

# **Appendix for the Bachelor degree programmes in Life Science & Technology**

## **Appendix I Learning outcomes of the Bachelor's degree programme (Article 1.3.a)**

Graduates are able to:

1. Explain general basic principles of biology from chemical and physical perspectives;
2. Explain the basic principles of applied technology within the field of life sciences;
3. Estimate the relevance of research results in Science, Technology, Engineering and Mathematics (STEM) published in academic journals and discuss these results with peers;
4. Describe fundamental and/or applied scientific research and/or a technological method and recognize areas of interest within it;
5. Describe the relationship between various disciplines and integrate terms and concepts from the subject areas;
6. Recognise and analyse scientific problems, and design a scientific/academic approach to them in a systematic manner;
7. Under supervision, formulate a research hypothesis or propose a research design within their own discipline, and possess sufficient practical skills to conduct the research themselves;
8. Explain the societal relevance of the discipline, evaluate the related responsibilities and judge their individual role in that context;
9. Develop a work method independently and proactively, justify it, and carry it out in order to achieve a specific aim;
10. Contribute to and take responsibility for solving a specific problem or task in a specific role as part of a team;
11. Report about research in a structured manner, both orally and in writing;

## **Appendix II Majors and Minors of the degree programme (Article 2.1.4)**

As of September 2020, the degree programme has one major: Life Science & Technology. This consists of the propaedeutic phase as listed in Appendix III and the post-propaedeutic phase as listed in Appendix IV.

The degree programme includes a minor of 30 ECTS, see also TER article 8A.

Students who started with the Life Science & Technology programme before the 1<sup>st</sup> of September 2020 can choose from the following majors:

- Behaviour and Neurosciences
- Biomedical Engineering
- Biomedical Sciences
- Molecular Life Sciences

Students who started with the Life Science & Technology programme before the 1<sup>st</sup> of September 2020 can choose from the following minors:

- Behaviour and Neurosciences
- Biomedical Engineering
- Biomedical Sciences
- Implantation and Function Recovery (only available to and mandatory for students of the major Biomedical Engineering)
- Molecular Life Sciences

## Appendix III Course units in the propaedeutic phase

- List of course units; Article 3.1.1
- Compulsory order of examinations; Article 8.2

For students who started the degree programme on or after the 1<sup>st</sup> of September 2020.

<b>Course unit name</b>	<b>ECTS</b>	<b>Practical</b>	<b>Entry requirements</b>
Optics	5		
Mammalian Cell Biology	5		
Practical Course Optics and Cell Biology	5	X (lab)	
Organic Chemistry for Life Science 1	5		
Biochemistry for LST	5	X (computer)	
Calculus for LST	5		
Biophysics	5		
Thermodynamics	5	X (computer)	
Principles of Physiology	5	X (computer)	
Pharmaceutical Analysis	5	X (lab)	
Programming for Life Sciences	5	X (computer)	
Scientific Reading and Communication Skills	5		

## Appendix IV Course units in the post-propaedeutic phase

- List of course units; Article 6.1.1
- Compulsory order of examinations; Article 8.2

For students who started the degree programme on or after the 1<sup>st</sup> of September 2020.

### Year 2

Course unit name	ECTS	Practical	Entry requirements
Microbiology	5		
Bioinorganic Chemistry	5		
Practical Course Microbiology	5	X (lab)	
Linear Algebra for LST	5		
Quantum Mechanics	5		
Imaging	5		
Organic Chemistry for Life Science 2	5		
Spectroscopy	5		
Practical Course Synthesis	5	X (lab)	
Genetics and Evolution	5		
Biotechnology	5		
Science, Ethics and Society	5		

### Year 3:

Course unit name	ECTS	Practical	Entry requirements
Minor	30	Depends on minor	Propaedeutic exam
Bachelor Research Project	15	X	At least 120 ECTS, including the propaedeutic exam
Electives * <ul style="list-style-type: none"> <li>• Physics</li> <li>• Biology</li> <li>• Chemistry</li> <li>• Biomedical Engineering</li> <li>• Biomedical Sciences</li> <li>• Medical Pharmaceutical Sciences</li> </ul>	15	Depends on elective	Depends on course

\* Electives will also depend on the master programme the student wants to pursue. Electives must be approved by the Board of Examiners.

Students who have not completed the propaedeutic phase are not allowed to enroll for more than 15 ECTS in one period (e.g. period 1a) including re-examinations. Students who have not passed first-year courses need to prioritise these when enrolling for second-year courses.

