Appendices
to
Teaching and Examination Regulations
2026-2027
Master's degree programme
in
Biomedical Engineering

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Appendix I. Learning outcomes of the degree programme (Art. 3.1)

A graduate with a Master of Science in BME is able to:

1. *Acquire expertise in Biomedical engineering*

A Biomedical Engineer is able to continuously improve his/her expertise (knowledge and competences) by building on his/her thorough mastery of a specific field of biomedical engineering. This is demonstrated, not only by the Biomedical Engineer's ability to develop and apply new knowledge based on a critical reflection on standard knowledge but more so by increasing or adapting his/her competences by critically and independently reflecting on his/her own thinking, decision making, and acting.

2. *Analyse the problem and define aim*

A Biomedical Engineer is able to analyse biomedical problems of a complex nature by choosing the appropriate level of abstraction and by critically examining existing theories, models or interpretations based on the assessment of the scientific value of current research within Biomedical Engineering. The Biomedical Engineer thereby creates a cause-effect model, distinguishes the problems that are fundamental and solvable and defines the aim which has the highest priority.

3. *Create a Design, Research & Development proposal*

A Biomedical Engineer is able to design different strategies to obtain the defined aim, and has the skills in, and the affinity with the design, use and validation of models to allow the Biomedical Engineer to consciously choose the most efficient and effective Design, Research & Development plan.

4. *Execute the Design, Research & Development plan*

A Biomedical Engineer is able to execute a Design, Research & Development plan and to adapt it when external circumstances or advancing insight requires it. Depending on the project the focus may be more on the scientific approach to increase knowledge and understanding (research), on prototyping and product improvement (development) or on the design of new devices or systems, although all three aspects are essential in the Design, Research & Development cycle of innovative products.

5. *Analyse and interpret the data*

A Biomedical Engineer is able to ask adequate questions and has a critical, yet constructive attitude towards analysing and solving complex real-life biomedical problems. The Biomedical Engineer is able to form a well-reasoned opinion in the case of incomplete or irrelevant data; is able to analyse and interpret the results of Design, Research & Development in terms of statistics, limitations and the relation to existing literature and devices aiming to contribute to the advancement of knowledge in his or her field of Biomedical Engineering and beyond it.

6. *Communicate results*

A Biomedical Engineer, as an interdisciplinary specialist, is able to communicate orally and in writing about Design, Research & Development with colleagues, non-colleagues and other involved parties including health care providers and patients. In addition, the Biomedical Engineer is able to debate about both Biomedical Engineering and the place of Biomedical Engineering in society.

7. *Embed the results in scientific and social context*

A Biomedical Engineer is able to analyse and to discuss the social consequences (economic, social, cultural) of new developments in Biomedical Engineering with colleagues and non-colleagues; has insight into (debates about) scientific practice and is able to analyse and to discuss the ethical and the normative aspects of the consequences and assumptions of the scientific practice with colleagues and non-colleagues and is able to integrate these ethical and normative aspects in its own work.

8. *Demonstrate a professional attitude*

A Biomedical Engineer is able to incorporate the knowledge, skills and competences described above and demonstrates a professional attitude by showing a high level of independence, responsibility and commitment. In addition, the Biomedical Engineer shows social skills as well as the ability to improve after feedback.

Appendix II. Tracks/specializations (Art. 3.6)

The degree programme is divided into the following tracks:

Biomaterials Science and Engineering
Medical Device Design
Medical Imaging

Appendix III. Content of the degree programme (Art. 3.7.1)

Course details, teaching method, practical, entry requirements, mode of assessment, and entry requirements of the courses are described in Ocasys.

1. Course elements of the track Biomaterials Science and Engineering

Course elements year 1

Course code	Course name	ECTS
WMBE011-05	Biofilms	5
WMBE041-05	Biomaterial Interface Technology	5
WMBE030-05	Nanomedicines for Biomedical Applications	5
WMBE014-05	Engineering and Biotribology	5
WMBE31-05	Medical Device Innovation and Translation 1	5
WMBE021-05	Statistical Methods for BME	5
WMBE022-30	Internship BME [1]	30
	Seminars (4) [1]	-

[1] As described in the Guidelines on Study Guide on Brightspace.

