss these with colleagues and non-colleagues (in both research and design) and integrate these ethical and normative aspects into their scientific work. [ksa]
- Chooses a position as professional in society. [ksa]

Article 4 Admission to the study programme

1. Direct admission to the study programme is obtained with:
    a. a final certificate of the Biomedical Technology bachelor's programme from the University of Twente, Eindhoven University of Technology or the BMT specialisation of the Life Sciences programme from the University of Groningen.
    b. a certificate of admission to the study programme issued by the admission board.

2. Admission to the study programme subject to certain conditions can be obtained by:
    a. a student who holds a certificate from a technical bachelor's programme from a Dutch university. Sections 3 to 5 of this article apply.
    b. a student who holds a higher-education degree (HBO) from a study programme relevant to the field of biomedical technology. Sections 3 to 5 of this article apply. Further provisions for these students are laid down in article 6 of this programme supplement.
    c. a student who holds an international bachelor's degree. See website for conditions and procedures. Furthermore, sections 3 to 5 of this article apply.

3. When assessing the application for admission to the master's programme, the admission board may demand that certain courses are passed before a certificate of admission to the master's programme is issued.

4. When issuing a certificate of admission to the master's programme, the admission board may decide to exempt the student from the obligation to complete certain units of the master's programme, with the exception of the final project.

5. When issuing a certificate of admission to the master's programme, the admission board may set conditions with regard to the specific content of the student's master's programme and determine that the admission is only valid for a certain track.

6. The decisions of the admission board referred to in section 4 of this article require the approval of the Examination Board.

7. Students with a foreign pre-university education must be able to demonstrate a sufficient verbal and written command of English. As an entry requirement, they may be required to meet the standard score on a recognised test. This means a total score of 6.5 or higher on the IELTS test or a score of 90 or higher

on the internet-based TOEFL test. Students with a bachelor's degree from countries with only English as the language of higher education are exempted from this language requirement.

Article 5 The pre-master programme

1. The student must first complete a transfer programme of circa 30 EC as determined by the admission board. This programme is tailored to the competences that the student has acquired elsewhere.

2. If a student fails to complete their assigned transfer programme within the available time frame, they will be excluded from participation in the BME transfer programme for a period of three years.

3. If the student completes the transfer programme within the available time frame, they can be admitted to the BME master's programme.

4. Only personal circumstances that the student has reported to their student adviser as soon as can reasonably be expected after their occurrence will be taken into consideration by the admission board in its decision whether or not to extend the available time frame or grant additional opportunities. Personal circumstances are illness of the person concerned, physical, sensory or other functional disorders of the person concerned, pregnancy of the person concerned or special family circumstances.

5. For each part to be completed, the student has a maximum of two (examination) opportunities.

Article 6 Language

1. The courses and the exams of the Biomedical Engineering master's programme are in English.

2. The master thesis report will be written and defended in English. Students are free to make a translation or summary in Dutch if this is necessary for the dissemination of the research results, but the final grade will be based on the original version in English.

Article 7 Structure of the programme

1. For the BME master's programme, students must choose one of five tracks that tie into the research areas of the TechMed Centre:
    a. Bioengineering Technologies
    b. Imaging and In Vitro Diagnostics
    c. Physiological Signals and Systems
    d. Medical Device Design
    e. Biorobotics

2. The BME master's programme consists of 120 EC, 15 and 45 EC of which are reserved for, respectively, an internship and a master thesis report. Per track, there are at least six compulsory subjects (30 EC green). Furthermore, there are track-specific electives (at least 15 EC blue) and free electives (no more than 15 EC orange). Consult tables 6 to 10 and the pre-approved electives on the website for more information and the most recent version of the tracks (https://www.utwente.nl/en/bme/education/).

3. The electives are chosen in conference with the chair of the master thesis committee. The curriculum must be approved by the chair of the master thesis committee and the examination board. The curriculum must be approved before the end of the first quartile after the student enrolled in the BME master's programme.

