

# **Teaching and Examination Regulations**

**2016-2017**

## **Appendices master's degree programme Biomedical Engineering**

### **Appendix I. Learning outcomes of the degree programme (art. 1.3)**

A graduate with a Master of Science in BME can:

- 1 Reproduce and demonstrate knowledge of anatomy of the musculoskeletal, circulatory, digestive, respiratory, excretory, endocrine and nervous systems and general knowledge of tissues
- 2 Reproduce and demonstrate knowledge of physiology of the muscular, circulatory, digestive, respiratory, sensory and nervous system
- 3 Reproduce and demonstrate knowledge of general (patho)physiologic mechanisms (inflammation, infection, immunology, repair)
- 4 Reproduce and demonstrate knowledge of principles of biochemistry and cell biology
- 5 Signal analysis, system dynamics and computational mathematics
- 6 Reproduce and demonstrate knowledge of biotransport in terms of heat transport, mass transport, biofluid mechanics.
- 7 Demonstrate a systematic approach - characterised by the development and use of theories, models and cohesive interpretations and insight into the specific nature of science, design and technology
- 8 Argue soundly, evaluate and judge critically on their own work and that of others.
- 9 Demonstrate proper co-operation with other biomedical engineers and with medical experts.
- 10 Integrate medical, cultural, social and ethical insights in her/his work.
- 11 Use current scientific knowledge, assess deficiencies and extend this knowledge by means of life-long learning. Integrate all acquired knowledge and skills to perform a research or design project.
- 12 Apply design skills, including design methodology, risk analysis, project management, market survey.
- 13 Show understanding of ethics, including regulatory affairs, and social implications.
- 14 Apply skills and knowledge within a European industry or hospital. Demonstrate entrepreneurial skills and IP knowledge as part of their professional development.
- 15 Demonstrate written and oral communication in English within the Biomedical Engineering field.
- 16 Reproduce and demonstrate knowledge of bio-instrumentation; overview of diagnostic instruments, their possibilities, limitations, physical principles, the phenomena they measure, the relation with the required information.
- 17 Reproduce and demonstrate knowledge of medical imaging in terms of an overview of present equipment for diagnostics, their possibilities and limitations, their physical principles, the phenomena they measure.
- 18 Apply knowledge and understanding in designing new/improved diagnostic instruments
- 19 Apply knowledge and understanding in research involving diagnostic instruments
- 20 Reproduce and demonstrate knowledge of biomaterials in terms of an overview of potential materials, their properties, applications and limitations, in terms of biocompatibility and failure mechanisms.

- 21 Reproduce and demonstrate knowledge of biomechanics in terms of statics, mechanics of materials (strength, stiffness, stress, deformation), dynamics (kinematics, kinetics, including gait analysis).
- 22 Apply knowledge and understanding in designing new or improved therapy devices.
- 23 Apply knowledge and understanding in research involving therapy devices.

## **Appendix II. Specialisations of the degree programme**

(art. 2.2)

The degree programme is divided into the following specialisations:

- a. Diagnostic Imaging and Instrumentation
- b. Prostheses & Implant Interface Technology
- c. Prostheses & Implant Design

## Appendix III. Content of degree programme (art. 2.3)

Course details and mode of assessment and examination are described in Ocasys.

### 1. Course elements year 1

#### 1a. General course elements

Course element	ECTS
Biomaterials 2	5
Biomedical Instrumentation 2	5
Control Engineering	5
Interdisciplinary Project	5
Mechatronics	5
Modelling and Simulation	5
Technology and the Ethics of Research	5
Electives	10
Internship *	15
Seminars (4) *	-

\* As described in the Guidelines on the Study Portal

#### 1b. CEMACUBE course elements

Course element	ECTS
Basic Biomedical Knowledge 1	5
Basic Biomedical Knowledge 2	5
Biomaterials 2	5
Biomedical Instrumentation 2	5
Interdisciplinary Project	5
Modelling and Simulation	5
Technology and the Ethics of Research	5
Electives	10
Internship *	15
Seminars (4) *	-