Course elements year 2

Course code	Course name	ECTS
WMBE037-05	3D Bioprinting for Tissue Engineering	5
WMBE003-05	Integrated Lab Course Biomaterials	5
WMBE009-05	Recent Developments in Biomaterials	5
WMBE018-05	Technology and the Ethics of Research	5
WMBE042-05	Advanced Microscopy and Imaging	5
WMBE901-30	Master's Project [1, 2]	30
	Elective (1)	5
	Seminars (4) [2]	-

[1] As described in the Guidelines on the Study Info page on Brightspace.
[2] Included in the Master's project are: Workshop Scientific writing, workshop Letter writing, workshop CV writing, project proposal, presentation symposium.

2. Course elements of the track Medical Device Design

Course elements year 1

Course code	Course name	ECTS
WMBE024-05	Control Engineering for BME [1]	5
WMBE016-05	Prosthetics and Orthotics	5
WMBE029-05	Product Design by FEM (for BME)	5
WMBE31-05	Medical Device Innovation and Translation 1	5
WMBE021-05	Statistical Methods for BME	5
WBIE011-05	Mechatronics [2]	5
WMBE022-30	Internship BME [1]	30
	Seminars (4) [3]	-

[1] This course is of appropriate level for the bachelor Applied Physics and bachelor Astronomy (minor Instrumentation and Informatics).
[2] This course is of appropriate level for the master Biomedical Engineering.
[3] As described in the Guidelines on the Study Guide on Brightspace.

Course elements year 2

Course code	Course name	ECTS
WMME036-05	AI Applications in Engineering	5
WMIE038-05	Robotics and Automation	5
WMBE026-05	Bio-signal processing for human machine interaction	5
WMME037-05	MEMS, NEMS and Nanofabrication	5
WMBE018-05	Technology and the Ethics of Research	5
WMBE901-30	Master's Project [1, 2]	30
	Elective (1)	5
	Seminars (4) [2]	-

[1] As described in the Guidelines on BME Study Info page on Brightspace.
[2] Included in the Master's project are: Workshop Scientific writing, workshop Letter writing, workshop CV writing, project proposal, presentation symposium.

3. Course elements of the track Medical Imaging

Course elements year 1

Course code	Course name	ECTS
WMBE035-05	MATLAB Concepts for Image and Data Analysis	5
WMBE008-05	Physics in Nuclear Medicine	5
WMBE007-05	MRI	5
WMBE31-05	Medical Device Innovation and Translation 1	5
WMBE013-05	Computed Tomography	5
WMBE021-05	Statistical Methods for BME	5
WMBE022-30	Internship BME [1]	30
	Seminars (4) [1]	-

[1] As described in the Guidelines on the Study Guide on Brightspace.

Course elements year 2

Course code	Course name	ECTS
WMBE034-10	Advanced Medical Imaging for Diagnosis and Treatment	10
WMBE015-05	Medical Physics for Radiation Oncology	5
WMBE042-05	Advanced Microscopy and Imaging	5
WMBE018-05	Technology and the Ethics of Research	5
WMBE901-30	Master's Project [1, 2]	30
	Elective (1)	5
	Seminars (4) [2]	-

[1] As described in the Guidelines on the Study Info page on Brightspace.
[2] Included in the Master's project are: Workshop Scientific writing, workshop Letter writing, workshop CV writing, project proposal, presentation symposium.

Appendix IV. Electives (Art. 3.8.1)

Electives
Course details, teaching method, practical, entry requirements, mode of assessment, and entry requirements of the courses are described in Ocasys.

Track Biomaterials Science and Engineering
During year 2, one of the below mentioned courses need to be chosen.

Course code	Course name	ECTS
WMBE032-05	Medical Device Innovation and Translation 2	5
WMBE029-05	Product Design by FEM (for BME)	5

Track Medical Device Design
During year 2, one of the below mentioned courses need to be chosen.

Course code	Course name	ECTS
WMBE032-05	Medical Device Innovation and Translation 2	5
WMBE035-05	MATLAB Concepts for Image and Data Analysis	5

Medical Imaging
During year 2, one of the below mentioned courses need to be chosen.