4. If a student has already completed one or more compulsory components of the master's programme during their bachelor's programme or if they have completed courses that can be approved as electives for the master's programme, the examination board can grant the student an exemption from these subjects. The total number of EC that the student must obtain as part of their master's programme will not be reduced. Furthermore, the student cannot retake any courses they have already completed to have them count as part of the master's programme.

Article 8 The master curriculum

The programmes below apply in academic year 2021-2022.

Table 1. Track Bioengineering Technologies

	Code	Course	1A	1B	2A	2B
1.	201400285	Biostatistics (Dr. K. Poortema)				

2.	201500222	Technology for Health (Dr. ir. J.R. Buitenweg)				
3.	201900088	Applied Cell biology (Dr. ing. J.N. Post)				
4.	201400284	Biomedical Membranes & Artificial Organs (Prof. dr. D. Stamatialis)				
5.	201600327	Tissue Engineering (Dr. J.C.H. Leijten)				
6.	201900123	Advanced Organic Chemistry (Prof. dr. ir. P. Jonkheijm)				
7.	201800288	Introduction to Bioengineering Technologies (note: only for students who didn't follow B-BMT) (Dr. J.C. Alers)				
8.	201700040	In Vitro Diagnostics (Prof. dr. ir. S. Le Gac)				
9.	193740010	Controlled Drug and Gene Delivery (R. Bansal)				
10.	193640020	Biophysical Techniques & Molecular Imaging (Dr. C. Otto)				
11.	201400283	Biomedical Materials Engineering (Dr. A.A. Poot)				
12.	201200220	Nanomedicine (Prof. dr. J. Prakash)				
13.	202001414	Physical Biology you can't choose this course if you participated in the minor Soft and Biological Physics (Prof. dr. M.M.A.E. Claessens)				
14.	191211120	Lab-on-a-chip (Prof. dr. J.C.T. Eijkel) (don't sign up if you already completed 201500054 due to overlap)				
15.	193400111	Bionanotechnology (Dr. ir. M.L. Bennink)				
16.	193700050	AMM-project Organic Materials (Dr. M.A. Hempenius)				
17.	191210720	Biomedical Signal Acquisition (Dr. ir. W. Olthuis)				
18.	193640050	Clinical Chemistry (max. 15 participants) (external lecturer)				
19.	200900040	Topics in Human Anatomy & Sports Physiology (Dr. J. Reenalda) (could be slightly altered in q4 col. 2021 t.b.d.)				

Compulsory **Elective**

Table 2. Track Imaging and In Vitro Diagnostics

	Code	Course	1A	1B	2A	2B
1.	201700040	In Vitro Diagnostics (Prof. dr. ir. S. Le Gac)				
2.	201400285	Biostatistics (Dr. K. Poortema)				
3.	193640020	Biophysical Techniques & Molecular Imaging (Dr. C. Otto)				
4.	201800114	Imaging Technology in Radiology (Dr. ir. F.F.J. Simonis)				
5.	201500222	Technology for Health (Dr. ir. J.R. Buitenweg)				
6.	191506001	Mathematical Methods (Dr. H.G.E. Meijer)				
7.	201900044	Radiation Protection Expertise (Ir. E. van Dijk)				
8.	193572010	Physics of Bubbles (Prof. dr. M. Versluis)				
9.	191551150	Numerical Techniques for PDE (Dr. M. Schlottbom)				
10.	193542070	Medical Acoustics There is a slight possibility that this course will be shifted to q4 (Prof. dr. M. Versluis)			?	
11.	201900260	Magnetic Methods in Medicine (Dr. ir. L. Alic)				
12.	193810020	Advanced Techniques for Signal Analysis (Dr. ir. T. Heida)				

13.	191210910	Image Processing and Computer Vision (Dr. ir. M. Abayazid)				
14.	193500000	Biomedical Optics (Prof. dr. ir. I.M. Vellekoop)				

