

Appendices to the Teaching and Examination Regulations 2018-2019

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

The graduate:

1A (Biology) has acquired in depth knowledge on one or more scientific disciplines within the general field of Biology and can use this knowledge to explain in detail the relevant concepts, using the appropriate terminology.

1B (Ecology & Evolution) has acquired in depth knowledge on one or more scientific disciplines within the field of Ecology and Evolution and can use this knowledge to explain in detail the relevant concepts, using the appropriate terminology.

1C (Marine Biology) has acquired in depth knowledge on one or more scientific disciplines within the field of Marine Biology and can use this knowledge to explain in detail the relevant concepts, using the appropriate terminology

1D (Molecular Biology & Biotechnology) has acquired in depth knowledge on one or more scientific disciplines within the field of Molecular Biology & Biotechnology and can use this knowledge to explain in detail the relevant concepts, using the appropriate terminology

2 can design and conduct scientific research;

3 can independently investigate and critically evaluate scientific literature;

4 can identify new developments in the relevant disciplines, and can become familiar with these developments;

5 can systematically organize his/her work in scientific research and formulate realistic and original solutions to complex problems;

6 can participate in and contribute to a multidisciplinary team;

7 can effectively communicate acquired knowledge, insights and skills to others, both in writing and in oral presentation;

8 can identify societal and ethical implications of scientific research and is able to critically reflect on his/her actions in this context;

9 can independently acquire new knowledge and skills that are relevant for his/her professional career, in science, in policy & management or society.

* These are based on the taxonomy of Bloom

Appendix II. Tracks/Specializations of the degree programmes

(art. 2.2)

1. Within the degree programmes, the student chooses one of the following tracks:
 - a. R-track ("Research-track), which provides training as a researcher;
 - b. SBP-track ("Science, Business and Policy -track", m-variant in Dutch), which prepares for professions in a societal, political and/or commercial context.
2. Within the degree programme Biology students can follow the specialization Modelling in Life Sciences
3. Within the degree programme Ecology & Evolution students can follow the specialization Ecology and Conservation
4. Within the degree programme Ecology & Evolution qualified students can follow the Top research track Evolutionary Biology, an intensified programme that prepares for conducting top quality research in this field of ecology and evolution.
5. Within the degree programme Ecology & Evolution qualified students can follow the Erasmus Mundus research track Evolutionary Biology, an intensified European programme that prepares for conducting top quality research in this field of ecology and evolution. For this programme the Erasmus Mundus Teaching and Examination Regulations will apply.
6. Within the degree programme Molecular Biology & Biotechnology qualified students can follow the Top research track Biomolecular Sciences, an intensified programme that prepares for conducting top quality research in this field of molecular biology and biotechnology
7. Within the degree programme Molecular Biology & Biotechnology students can follow the specialization Chemical biology

Appendix III. Content of the degree programmes

(art. 2.3)

The degree programmes consist of either the R- or the SBP-track programme:

Research-Track:

Study elements	ECTS	entry requirements
research project (RP)*	40 or ≥	see appendix V
research project (RP)*	30 or ≥	see appendix V
colloquium	5	RP
essay	5	-
compulsory master courses	20	see Ocasys
electives**	≤20	see Ocasys

SBP-Track:

Study elements	ECTS	entry requirements
research project (RP)*	40 or ≥	see appendix V
compulsory master courses	5	see Ocasys
colloquium	5	RP
internship SBP	35 + 5*	RP
Science and Business	10	
Science and Policy	10	
electives**	≤ 10	see Ocasys

**Part of the skills internship SBP (5 ECTS) is taught at the UG*

In addition to the above scheme the following rules apply to all programmes:

- The student chooses a mentor - a professor from the list of each Master programme- to advise and discuss the contents of the individual degree programme before approval of the Board of Examiners.
- * The first research project (preferably the one ≥40 EC) must be performed at the FSE (within life sciences oriented research groups) , the University Medical Centre Groningen or the Netherlands Institute for Sea Research under supervision of one of the examiners.
- The subject of the SBP- internship must be clearly related to the scientific domain of the chosen master programme (see Appendix I, 1). Therefore, two examiners must be involved in the assessment of the internship: one SBP-examiner and one appointed examiner
- ** The student may choose to use 5, - 20 ECTS to extend a research project, prepare a manuscript related to a master research project (no more than 10 ECTS, the assessment will be Pass or Fail), attend master courses (appendix IV), to include a maximum of 10 ECTS of courses from other relevant Life Sciences programmes, to repair specific deficiencies or perform a research assignment of 5-20 ECTS. During the mid-term assessment one may extend the research project with only 5-10 ECTS.