Course code	Course name	ECTS
WMBE032-05	Medical Device Innovation and Translation 2	5
WMME036-05	AI Applications in Engineering	5

Approved extracurricular course(s):

Course code	Course name	ECTS
WMBE040-05	CybaNorth Team	5
WMBE027-05	Radiation Safety	5
WMBE039-05	Data Science and AI in Healthcare	5

Courses selected by students
Upon request of the student, the Board of Examiners may approve courses that are not mentioned in Appendix III or IV. The request procedure must start at least 6 weeks before the course enrolment deadline. The procedure starts when the Board of Examiners receives a request form with a detailed course description and a clear argumentation containing the relevance of the selected course for the student's curriculum.

The Board of Examiners will decide on an individual basis if permission is granted. The student will be informed about the Board's decision, within 6 weeks by email.

Appendix V. Entry requirements and compulsory order (Art. 4.4)

Course details, teaching method, practical, entry requirements, mode of assessment, and entry requirements of the courses are described in Ocasys.

Course code	Course unit	ECTS	Entry requirements
WMBE022-15	Internship	15	A minimum of 15 ECTS finalized courses from the curriculum of the Master's programme Biomedical Engineering needs to be finalised before the start of the Internship.
WMBE022-30	Internship	30	A minimum of 15 ECTS finalized courses from the curriculum of the Master's programme Biomedical Engineering needs to be finalised before the start of the Internship.
WMBE901-30	Master's project	30	45 ECTS of courses from the curriculum of the Master's programme Biomedical Engineering needs to be finalised four weeks before the start of the Master's project, including the Internship (WMBE022-15 or WMBE022-30)

Appendix VI. Admission to the degree programme (Art. 2.1A.1, 2.1A.2 and Art. 2.1B.1)

Admission to the Master's degree programme

1. Holders of the following University of Groningen Bachelor's degrees are considered to have sufficient knowledge and skills and will be directly admitted to the Master's degree programme:
   a. Holders of a Bachelor's degree in Life Science and Technology with a major Biomedical Engineering from the University of Groningen (old curriculum, start date prior to 2020).
   b. Holders of a Bachelor's degree in (Applied) Physics from the University of Groningen, including:

WBBY024-05	Modelling Life
WBPH023-05	Molecular Biophysics
WBBE007-05	Biomaterials 1
WBPH042-05	Physics of Fluid

2. Holders of a Bachelor's degree in Life Science and Technology from the University of Groningen Biomedical Engineering specialisation.
3. Holders of a Dutch University Bachelor's degree in Biomedical Engineering will be directly admitted to the Master's degree programme.
4. Students who successfully finalise one of the pre-master programmes of appendix VII will be directly admitted to the Master's degree programme in Groningen.

Appendix VII. Pre-master programmes and Fast-Track programmes (Art. 2.3)

A. Pre-Master's programmes

1. FSE offers Pre-Master's programmes of 60, 45 or 30 ECTS to access to the MSc Biomedical Engineering and individually determined pre-Master's programmes.
   The overview below shows:
   - which NVAO-accredited HBO/WO diploma grants access to the MSc Biomedical engineering upon completion of the Pre-Master's programme;
   - the content and workload for these fixed pre-master programmes;
   - starting date premaster programmes: 1 September.

Pre-master programme A:
- WO Bachelor Movement Science (Bewegingswetenschappen, CROHO code: 56950)

Semester	Code	Course	ECTS
1a	WBBE033-05	Python and Numerical Methods	5
1a	WBBE055-05	Mathematical Tools (for BME)	5
1a	WBBE062-05	Principles of Design Engineering	5
1b	WBBE005-05	Material Science	5
1b	WBBE032-05	Electricity and Magnetism	5
1b	WBBE023-05	Transport in Biological Systems	5
2a	WBBE057-05	Physics and Technology of Medical Imaging	5
2a	WBBE041-05	Molecules of Life for BME	5
2a	WBIE030-05	Signals and Systems	5
2b	WBBE007-05	Biomaterials I	5
2b	WBBE009-05	Electronics	5
Total			**55**

Pre-master programme B:
- HBO Mechanical Engineering (Werktuigbouwkunde, CROHO 34280)
- WO Industrial Design (Industrieel Ontwerpen, CROHO 56955)
- HBO Electrical Engineering (Elektrotechniek, CROHO 34267)