Compulsory **Elective**

Table 3. Track Physiological Signals and Systems

	Code	Course	1A	1B	2A	2B
1	201500222	Technology for Health (Dr. ir. J.R. Buitenweg)				
2	201400285	Biostatistics (Dr. K. Poortema)				
3	201400286	Clinical Research Methods (Prof. dr. C.J.M. van Doggen)				
4	193810020	Advanced Techniques for Signal Analysis (Dr. ir. T. Heida)				
5	191150700	Integrative Design of Biomedical Products (Prof. dr. ir. G.J. Verkerke)				
6	201700071	Identification of Human Physiological Systems (Dr. E.H.F. van Asseldonk)				
7	193810010	Biological Control Systems (Prof. dr. H.J. Zwart)				
8	201800156	Biomechanics of human movement (Dr. ir. M. Sartori)				
9	191210720	Biomedical Signal Acquisition (Dr. ir. W. Olthuis)				
10	201400282	Bioelectromagnetics (Dr. ir. T. Heida)				
11	191150480	Human Movement Control (Dr. E.H.F. van Asseldonk)				
12	201600028	Telemedicine and Data Analysis for Monitoring (Dr. ir. M. Tabak)				
13	193810100	Dynamic Behavior of Neuronal Networks (Prof. dr. ir. M.J.A.M. van Putten)				
14	191506001	Mathematical Methods (Dr. H.G.E. Meijer)				
15	191560430	Nonlinear Dynamics (Dr. H.G.E. Meijer)				
16	191210920	Optimal Estimation in Dynamic Systems (Dr. ir. F. van der Heijden)				
17	191131700	System Identification and Parameter Estimation (Dr. ir. R.G.K.M. Aarts)				
18	201600070	Machine Learning I (Dr. ing. G. Englebienne)				
19	191154740	Biophysical Fluid Dynamics: The Respiratory System (Dr. ir. F.H.C. de Jongh)				

Compulsory **Elective**

Table 4. Track Medical Device Design

	Code	Course	1A	1B	2A	2B
1.	191150700	Integrative Design of Biomedical Products (Prof. dr. ir. G.J. Verkerke)				
2.	201400286	Clinical Research Methods (Prof. dr. C.J.M. van Doggen)				
3.	201400285	Biostatistics (Dr. K. Poortema)				
4.	201500222	Technology for Health (Dr. ir. J.R. Buitenweg)				
5.	201400287	Ergonomics (Dr. ir. D. van de Belt)				

6.	201800156	Biomechanics of human movement (Dr. ir. M. Sartori)				
7.	200900040	Topics in Human Anatomy & Sports Physiology (Dr. J. Reenalda) (could be slightly altered in q4 col. 2021 t.b.d.)				
8.	202000255	Advanced Control Engineering (Dr. ir. W.B.J. Hakvoort)				
9.	201400283	Biomedical Materials Engineering (Dr. A.A. Poot)				
10.	202001409	Development of Artificial Internal Organs (Prof. dr. ir. J. Arens)				
11.	201300004	Robotics for Medical Applications (Prof. dr. S. Misra)				
12.	191150480	Human Movement Control (Dr. E.H.F. van Asseldonk)				
13.	191121720	Design, Production and Materials (Dr. I. Baran)				
14.	201700294	Engineering Project Management (Dr. M.V. Pereira Pessoa)				
15.	201400103	3D Printing; Processes and Use (Dr. ir. T.H.J. Vaneker)				
16.	202001580	Early HTA during Med. Device Development (dr.ir. H. Koffijberg)				