\* As described in the Guidelines on the Study Portal

## 2. Course elements year 2

### 2a. Course elements of the specialisation *Diagnostic Imaging & Instrumentation*

Course element	ECTS
Image Processing	5
Imaging Techniques in Radiology 2	5
Magnetic Resonance Physics	5
Medical Physics in Radiation Oncology	5
Physics in Nuclear Medicine	5
Master's Project *	35
Seminars (4) *	-

\* As described in the Guidelines on the Study Portal

### 2b. Course elements of the specialisation *Prosthesis & Implant Interface Technology*

Course element	ECTS
Colloid and Interface Science	5
Interface Biology	5
Integrated Lab Course Biomaterials	5
Recent Developments in Biomaterials	5
Surface Characterization	5
Master's Project *	35
Seminars (4) *	-

\* As described in the Guidelines on the Study Portal

### 2c. Course elements of the specialisation *Prosthesis & Implant Design*

Course element	ECTS
Robotics	5
Interface Biology	5
Neuromechanics	5
Product Design by the Finite Element Method	5
Prosthetics and Orthotics	5
Master's Project *	35
Seminars (4) *	-

\* As described in the Guidelines on the Study Portal

## **Appendix IV. Electives (art. 2.4)**

Course details and mode of assessment and examination are described in Ocasys.

### **1. Electives year 1**

#### **1a. General Electives**

<b>Course element</b>	<b>ECTS</b>
Engineering & Biotribology	5
Radiation Physics	5
Statistical Methods in Physics	5
Scientific visualization	5

#### **1b. CEMACUBE Electives**

<b>Course element</b>	<b>ECTS</b>
Neuromechanics	5
Imaging Techniques in Radiology 1	5
Statistical Methods in Physics	5
Scientific visualization	5

### **2. Courses selected by students**

Upon request of the student, the Board of Examiners may approve a course that is not mentioned above. The request procedure must be started at least 6 weeks before the start of the course, and starts when the Board of Examiners receives a new programme proposal, supplemented with argumentation for the request, plus a detailed course description. The argumentation should contain the relevance of the selected course for the student's individual 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 VI. Admission to the degree programme and different specializations (art. 5.1, 5.2, 5.3)**

### **Admission to the Master's degree programme**

1. Holders of a Bachelor's degree in Life Science & Technology with a major Biomedical Engineering from the University of Groningen, holders of a Bachelor's degree in Physics with the track Life and Health from the University of Groningen, and holders of a Dutch University Bachelor's degree in Biomedical Engineering are considered to have sufficient knowledge and skills and will be directly admitted to the Master's degree programme.
2. Holders of a non-university Bachelor's degree in electrical engineering or mechanical engineering may be admitted individually, under the condition of successfully finishing a premaster programme first. This premaster programme will have a fixed amount of ECTS (15, 30, 45 or 60 ECTS).
3. All other students who apply for the Master's degree programme are individually screened by the BME Admissions Board. Depending on deficiencies, successfully finishing a premaster programme may be necessary before admission to the master programme is granted. This premaster programme will have a fixed amount of ECTS (15, 30, 45 or 60 ECTS). Another option is that any relevant deficiencies have to be neutralized in the first year of the Master's degree programme.
4. CEMACUBE students follow adjusted course elements in year 1 to catch up on the necessary biological background knowledge. In year 2, CEMACUBE students follow one of the regular specialization programmes.
5. International students (these are students with a non-Dutch Bachelor's degree) need to submit their application via the online application system of the University of Groningen to the Admissions Office. The admission deadlines are presented in Appendix VII. All candidates with an international degree are screened by the BME Admissions Board.

## **Appendix VII. Admission deadlines**

### **Application deadlines for admission**

(art. 5.6.1)

<b>Deadline of Application</b>	<b>EU/EEA students</b>	<b>non-EU/EEA students</b>
Start programme September 2017	May 01, 2017	May 01, 2017

### **Decision deadline Admissions Board**

(art. 5.6.3)

<b>Deadline of decision</b>	<b>EU/EEA students</b>	<b>non-EU/EEA students</b>
Start programme September 2017	June 01, 2017	June 01, 2017