Semester	Code	Course	ECTS
1a	WBLT002-05	Mammalian Cell Biology	5
1a	WBBE055-05	Mathematical Tools (for BME)	5
1b	WBBE024-05	Anatomy and Physiology	5
1b	WBBE002-05	Biomechanics	5
1b	WBBE005-05	Material Science	5
2a	WBIE030-05	Signals and Systems	5
2a	WBBE041-05	Molecules of Life for BME	5
2a	WBBE057-05	Physics and Technology of Medical Imaging	5
2b	WBBE007-05	Biomaterials 1	5
2b	WBBE053-10	Pre-master project BME *	10
Total			**55**

* WO Industrial Design Engineering: No project needed. Programme of 45 ECTS

Pre-master programme C:
- WO Business Engineering (CROHO 50769)

Semester	Code	Course	ECTS
1a	WBBE062-05	Principles of Design Engineering	5
1a	WBLT002-05	Mammalian Cell Biology	5
1a	WBBE055-05	Mathematical Tools (for BME)	5

1b	WBBE024-05	Anatomy and Physiology	5
1b	WBBE005-05	Material Science	5
1b	WBBE002-05	Biomechanics	5
2a	WBIE030-05	Signals and Systems	5
2a	WBBE041-05	Molecules of Life for BME	5
2a	WBBE057-05	Physics and Technology of Medical Imaging	5
2b	WBBE007-05	Biomaterials 1	5
2b	WBBE053-10	Pre-master project BME	10
Total			**50**

Pre-master programme D:
- Medical Imaging and Radiation Therapy (Medisch Beeldvormende en Radiotherapeutische Technieken, CROHO 34561)

Semester	**Code**	**Course**	**ECTS**
1a	WBBE054-05	Calculus for BME	5
1a	WBBE033-05	Python and Numerical Methods	5
1b	WBBE032-05	Electricity and Magnetism	5
1b	WBBE002-05	Biomechanics	5
1b	WBBE005-05	Material Science	5
2a	WBBE025-05	Statistics 1 for BME	5
2a	WBBE040-05	Waves and Optics for BME	5
2b	WBBE029-05	Linear Algebra for BME	5
2b	WBBE053-10	Pre-master project BME	10
Total			**50**

For programmes E to G there is a course option depending on the focus of the chosen pre-master track; Medical Device Design (MDD) and Biomaterials Science and Engineering (BSE) course option, or Medical Imaging (MI) course option.

Pre-master programme E:
- WO Life Science and Technology (all specialisations, except Biomedical Engineering; CROHO 56286)
- HBO Biomedical Engineering (Biomedische Technologie, CROHO 35530)

Semester	**Code**	**Course**	**ECTS**
1a	WBBE055-05	Mathematical Tools (for BME)	5
1a	WBBE062-05 WBBE033-05	Principles of Design Engineering *MDD/BSE course* Python and Numerical Methods *MI course*	5
1b	WBBE005-05	Material Science	5
1b	WBBE032-05	Electricity and Magnetism	5
2a	WBBE057-05	Physics and Technology of Medical Imaging	5
2a	WBBE041-05	Molecules of Life for BME	5
2a	WBIE030-05	Signals and Systems	5
2b	WBBE007-05 WBBE060-05	Biomaterials I *MDD/BSE course* Biomedical Image Processing *MI course*	5
2b	WBBE053-10	Pre-master project BME*	10
Total			**50**

* WO Life Science and Technology: No project needed. Programme of 40 ECTS

Pre-master programme F:
- WO Industrial Engineering and Management (Technische Bedrijfskunde, CROHO 56994)

Semester	Code	Course	ECTS
1a	WBBE033-05	Python and Numerical Methods	5
1a	WBLT002-05	Mammalian Cell Biology	5
1a	WBBE052-05 WBBE058-05	Biofabrication *MDD/BSE course* Microscopy and Imaging *MI course*	5
1b	WBBE024-05	Anatomy and Physiology	5
1b	WBBE035-05	Cell Biology and Immunology	5
1b	WBBE023-05 WBBE031-05	Transport in Biological Systems *MDD/BSE course* Imaging Laboratory 1 *MI course*	5
2a	WBBE040-05	Waves and Optics for BME	5
2a	WBBE041-05	Molecules of Life for BME	5
2a	WBBE057-05	Physics and Technology of Medical Imaging	5
2b	WBBE007-05 WBBE060-05	Biomaterials I *MDD/BSE course* Biomedical Image Processing *MI course*	5
		Total	**50**