Compulsory **Elective**

Table 5. Track Biorobotics

	Code	Course	1A	1B	2A	2B
1.	201400285	Biostatistics (Dr. K. Poortema)				
2.	201300004	Robotics for Medical Applications (Prof. dr. S. Misra)				
3.	201500222	Technology for Health (Dr. ir. J.R. Buitenweg)				
4.	202000255	Advanced Control Engineering (Dr. ir. W.B.J. Hakvoort)				
5.	201800335	Programming 2 (Dr. ir. J.F. Broenink)				
6.	201700071	Identification of Human Physiological Systems (Dr. E.H.F. van Asseldonk)				
7.	201200133	Biomechatronics (Prof. dr. ir. H. van der Kooij)				
8.	191210910	Image Processing and Computer Vision (Dr. ir. M. Abayazid)				
9.	191561620	Optimal Control (Dr. ir. G. Meinsma)				
10.	201600070	Machine Learning I (Dr. ing. G. Englebienne)				
11.	201900037	Flexible Multibody Dynamics (Dr. ir. J.P. Schilder)				
12.	191150480	Human Movement Control (Dr. E.H.F. van Asseldonk)				
13.	201800156	Biomechanics of Human Movement (Dr. ir. M. Sartori)				
14.	201400286	Clinical Research Methods (Prof. dr. C.J.M. van Doggen)				
15.	191150700	Integrative Design of Biomedical Products (Prof. dr. ir. G.J. Verkerke)				
16.	193810020	Advanced Techniques for Signal Analysis (Dr. ir. T. Heida)				
17.	191211060	Modern Robotics (Prof. dr. ir. S. Stramigioli)				

Compulsory **Elective**

Pre-approved free electives
These courses are part of all the BME tracks or other MSc programmes. Always check your eligibility and entry requirements in Osiris before choosing these courses as free electives.

Table 6. Quartile 1

	Code	Course	1A	1B	2A	2B
1.	201400103	3D Printing; Processes And Use				
2.	201800083	Advanced Colloids & Interfaces you can't choose this course if you participated in the minor Soft and Biological Physics				
3.	201600070	Machine Learning I				
4.	193810010	Biological Control Systems				
5.	191154740	Biophysical Fluid Dynamics: The Respiratory System				
6.	193640020	Biophysical Techniques & Molecular Imaging				
7.	201400286	Clinical Research Methods				
8.	201900093	Control System Design for Mechatronics				
9.	193740010	Controlled Drug and Gene Delivery				
10.	201400584	Design of Persuasive Health Technology				
11.	201900074	Fundamentals of Numerical Methods				
12.	201200167	Imaging Techniques				
13.	201700040	In Vitro Diagnostics				
14.	191150700	Integrative Design of Biomedical Products				
15.	201200146	Maintenance Engineering & Management				
16.	191560430	Nonlinear Dynamics				
17.	202001414	Physical Biology				
18.	191158510	Programming in Engineering				
19.	201900044	Radiation Protection Expertise				
20.	191820210	Simulation				
21.	191211080	System Engineering (Dr. ir. J.F. Broenink) **Track Medical Device Design**				

Courses in 2 quartiles have a spread studyload (e.g. 2,5EC each quartile, 5EC total)

Table 7. Quartile 2

	Code	Course	1A	1B	2A	2B
1.	201600071	Machine Learning II				
2.	201900091	Advanced Topics in Finite Element Methods				
3.	191158500	Advanced Programming in Engineering				
4.	201900088	Applied Cell biology				
5.	201400283	Biomedical Materials Engineering				
6.	201400174	Data Science				
7.	201800177	Deep Learning - From Theory to Practice				
8.	201400287	Ergonomics				
9.	191210001	Instrumentation for Embedded Systems				
10.	191211120	Lab-on-a-chip				
11.	191506001	Mathematical Methods				
12.	201200220	Nanomedicine				
13.	191551150	Numerical Techniques for PDE				
14.	191561620	Optimal Control				
15.	191210920	Optimal Estimation in Dynamic Systems				

16.	193572010	Physics of Bubbles				
17.	191211090	Real-Time Software Development				
18.	201300004	Robotics for Medical Applications				
19.	201600028	Telemedicine and Data Analysis				

Courses in 2 quartiles have a spread studyload (e.g. 2,5EC each quartile, 5EC total)