<b>Course unit name</b>	<b>ECTS</b>
Electricity and Magnetism	5
Applied Medical Visualisation	5
Methods Design 3	5
Biomedical Instrumentation	5
Quantitative Image Analysis	5
Big Data in BME	5
Additive Manufacturing	5
Materials Sciences	5
Biomechanics	5
Mechanics and Relativity 2	5
Waves and Optics	5
Signals and Systems	5
Statistics	5
Bachelor project	10
Bachelor thesis	5

### **Electives in Biomedical Engineering**

These courses can also be used to create a minor in Biomedical Engineering.

The assessment method of the courses can be found in the assessment plan of the degree programme and in the Ocasys database.

### **Electives in Medical Pharmaceutical Sciences**

These courses can also be used to create a minor in Medical Pharmaceutical Sciences

<b>Course unit name</b>	<b>ECTS</b>
Pharmacokinetics	5
Metabolism and Toxicology	5
Biostatistics	5
Pharmacoepidemiology	5

Bachelor project	10
Bachelor thesis	5

The assessment method of the courses can be found in the assessment plan of the degree programme and in the Ocasys database.

## For students who started the degree programme before the 1<sup>st</sup> of September 2020

The major-specific requirements and minors for the following majors are listed in the TER Appendix of the bachelor programme Biology 2020/2021:

- Behaviour and Neurosciences
- Biomedical Sciences
- Molecular Life Sciences

### Major Biomedical Engineering

The post-propaedeutic phase is composed of 90 ECTS major-specific course units, plus a minor programme of 30 ECTS.

Compulsory course units (90 ECTS)

Course unit name	ECTS
Biomechanics	5
Material Science	5
Anatomy and Histology	5
Designing Biomedical Products 2	5
Biomaterials 1	5
Thermodynamics	5
Regenerative Medicine	5
Medical Implants	5
Biological Implant Evaluation	5
Practical Chemistry for BMT <i>or</i> Programming for Life Sciences	5
Medical Technology and Society	5
Transport in Biological Systems	5
Signals and Systems	5
Imaging Techniques in Radiology 1	5
Numerical Methods	5
Bachelor Research BME *	10
Bachelor Thesis *	5

\* Students need to have completed 120 ECTS of their bachelor programme, including the propaedeutic phase, in order to start these two course units.

### Minor Implantation and Function Recovery

Course unit name	ECTS
Medical Microbiology	5
Biomedical Instrumentation	5
Designing Biomedical Products 3	5
Electronics	5
Research Course BME	10

### Courses with one or several practical components

The courses in the major Biomedical Engineering and minor Implantation and Function Recovery have a strong integration of practicals, lectures, and tutorials. Course units where the final assessment is not solely through a written exam are assessed through practicals. For further information, see OCASYS.

### Compulsory order of examinations

All course units in the major Biomedical Engineering and minor Implantation and Function Recovery are accumulative and assume knowledge, insight, and skills have been obtained in previous courses. Any deficiencies should be repaired as soon as possible.

Students who have not completed the propaedeutic phase are not allowed to enroll for more than 15 ECTS in one period (e.g. period 1a) including re-examinations. Students who have not passed first-year courses need to prioritise these when enrolling for second-year courses.

## Appendix V Entry requirements (Article 2.1, article 2.2)

### A. Deficient VWO-diploma

1. The following requirements apply to the entrance examination as defined in Article 7.28.3 of the Act:

<b>Bacheloropleiding</b> <i>Bachelor's degree programme</i>	<b>N+T</b>	<b>N+G</b>	<b>E+M</b>	<b>C+M</b>
<b>Biologie</b> <i>Biology</i>	Biologie	Natuurkunde	Wiskunde A of B Natuurkunde Scheikunde Biologie	Wiskunde A of B Natuurkunde Scheikunde Biologie
<b>Farmacie</b> <i>Pharmacy</i>	V	Natuurkunde	Natuurkunde Scheikunde	Wiskunde A of B Natuurkunde Scheikunde
<b>Life Science and Technology</b>  <b>Scheikunde</b> <i>Chemistry</i> <b>Scheikundige Technologie</b> <i>Chemical Engineering</i>	V	Wiskunde B Natuurkunde	Wiskunde B Natuurkunde Scheikunde	Wiskunde B Natuurkunde Scheikunde
<b>Biomedische Technologie</b> <i>Biomedical Engineering</i>	V	Wiskunde B Natuurkunde	Wiskunde B Natuurkunde	Wiskunde B Natuurkunde
<b>Informatica</b> <i>Computing Science</i> <b>Technische Bedrijfskunde</b> <i>Industrial Engineering and Management</i> <b>(Technische) Wiskunde</b> <i>(Applied) Mathematics</i>	V	Wiskunde B	Wiskunde B	Wiskunde B
<b>Kunstmatige Intelligentie</b> <i>Artificial Intelligence</i>	V	V	V	Wiskunde A of B
<b>(Technische) Natuurkunde</b> <i>(Applied) Physics</i> <b>Sterrenkunde</b>	V	Wiskunde B Natuurkunde	Wiskunde B Natuurkunde	Wiskunde B Natuurkunde