- Research projects, colloquium and essay must deal with different subjects, be supervised by a different examiner, and be approved of by the Board of Examiners.

Additional requirements for the specialization *Modelling in Life Sciences* (Biology)

1. Mathematics in the Life Sciences; 5 ECTS
2. Biological Modelling and Model Analysis; 10 ECTS
3. Programming C++ for biologists; 5 ECTS
4. At least one research project focusing on modelling in one of the domains of Life Science

Additional requirements for the Top research track *Evolutionary Biology* (Ecology and Evolution)*

1. Behaviour, ecology & evolution; 9 ECTS
2. Evolutionary theory 8 ECTS
3. Genomics in ecology and evolution; 8 ECTS
4. Research proposal; 5 ECTS

* These courses are challenging both in content and time constraints

The essay in this case is a literature study written in the form of a review article or a research proposal during the course Research proposal.

Additional requirements for the MEME research track *Evolutionary Biology* (Ecology and Evolution) are described in Annex_MEME

Additional requirements for the specialization *Ecology and Conservation:* (Ecology and Evolution)

- Advanced Population & Community Ecology; 5 ECTS
- Conservation Ecology Practices; 5 ECTS
- Ecological research skills; 10 ECTS

Additional requirements for the Top research track *Biomolecular Sciences* (Molecular Biology and Biotechnology)

Students within the Top research track Biomolecular Sciences have to pass 6 out of the following courses*:

1. Advances in signal transduction; 5 ECTS
2. Advanced Membrane Biology; 5 ECTS
3. Organelle and membrane biogenesis; 5 ECTS
4. Molecular Dynamics and modeling of Membranes and Proteins ; 5 ECTS
5. Protein and Enzyme Engineering by Mutagenesis and Directed Evolution; 5 ECTS
6. Advanced protein crystallography; 5 ECTS
7. Tools and approaches of systems biology; 5 ECTS
8. Transcriptomics: DNA microarrays and RNAseq; 5 ECTS
9. Advanced Genetic Engineering and complex gene regulatory circuitries

* These courses are challenging both in content and time constraints

The master essay is a written literature study in the form of a research proposal; 5 ECTS.

Additional requirements for the specialization *Chemical biology* (Molecular Biology and Biotechnology)

1. Advanced protein crystallography; 5 ECTS
2. Protein and Enzyme Engineering by Mutagenesis and Directed Evolution; 5 ECTS
3. Advances in Chemical Biology; 5 ECTS
4. Synthetic Biology & Systems Chemistry; 5 ECTS

Additional requirements for the programme *Marine Biology*

1. Principles of Biological Oceanography; 5 ECTS
2. Principles of Marine Biology; 5 ECTS
3. Principles of Marine Conservation; 5 ECTS

Students within the degree programme Marine Biology may use the title Marine Scientist of the Netherlands when they have fulfilled the requirements of their programme and passed one of the annual field courses organized by the NIOZ, the Royal Netherlands Institute for Sea Research (Texel).

Appendix IV. Courses (art. 2.4)

Master courses and electives

The following lists presents study elements that can be chosen as 'master courses' and 'electives'. The column on the right indicates the master's programmes for which the courses were developed in particular:

B = Biology,

EE = Ecology and Evolution,

MB = Marine Biology, MBB = Molecular Biology and Biotechnology.

Master courses

The following list presents study elements that can be chosen as part of the 'master courses' (unless stated differently). After consultation with the study mentor and approval of the Board of Examiners (use the proposal form) students may also choose from options available from other departments, other universities in the Netherlands or even abroad. In case the 'master courses' in an individual programme are completely filled, additional master courses may be chosen, which will automatically be part of the 'electives'.