Table 8. Quartile 3

	Code	Course	1A	1B	2A	2B
1.	201900123	Advanced organic chemistry				
2.	193810020	Advanced Techniques for Signal Analysis				
3.	193700050	AMM-Project Organic Materials				
4.	201800156	Biomechanics of Human Movement				
5.	201400284	Biomedical Membranes & Artificial Organs				
6.	191210720	Biomedical Signal Acquisition				
7.	193400111	Bionanotechnology				
8.	201400584	Design of Persuasive Health Technology				
9.	191131360	Design Principles for Precision Mechanisms 2				
10.	201000159	Durability of Consumer Products				
11.	193580020	Experimental Techniques in Physics of Fluids				
12.	201400046	Experimental Methods				
13.	191150480	Human Movement Control				
14.	191210910	Image Processing and Computer Vision				
15.	201900260	Magnetic Methods for Imaging				
16.	193542070	Medical Acoustics				
17.	193400121	Nano-Fluidics				
18.	194121020	Optimization of Healthcare Processes				
19.	201800335	Programming 2				
20.	191551200	Scientific Computing				
21.	191131700	System Identification and Parameter Estimation				
22.	191155730	Tribology				
23.	191211060	Modern Robotics (Prof. dr. ir. S. Stramigioli) **Track Medical Device Design**				

Courses in 2 quartiles have a spread studyload (e.g. 2,5EC each quartile, 5EC total)

Table 9. Quartile 4

	Code	Course	1A	1B	2A	2B
1.	201100254	Advanced Computer Vision and Pattern Recognition				
2.	201400282	Bioelectromagnetics				
3.	201200133	Biomechatronics				
4.	193500000	Biomedical Optics				
5.	193640050	Clinical Chemistry (max. 15 participants)				
6.	193810100	Dynamic Behaviour of Neuronal Networks				
7.	192360501	E-health Strategies				
8.	201700071	Identification of Human Physiological Systems				
9.	201800114	Imaging Technology in Radiology				

10.	191211110	Modelling and Simulation				
11.	201400048	Moulding Technology				
12.	193730040	Polymers and Material Science Practice				
13.	201000262	Surgical Navigation Technology				
14.	191622510	Technology and Social Order				
15.	191571090	Time Series Analysis				
16.	201600327	Tissue Engineering				
17.	200900040	Topics in Human Anatomy & Sports Physiology (could be altered in q4 col. 2021 t.b.d.)				
18.	202001580	Early HTA during Med. Device Development (dr.ir. H. Koffijberg)				
19.	T.B.D.	**Technology for assessment of performance in sports**				
20.	202000040	Introduction to Robotics Design (Dr. V. Kalpathy Venkiteswaran) **Track Medical Device Design**				

Table 10. Capita Selecta

	Code	Course	1A	1B	2A	2B
1.	193640010	Capita Selecta BME				
2.	201400267	Capita Selecta BW				
3.	201800207	Capita Selecta RAM				
4.	201400270	Capita Selecta BIOS				
5.	201400269	Capita Selecta BSS				
6.	(code t.b.a.)	Capita Selecta AST				
7.	201400268	Capita Selecta BMPI				
8.	201400266	Capita Selecta BST				
9.	201400271	Capita Selecta CNPH				
10.	201400272	Capita Selecta DBE				
11.	201400275	Capita Selecta NBP				
12.	201400273	Capita Selecta MCBP				
13.	201400274	Capita Selecta MTG				
14.	201400276	Capita Selecta NIM				
15.	201600219	Capita Selecta POF				
16.	202001596	Capita Selecta BioEE				

Article 9 Sequence of study units

1. Before the start of a study unit, the student must meet the prior knowledge requirements of that study unit.
2. The student may only begin working on their master thesis project after completing at least 65 EC of the master's programme, including the internship.
3. In order to pass the master thesis defence, the student must have completed all other study units of the master's programme.
4. The examination board is authorised to grant an exemption of the conditions stipulated in sections 1 to 3 of this article in cases where the strict application of these conditions would result in an unjustifiable delay of a student's study progress. The student may submit their request for exemption to the examination board.
5. Students may begin their internship once they have completed 30 ECs' worth of subjects.

Article 10 Final master's assignment

1. The purpose of this assignment is to learn to independently execute a research assignment of a certain scope and complexity.