Astronomy		de	de	
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2. The Admissions Board Bachelor's programmes FSE will determine whether deficiencies have been compensated satisfactorily.

**B. HBO (university of applied sciences) or academic propaedeutic certificate**

1. The following requirements apply to the entrance examination as defined in Article 7.28.3 of the Act:

<b>Bachelor's degree programme</b>	<b>Subjects at VWO (pre-university) level</b>
B Biology	wia or wib + na+sk+bio
B Pharmacy	wia or wib + na+sk
B Life Science and Technology	wib+na+sk
B Computing Science	wib
B Artificial Intelligence	wia or wib
B Physics	wib+na
B Chemistry	wib+na+sk
B Astronomy	wib+na
B Mathematics	wib
B Chemical Engineering	wib+na+sk
B Industrial Engineering and Management Science	wib
B Applied Physics	wib+na
B Applied Mathematics	wib

wia = Mathematics A; wib = Mathematics B; na = Physics; sk = Chemistry; bio = Biology

2. In addition, candidates are required to be competent in English:

	<b>Overall</b>	<b>Reading</b>	<b>Listening</b>	<b>Speaking</b>	<b>Writing</b>
<b>IELTS (Academic)</b>	6.5	6.5	6.5	6.5	6.5
<b>TOEFL IBT (internet-based test)</b>	90	21 * (19-23)	21 * (20-23)	21 * (20-22)	24 (24-26)
<b>Cambridge English</b>	CAE of CPE Certificate with a minimum score of 180				
<b>English language test - UG Language Centre</b>		B2	B2	B2	C1

Applicants with a Dutch VWO or equivalent diploma are exempt for an English language test as are native English speakers.

3. The Admissions Board Bachelor programmes FSE will determine whether deficiencies have been compensated satisfactorily.

### C. Foreign qualifications (EEA)

1. Any certificate that grants access to a university in a European country will also grant access to Dutch universities.
2. In the entrance examination, as referred to in art. 7.28, paragraph 3 of the Act, per country and educational institution specific training conditions are mentioned. These are standardized. The entrance examination is, in accordance with the Admissions Board Bachelor's programmes FSE, carried out by the Admissions Office. If for a specific diploma no standardisation has taken place then the requirements as formulated for candidates with a HBO (university of applied science) propaedeutic certificate will apply to these candidates in the entrance examination as defined in Article 7.28.3 of the Act (see A).
3. In addition, candidates are required to be competent in English:

	<b>Overall</b>	<b>Reading</b>	<b>Listening</b>	<b>Speaking</b>	<b>Writing</b>
<b>IELTS (Academic)</b>	6.5	6.5	6.5	6.5	6.5
<b>TOEFL IBT (internet-based test)</b>	90	21 * (19-23)	21 * (20-23)	21 * (20-22)	24 (24-26)
<b>Cambridge English</b>	CAE or CPE Certificate with a minimum score of 180				
<b>English language test - UG Language Centre</b>		B2	B2	B2	C1

Applicants with a Dutch VWO or equivalent diploma are exempt for an English language test as are native English speakers.

4. The Admissions Board Bachelor's programmes FSE will determine whether deficiencies have been compensated satisfactorily.

### D. Foreign qualifications (non-EEA)

1. A non-European certificate that according to NUFFIC and/or NARIC standards is equivalent to a Dutch VWO certificate will grant access to university in the Netherlands.
2. In the entrance examination, as referred to in art. 7.28, paragraph 3 of the Act, per country and educational institution specific training conditions are mentioned. These are standardized. The entrance examination is, in accordance with the Admissions Board Bachelor's programmes FSE, carried out by the Admissions Office. If for a specific diploma no standardisation has taken place then the requirements as formulated for candidates with a HBO (university of applied science) propaedeutic certificate will apply to these candidates in the entrance examination as defined in Article 7.28.3 of the Act (see A).