Master courses organised by the research institutes GELIFES and ESRIG

Course	ECTS	Programmes
A Primer in Population Genetic Modeling (not in 2019-2020)	5	B, EE, MB
Advanced selforganisation, of social systems	5	B, EE, MB
Advanced imaging techniques	5	B, MBB
Advanced Population & Community Ecology	5	B, EE, MB
Advanced statistics	5	B, EE, MB, MBB
Animal and human experimentation: design, practice and ethics	5	B, EE, MB, MBB
Biological Modelling and Model Analysis	10	B, EE, MB, MBB
Conservation Ecology Practices	5	B, EE, MB
Current themes seminar series	2	B, EE, MB
Ecological research skills	10	B, EE, MB
Ecosystems Mediterranean rocky shores (not in 2019-2020)	10	MB
Evolutionary ecology of marine organisms	5	B, EE, MB
Flyway ecology (not in 2019-2020)	5	B, EE, MB
GELIFES lectures	2	B, EE, MB
Genetics in Conservation and Ecology (not in 2018-2019)	5	B, EE, MB
Mathematical models in ecology and evolution	6	B, EE, MB
Mathematics in the Life Sciences	5	B, EE, MB, MBB
Marine ecosystem service & global change	5	B, EE, MB
Meta-analyses in Ecology (not in 2019-2020)	5	B, EE, MB
Molecular methods in ecology & evolution (not in 2018-2019)	5/10	B, EE, MB
Orientation on International Careers	5	B, EE, MB, MBB
Practical bioinformatics for biologists	5	B, EE, MB, MBB
Practical modelling for biologists	5	B, EE, MB
Principles of Biological Oceanography*	5	B, EE, MB
Principles of Marine Biology*	5	B, EE, MB
Principles of Marine Conservation*	5	B, EE, MB

Programming in C++ for biologists	5/10	B, BN, EE, MB, MBB
Polar ecosystems	5	B, EE, MB
Research proposal Ecology and Evolution	5	B, EE, MB

* Students MB have priority in enrolment

Master courses organised by the research institute GBB

Course	ECTS	Programmes
Advanced light microscopy	5	B, EE, MB, MBB
Advanced Membrane Biology	5	B, MBB
Advanced genetic engineering and complex gene regulatory circuitries	5	B, MBB
Advances in signal transduction	5	B, MBB
Advanced protein crystallography	5	B, MBB
Biocatalysis & Green chemistry	5	B, MBB
Electron microscopy of biological macromolecules	5	B, MBB
Microbiome & Health	5	B, EE, MB, MBB
Molecular dynamics and modeling of membranes and proteins	5	B, MBB
Organelle and membrane biogenesis	5	B, MBB
Protein and enzyme engineering by mutagenesis and directed evolution	5	B, MBB
Radioisotopes in experimental biology	5	B, EE, MB, MBB
Tools and approaches of systems biology	5	B, MBB
Transcriptomics: DNA microarrays and RNAseq	5	B, EE, MB, MBB

* Students following these degree programmes may only choose these courses as part of the 'electives' not as part of the 'master courses'

Master courses organised by Biomedical Sciences/GELIFES

Course	ECTS	Programmes
Advanced metabolism & nutrition	5	B
Behavioural pharmacology	5	B
Current themes in healthy ageing*	5	B, MBB
Current Themes in Biomedicine	5	B, MBB
Immunology: from bedside to bench and back	5	B
Introduction to the behavioural and cognitive neurosciences	4	B
Microbiological safety	1	B, MBB
Molecular biology of ageing and age-related diseases*	5	B, MBB
Neurobiology of nutrition*	5	B
Neurodegenerative diseases *	5	B
Nutrition, Brain Development and Cognition		B
Nutrition in medicine	5	B
Orientation on international careers	5	B, EE, MB, MBB
Professionalism and ethics in science^	5	B, EE, MB, MBB
Scientific writing	5	B, EE, MB, MBB
Stem cells & regenerative medicine	5	B, MBB

^Students who follow the SBP-track may only choose this course unit as part of the 'electives' not as part of the 'master courses'

Master courses organised by Science & Society

Course	ECTS	Programmes
Science & Business [#]	10	B, EE, MB, MBB
Science & Policy [#]	10	B, EE, MB, MBB

[#] Students who follow the R-track may only choose these courses as part of the 'electives' not as part of the 'master courses'

Master course organised by Spatial Sciences

Course	ECTS	Programmes
Transitions in water management	5	B, EE, MB

Master course organised by Royal Netherlands Institute of Sea Research

Course	ECTS	Programmes
NIOZ Marine Masters' Summer Course	4	B, EE, MB

Electives

The following lists presents study elements that can only be chosen as 'electives' in the indicated master's programmes (see two columns on the right). After consultation with the study mentor and approval of the Board of Examiners students may also choose from options available from other departments, other universities in the Netherlands or even abroad.

