Appendices

to

Teaching and Examination Regulations

2023-2024

Bachelor degree programme

in

Biomedical Engineering

Appendix I Learning outcomes of the Bachelor's degree programme (Article 1.3.1)

A. Generic learning outcomes — Knowledge

A1. Bachelor's graduates have general knowledge and understanding of mathematics, natural sciences (biology, physics, chemistry), life sciences (biochemistry, anatomy, physiology) and engineering sciences (mechanical, electrical) underlying biomedical engineering.

A2. Bachelor's graduates are familiar with the quantitative nature of mathematics, natural sciences and engineering sciences, and have a general understanding of the models and methods used in these fields, including computer-aided methods.

A3. Bachelor's graduates are familiar with the learning methods necessary to follow developments in biomedical engineering. They are able to engage in lifelong learning and are prepared to continue in any Master's programme on Biomedical Engineering.

B. Generic Learning outcomes — Application of knowledge

B1. Bachelor's graduates are able to apply knowledge of mathematics, natural sciences, life sciences and engineering sciences to conduct research on basic biomedical problems; to contribute to design of new solutions to biomedical problems and to contribute to the further development of devices, instruments or materials.

B2. Bachelor's graduates are familiar with materials, equipment and technologies typically used in the biomedical practice. They know how to perform measurements on biological systems and are able to interpret the data, and are aware of the problems associated with the interaction between living and non-living materials and systems.

B3. When involved in design, research and/or development, Bachelor's graduates demonstrate the ability to critically formulate the relevant questions, choose or propose appropriate methods, procedures and/or systems.

C. Generic Learning outcomes — Decision making

C1. Bachelor's graduates are aware of the key aspects of professional, ethical and societal responsibilities linked to the biomedical engineering practice, to decision making and to formulating judgments.

C2. Bachelor's graduates are able to reflect on professional, ethical and social responsibilities of biomedical engineering.

D. Generic Learning outcomes — Communication

D1. Bachelor's graduates have a general understanding of functioning methods of multidisciplinary teams and are able to function effectively as team members, contributing to meet deliverable, schedule and budget requirements.

D2. Bachelor's graduates are familiar with the established methods/tools of communication and their limitations.

D3. Bachelor's graduates are able to identify the appropriate method to effectively, clearly and unambiguously communicate their findings/results in a multidisciplinary setting.

Appendix II Majors and Minors of the degree programme (Article 3.7.4)

The programme consists of a core part, laying down the foundations for all biomedical engineers, and a 60 ECTS specialisation in one of the following three specialisations:

- Biomaterials Science and Engineering (BSE)
- Medical Imaging (MI)
- Medical Device Design (MDD)

Each specialisation includes a 15 ECTS deepening minor in period 1a of year 3. A minor from the collection of university, faculty minors or personal minor this period is permitted, but not recommended.

Appendix III Course units in the propaedeutic phase

- **List of course units; Article 4.1.1**
- **Compulsory order of examinations; Article 9.3**

Course elements year 1

The propaedeutic phase comprises a number of compulsory course units, listed in the table below. Course details, practical, entry requirement, mode of assessment and examination are described in Ocasys.

Compulsory course

Course code	Course unit name	ECTS
WBBE024-05	Anatomy and Physiology	5
WBBE007-05	Biomaterials 1	5
WBBE002-05	Biomechanics	5
WBBE054-05	Calculus (for BME)	5
WBBE047-05	Designing Biomedical Products 1	5
WBBE030-02	Ethics 1: Philosophy of Science & Scientific Integrity	2
WBBE029-05	Linear Algebra for BME	5
WBLT002-05	Mammalian Cell Biology	5
WBBE005-05	Material Science	5
WBBE026-05	Microbiology	5
WBBE041-05	Molecules of Life for BME	5
WBBE028-03	Physics Lab for BME	3
WBBE025-05	Statistics 1 for BME	5

Appendix IV Course units in the post-propaedeutic phase

- **List of course units; Article 7.1.1**
- **Compulsory order of examinations; Article 9.3**

Course elements year 2

Year 2 consists of compulsory course units and elective courses. All course units in the second year comprise a workload of 5 ECTS. Course details, practical, entry requirements, mode of assessment, examination and entry requirements are described in Ocasys.