2. The final master's assignment is generally conducted with one of the UT's biomedical chairs.

3. The final master's assignment is designed in coordination with the graduation professor.

4. If the student opts for an external graduation assignment, this must be conducted under the responsibility of one of the professors involved in the BMT/BME study programme. Furthermore, the assignment must be presented for approval to the examination board.

5. Procedures pertaining to the final master's assignment can be found in the master's assignment guideline.

Article 11 Dual master's guideline

If a student wishes to combine the BME master's programme with a second master's programme, they must acquire approval from both examination boards beforehand.

For the BME master's programme, the student has to meet the following requirements:

- 60 ECs' worth of BME subjects (in accordance with article 6), including 30 ECs' worth of subjects that form part of both study programmes
- A combined internship of 20 EC
- A combined master's thesis of 70 EC.
- Furthermore, the student must also meet the requirements of the second master's programme.

The combined master's thesis and internship must be substantively approved by both examination boards beforehand.

The aforementioned ECs serve as a guideline; every request for a dual master's will be individually reviewed by the examination board. If a student wishes to deviate from these guidelines, they can submit their motivated request to the examination board.

Article 12 Internship

The purpose of the internship is to have students complete an assignment at an external organisation in order to gain experience in their future professional field and put the knowledge and skills they have thus far acquired during their studies into practice. This external organisation can be a health care institution, a research institute, a university or a biomedical company.

Article 13 Quality assurance

The quality of education is systematically monitored according to the Plan-Do-Check-Act (PDCA) cycle. The quality assurance system is described in the BMT/BME Quality Assurance Manual[1] and consists of two parts:

1. The organisation of the faculty with all actors who play a role in the management, organisation, development and execution of the study programme. Through a clear division of tasks and responsibilities and mutual coordination, the actors jointly ensure a high-quality study programme.

2. The evaluation system that monitors the quality of the study programme and provides the actors with information on the quality and is therefore aimed at educational development and continuous quality improvement. Furthermore, the evaluation system also provides information for external accountability about the study programme to bodies within the university (such as the Faculty Council, the dean, the University Council and the Executive Board) and outside the university (the Ministry, the Education Inspectorate, review committees and accreditation bodies).

A complaints procedure for students forms part of the quality assurance provisions.

Article 14 Transitional arrangement

1. If the study programme included in article 7 of this supplement is amended or if one of the articles in the general section or in this programme-specific supplement is amended, the programme will draw up and publish a transitional arrangement.

[1] The Quality Assurance Manual can be found on the OKC's Canvas page.

2. The conditions for such transitional arrangements are stipulated in article 8.4 of the general section.

3. Any transitional arrangements are published on the website of the Biomedical Engineering programme.

Article 15 Safety

Working in a laboratory is subject to certain safety requirements. Students are obligated to inform themselves of these rules and comply with them.

Article 16 Flexible programme

By way of derogating from the provisions in article 7 of this supplement, the student can submit a request to the examination board to follow a flexible programme as referred to in article 7.3d of the WHW. The examination board will assess whether the flexible programme fits within the domain of the master's programme, is coherent and is of a sufficient level in light of the aims and attainments of the programme.

Article 17 Student counselling

1. The programme director will appoint a student adviser for the purpose of student counselling. The student adviser's job is to, on the one hand, advise and guide individual students regarding all aspects of their studies and, on the other hand, inform the programme director regarding the students' study progress.

2. Over the course of the study programme, the student adviser monitors the progress made by the students assigned to them and offers them solicited and unsolicited advice.

3. The student adviser provides solicited and unsolicited advice to the examination board regarding decisions that affect individual students; in doing so, the student adviser and the examination board will treat any information provided to them by the students confidentially.

Article 18 Amendment

In the event of amendments to the programme supplement, the provisions of articles 8.3 and 8.4 of the general section shall apply.

Article 19 Commencement

These regulations will enter into force on 1 September 2021 and replace the regulations of 26 October 2020.

Adopted by the Faculty Board after having obtained advice from the TNW Faculty Council and the BME Programme Committee and with consent from the BME Programme Committee with article 3, 5, 8, 13 and 15.

Enschede, 21 July 2021.