3. In addition, candidates are required to be competent in English:

	<b>Overall</b>	<b>Reading</b>	<b>Listening</b>	<b>Speaking</b>	<b>Writing</b>
<b>IELTS (Academic)</b>	6.5	6.5	6.5	6.5	6.5
<b>TOEFL IBT (internet-based test)</b>	90	21 * (19-23)	21 * (20-23)	21 * (20-22)	24 (24-26)
<b>Cambridge English</b>	CAE or CPE Certificate with a minimum score of 180				
<b>English language test - UG Language Centre</b>		B2	B2	B2	C1

Applicants with a Dutch VWO or equivalent diploma are exempt for an English language test as are native English speakers.

4. The Admissions Board Bachelor's programmes FSE will determine whether deficiencies have been compensated satisfactorily.

### **E. Entrance examination (Colloquium Doctum)**

1. The following requirements apply to the entrance examination as defined in Article 7.29 of the Act:

<b>Degree programme</b>	<b>Nature and Health VWO level</b>	<b>or</b>	<b>Nature and Technology VWO level</b>
B Biology	en, wia or b, sk, bio, na		en, wib, na, sk, bio
B Pharmacy	en, wia or b, sk, bio, na		en, wib, na, sk
B Life Science and Technology	en, wib, sk, bio, na		en, wib, na, sk
B Computing Science	en, wib, sk, bio		en, wib, na, sk
B Artificial Intelligence	en, wia or b, sk, bio		en, wib, na, sk
B Physics	en, wib, sk, bio, na		en, wib, na, sk
B Chemistry	en, wib, sk, bio, na		en, wib, na, sk
B Astronomy	en, wib, sk, bio, na		en, wib, na, sk
B Mathematics	en, wib, sk, bio		en, wib, na, sk
B Chemical Engineering	en, wib, sk, bio, na		en, wib, na, sk
B Industrial Engineering and Management Science	en, wib, sk, bio		en, wib, na, sk
B Applied Physics	en, wib, sk, bio, na		en, wib, na, sk
B Applied Mathematics	en, wib, sk, bio		en, wib, na, sk

en = English; wia = Mathematics A; wib = Mathematics B; na = Physics; sk = Chemistry; bio = Biology

2. In addition, candidates are required to be competent in English:

	<b>Overall</b>	<b>Reading</b>	<b>Listening</b>	<b>Speaking</b>	<b>Writing</b>

<b>IELTS (Academic)</b>	6.5	6.5	6.5	6.5	6.5
<b>TOEFL IBT (internet-based test)</b>	90	21 * (19-23)	21 * (20-23)	21 * (20-22)	24 (24-26)
<b>Cambridge English</b>	CAE or CPE Certificate with a minimum score of 180				
<b>English language test - UG Language Centre</b>		B2	B2	B2	C1

Applicants with a Dutch VWO or equivalent diploma are exempt for an English language test as are native English speakers.

3. The Admissions Board Bachelor's programmes FSE will determine whether deficiencies have been compensated satisfactorily.

## Appendix VI Clustering of Bachelor's degree programmes Article 5.3.4, Article 5.6.1

<b>Degree programme CROHO code</b>	<b>Name of degree programme</b>	<b>Clustered with CROHO code</b>	<b>Name of degree programme</b>
56286	B Life Science and Technology	56860 56157 56226	B Biology B Pharmacy B Biomedical Engineering
56860	B Biology	56286 56157 56226	B Life Science and Technology B Pharmacy B Biomedical Engineering
56157	B Pharmacy	56860 56286 56226	B Biology B Life Science and Technology B Biomedical Engineering
56226	B Biomedical Engineering	56860 56286 56157	B Biology B Life Science and Technology B Pharmacy
56980	B Mathematics	56965 50206 56962 50205	B Applied Mathematics B Physics B Applied Physics B Astronomy
56965	B Applied Mathematics	56980 50206 56962 50205	B Mathematics B Physics B Applied Physics B Astronomy
50206	B Physics	56962 50205 56965 56980	B Applied Physics B Astronomy B Applied Mathematics B Mathematics
56962	B Applied Physics	50206 50205 56965 56980	B Physics B Astronomy B Applied Mathematics B Mathematics
50205	B Astronomy	56962 56965 50206 56980	B Applied Physics B Applied Mathematics B Physics B Mathematics

56857	B Chemistry	56960	B Chemical Engineering
56960	B Chemical Engineering	56857	B Chemistry

## **Appendix VII Admission to the post-propaedeutic phase**

### **Article 5.1.1**

The following candidates will be admitted to the post-propaedeutic phase:

Students who have been issued a positive study advice from the degree programme Life Science & Technology (cohort from 2020/2021 onwards) at the University of Groningen.