Compulsory courses

Course code	Course unit name	ECTS
WBBE003-05	Biomedical Instrumentation	5
WBIE054-05	Dynamics and Vibrations	5
WBBE032-05	Electricity and Magnetism	5
WBBE033-05	Python and Numerical Methods	5
WBBE035-05	Cell Biology and Immunology	5
WBBE008-03	Designing biomedical products 2	3
WBBE034-02	Ethics 2: Biomedical Ethics	2
WBBE012-05	Imaging Techniques in Radiology 1	5
WBIE030-05	Signals and Systems	5
WBBE040-05	Waves and Optics for BME	5
	Electives (3)	15

Electives

In preparation of choosing the specialisation in year 3, in period 2B of year 2, students have to choose *three* elective courses from *two* of the specialisation-specific clusters:

Specialisation	Course code	Course unit name	ECTS
Biomaterial Science and Engineering	WBBE036-05	Lab course Biomaterials	5
	WBBE037-05	Surface characterization	5
Medical Imaging	WBBE039-05	Capitum Selectum Medical Imaging Principles and Applications	5
	WBBE031-05	Imaging Laboratory 1	5
Medical Device Design	WBBE038-05	Biological Physics	5
	WBBE023-05	Transport in Biological Systems	5

Course elements year 3

Year 3 consists of compulsory course units, elective courses, a bachelor project (15 ECTS) and a minor (15 ECTS). As a general entry requirement for course units in year 3, including the Minor, students must have successfully completed the propaedeutic phase. To start the *Bachelor's project Biomedical Engineering* the student needs to have obtained a minimum of 150 ECTS within the Biomedical Engineering bachelor degree programme, and needs to have finalized the *Research Course BME (WBBE010-09)*.
Course details, practical, entry requirements, mode of assessment, examination and entry requirements are described in Ocasys.

Compulsory courses

Course code	Course unit name	ECTS
WBBE901-15	Bachelor's Project Biomedical Engineering	15
WBBE009-05	Electronics	5
WBBE046-01	Ethics 3: Research Ethics	1
WBBE010-09	Research Course BME	9
WBFA021-05	Thermodynamics	5
WBBE042-05	Tissue Engineering and Regenerative Medicine	5
	Minor	15
	Elective (1)	5

Minor

During the first half of the first semester (period 1A) students will have to do a 15 ECTS minor. Within the programme, three deepening minors are offered:

Minor Biomaterial Science and Engineering

Course code	Course unit name	ECTS
WBBE052-05	Biofabrication	5
WBBE051-05	Big Data for BME	5
WBBE050-05	Biomedical Nanotechnology for BME	5

Minor Medical Imaging

Course code	Course unit name	ECTS
WBBE045-05	Applied Medical Visualization	5
WBBE051-05	Big Data for BME	5
WBBE049-05	Quantitative Image Analysis	5

Minor Medical Device Design

Course code	Course unit name	ECTS
WBBE052-05	Biofabrication	5
WBBE051-05	Big data for BME	5
WBBE004-05	Designing Biomedical Products 3	5

Electives

During the first half of second semester (period 2A,) students have to choose one specialisation elective course from:

Specialisation	Course code	Course unit name	ECTS
Biomaterial Science and Engineering	WBBE044-05	Physicochemical Concepts in Bionanotechnology	5
Medical Imaging	WBBE043-05	Imaging Laboratory 2	5
Medical Device Design	WBBE048-05	Biomedical Sensors	5

Appendix V Admission to the post-propaedeutic phase (Article 6.1.1)

The following candidates will be admitted to the post-propaedeutic phase:
a. Students who have been issued a positive study advice from the degree programme in question

Appendix VI Contact hours propaedeutic and post-propaedeutic phase (Article 3.6)

The following candidates will be admitted to the post-propaedeutic phase:
Students who have been issued a positive study advice from the degree programme Biomedical Engineering at the University of Groningen.

The Board of Examiners decides over students from other degree programmes.

Degree programme year 1	
Structure contact hours	**Contact hours per year**
Lectures	110
Tutorials	60
Practicals	120
Supervision during an internship	N/A
Examinations	30

Degree programme year 2	
Structure contact hours	**Contact hours per year**
Lectures	180
Tutorials	120
Practicals	200
Supervision during an internship	N/A
Examinations	30

Contact hours during year 3 depend on courses chosen during the minor and/or elective.

Appendix VII Additional Requirements Open degree Programmes (Art. 7.3)

In exceptional circumstances students wishing to pursue an open degree programme may file a request with the Board of Examiners. The Board of Examiners will evaluate whether the proposed curriculum meets the learning outcomes of the degree programme and can determine further conditions in their Rules and Regulations.

Appendix VIII Transitional provisions (article 12.1)

Course unit	**Replaced by**
WBIE003-05 Calculus 1 (for IEM)	WBBE054-05 Calculus (for BME)
WBPH021-05 Mechanics and Relativity 2	WBIE054-05 Dynamics and Vibrations