Pre-master programme G:
- WO Physics (Natuurkunde, COHO 50206; when missing the requirements mentioned in Appendix VI)
- WO Applied Physics (Technische Natuurkunde, COHO 56962)
- WO Astronomy (Sterrenkunde, CROHO 50205)

Semester	Code	Course	ECTS
1a	WBLT002-05	Mammalian Cell Biology	5
1a	WBBE062-05 WBBE058-05	Principles of Design Engineering *MDD/BSE course* Microscopy and Imaging *MI course*	5
1b	WBBE024-05	Anatomy and Physiology	5
1b	WBBE023-05 WBBE031-05	Transport in Biological Systems *MDD/BSE course* Imaging Laboratory 1 *MI course*	5
2a	WBBE041-05	Molecules of Life for BME	5
2a	WBBE057-05	Physics and Technology of Medical Imaging	5
2a	WBBE042-05	Tissue Eng. and Regen. Med.	5
2b	WBBE026-04	Microbiology	4
2b	WBBE061-01	Safe Microbiological Techniques for BME	1
2b	WBBE007-05 WBBE060-05	Biomaterials I *MDD/BSE course* Biomedical Image Processing *MI course*	5
		Total	**45**

2. For holders of a WO and/or HBO diploma not listed above, or for holders of a Dutch or foreign degree not listed in Appendix VI, the Board of Admissions decides:
    a. The content and the student workload of a tailor-made pre-master's programme.
    or
    b. Admission is not granted.

B. Fast-Track programmes

The MSc degree programme does not offer Fast-Track programmes.

Appendix VIII. Transitional provisions (Art. 7.1)

Course unit	Replaced by
Changes curriculum 2024-2025: Applies to all registered student who have to finalise one of the below mentioned course unit(s)	
WMBE005-05 Introduction to MATLAB Programming for BME	WMBE035-05 MATLAB Concepts for Image and Data Analysis
WMBE023-05 Medical Device Commercialization	WMBE032-05 Medical Device Innovation and Translation 2
WMBE028-05 Quantitative Image Analysis + WMBE010-05 Applied Medical Visualization	WMBE034-10 Advanced Medical Imaging for Diagnosis and Treatment
WMBE017-05 Surface Characterization	WMBE030-05 Nanomedicines for Biomedical Applications
WMBE002-05 Conventional Imaging Techniques in Ultrasound	WMBE038-05 Conventional Imaging Techniques in Radiology
Changes curriculum 2025-2026: Applies to all registered student who have to finalise one of the below mentioned course unit(s)	
WMBE001-05 Biomaterials 2 (MDD track)	WMME027-05 Introduction to Data Science
WBME022-15 Internship	WMBE022-30 Internship BME - Students who started the master's programme in 2025 or earlier, are allowed to do WBME022-15 Internship
Changes curriculum 2026-2027: Applies to all registered student who have to finalise one of the below mentioned course unit(s)	
WMBE001-05 Biomaterials 2 (BSE track)	WMBE041-05 Biomaterial Interface Technology Two exam opportunities for Biomaterials 2 will be offered in 2026-2027
WBBE005-05 Interface Biology (MDD, BSE track)	WMBE041-05 Biomaterial Interface Technology Two exam opportunities for Interface Biology will be offered in 2026-2027
WMBE019-05 Biomedical Instrumentation 2	No replacement course in the curriculum. Two exam opportunities for Biomedical Instrumentation will be offered in 2026-2027
WMBE033-05 Radiation Physics	WMBE008-05 Physics in Nuclear Medicine Two exam opportunities for Radiation Physics will be offered in 2026-2027
WMBE006-05 Microscopy and Imaging	WMBE042-05 Advanced Microscopy and Imaging Two exam opportunities for Microscopy and Imaging will be offered in 2026-2027
WMBE038-05 Conventional Imaging Techniques in Radiology	Course will return in the curriculum of 2027-2028. Two exam opportunities will be offered in academic year 2026-2027
WMME027-05 Introduction to Data Science	WMME036-05 AI Applications in Engineering Two exam opportunities for Introduction to Data Science will be offered in 2026-2027
WMIE010-05 MEMS, NEMS and Nanofabrication	WMME037-05 MEMS, NEMS and Nanofabrication
WMIE005-05 Robotics for IEM	WMIE038-05 Robotics and Automation

Appendix IX Additional Requirements Open Degree Programmes (Art. 3.9.2)

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.