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

## **Appendix VIII Contact hours propaedeutic phase**

### **Article 2.3**

<b>Degree programme year 1</b>	
<b>Structure contact hours</b>	<b>Contact hours per year</b>
Lectures	110
Tutorials	60
Practicals	120
Supervision during an internship	N/A
Examinations	30
Career services	8 (mentor sessions)

## **Appendix IX University Minors of the faculty of Science and Engineering (Article 8.5.1)**

1. Neurosciences Minor (taught in English):

- Neuroscience (15 ECTS)
- Behavioural Neuroscience (15 ECTS)

Future Planet Innovation (taught in English):

- Global Challenges (10 ECTS)
- Sustainability in perspective (5 ECTS)
- Sustainable contributions to society (15 ECTS)

Astronomy through Space and Time Minor (taught in English):

- The Evolving Universe (5 ECTS)
- Cosmic Origins (5 ECTS)
- Astrobiology (5 ECTS)

Einstein's physics: Space-time and parallel worlds (taught in English):

- Einstein's Universe (5 ECTS)
- Quantum World (5 ECTS)
- Building blocks of matter (5 ECTS)

2. The Programme Committee for the Bachelor's degree programmes in Biology also has authority in the field of the Minor "Neurosciences" and/or its course units.

The Programme Committee for the Master's degree programme in Energy and Environmental Sciences also has authority in the field of the Minor "Future Planet Innovation" and/or its course units.

The Programme Committee for the Bachelor's degree programme in Astronomy also has authority in the field of the Minor "Astronomy through Space and Time" and/or its course units.

The Programme Committee for the Bachelor's degree programmes in Physics and Applied Physics also has authority in the field of the Minor "Einstein's physics: Space-time and parallel worlds" and/or its course units.

3. The Board of Examiners for the Bachelor's degree programmes in Biology and Life Science and Technology and the Master's degree programmes in Biology, Biomolecular Sciences, Ecology and Evolution, Marine Biology also has authority in the field of the Neurosciences Minor and/or its course units.

The Board of Examiners for the Master's degree programme in Energy and Environmental Sciences also has authority in the field of the "Future Planet Innovation" Minor and/or its course units.

The Board of Examiners for the Bachelor's degree programme in Astronomy also has authority in the field of the Astronomy through Space and Time Minor and/or its course units.

The Board of Examiners for the Bachelor's degree programmes in Physics and Applied Physics also has authority in the field of the Physics Minor "Einstein's physics: Space-time and parallel worlds" and/or its course units.

4. These Teaching and Examination Regulations also apply in their entirety to the Minors in Neurosciences, Future Planet Innovation, Astronomy through Space and Time and Einstein's physics: Space-time and parallel worlds and/or their course units.

## Appendix X Transitional arrangement:

This transitional arrangement applies to students who started in the degree programme before the 1<sup>st</sup> of September 2020.

Old course	New course
Biological Physics (WPLS18004)	Last chance exam Biological Physics (WPLS18004) <i>or</i> Biophysics (WBLT007-05)
Computer-aided Design (CAD) (WPLS18020)	Individual assignment
Mathematics for Life Sciences (WPLS18012)	Last chance exam Mathematics for Life Sciences (WPLS18012) <i>or</i> Calculus for LST (WBLT006-05) <i>or</i> Calculus 1 (for IEM) (WBIE003-05)
Methodical Design 1 (WPLS18014)	Design of Biomedical Products 1 (WBBE027-05)

Students of the majors Behaviour and Neurosciences, Biomedical Engineering, Biomedical Sciences and/or Molecular Life Sciences who started the degree programme Life Science and Technology before the 1<sup>st</sup> of September 2020 have until the 1<sup>st</sup> of September 2023 to finish their programme. After the 1<sup>st</sup> of September 2023 the Board of Examiners will look at each individual student on a case-by-case basis.