Elective master courses organised by Energy and Environmental sciences:

Course	ECTS	Programmes
Impacts of Energy and Material Systems	5	B, EE, MBB
Sustainable Use of Ecosystems	5	B, EE, MBB
Sustainability & Society	5	B, EE, MBB
Systems Integration and Sustainability	5	B, EE, MBB

Elective master courses organised by Education and Communication^a:

Course	ECTS	Programmes
History and Philosophy of Science	5	B, EE, MB, MBB
Introduction to Research in Science Education and Communication	5	B, EE, MB, MBB
Nature of Scientific Disciplines	5	B, EE, MB, MBB
Science Education and Communication Design	10	B, EE, MB, MBB
Science Communication Skills	5	B, EE, MB, MBB
Science and the Public	5	B, EE, MB, MBB
Science Communication and Journalism	5	B, EE, MB, MBB

^a These modules are instructed in Dutch

Elective master courses organised by The Donald Smits Center for Information Technology:

Course (max 2 ects per individual programme^)	½ day unit^	Programmes
Access basic	5	B, EE, MB, MBB
Excel basic	3	B, EE, MB, MBB
Excel advanced	5	B, EE, MB, MBB

^ A minimum of 5 half day units is required for a study load of 1 ECTS, for 2 ECTS 11 units are needed.

These courses have additional costs (low student tariff), which are at the student's own expenses. These courses are not available in Ocasys. Please consult the Donald Smits Center for further information, time schedules and enrolment details.

Elective master courses organised by Chemistry:

Course	ECTS	Programmes
Advances in chemical biology	5	B, MBB
Modern laser microscopy	5	B, MBB
Synthetic biology & systems chemistry	5	B, MBB

Elective master course organised by the centre for Synthetic Biology:

Course	ECTS	Programmes
iGEM (International Genetically Engineered Machine competition)*	≤20	B, EE, MB, MBB

* Selection for this competition takes place in winter time, an advertisement about application details will be announced via Nestor during the academic year.

Appendix V. Compulsory order of examinations (art 3.4)

Course unit	Entry requirement
Colloquium	Research project
Research project 2	Research project
Internship Science Business & Policy	Research project, Science & Policy, Science & Business
Biological Modelling and Model Analysis	Mathematics in the Life Sciences

Appendix VI. Admission to the degree programmes 2019/2020

(art. 5.1 + art. 5.2)

1. Requirements for admission to the master's degree in Biology

Holders of a Dutch Bachelor's degree in Biologie are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in Biology on that basis. Holders of a Bachelor's degree in Life Science & Technology from the University of Groningen with the majors *Biomedische wetenschappen*, *Gedrag & Neurowetenschappen* of *Moleculaire levenswetenschappen* will be admitted to the Master's degree programme in Biology on that basis. For holders of another relevant Bachelor's degree in life sciences there is an individual admission procedure based on the content of the bachelor's programme and language skills.

2. Requirements for admission to the selective master's degree in Ecology and Evolution

Holders of a Bachelor's degree in Biology will be considered to be admitted to the Master's degree programme in Ecology & Evolution on the basis of academic performance, motivation and language skills. The purpose is to select students who have the potential to finish the programme in two years

3. Requirements for admission to the selective master's degree in Marine Biology

Holders of a Bachelor's degree in any field of Biological Sciences will be considered to be admitted to the Master's degree programme in Marine Biology on basis of academic performance, motivation and language skills. The purpose is to select student who have the potential to finish the programme in two years.

4. Requirements for admission to the selective master's degree in Molecular Biology and Biotechnology

Holders of a Bachelor's degree in life sciences will be considered to be admitted to the master's degree programme in Molecular Biology and Biotechnology on basis of academic performance, motivation and language skills. The purpose is to select students who have the potential to finish the programme in two years.

5. Applications procedure for selective master degree programmes: (art. 4.2)

1. Students in possession of an admission letter can be admitted to the selective programme.

2. Students who meet the requirements are provided with an admission letter of acceptance by the Admission Board.

3. There may be other conditions attached to the admission letter. The requirements must be met before the programme has started.

4. The admission requirements comprise:

- a relevant bachelor's degree;
- sufficient knowledge of the English language;
- sufficient knowledge of the relevant sciences;
- a suitable attitude, motivation and talent to follow the selective programme.

5. The Faculty Board of Science and Engineering establishes an Admissions Board that judges the student's fulfilment of the requirements.

6. An appeal can be made against a decision of the Admissions Board at the Board of Appeal for Examinations.

9. Students apply to the admission procedure by filing
- a completed online application form;
 - a complete *curriculum vitae*;
 - a survey of the study results attained in academic courses so far;
 - a motivation letter in which the student incorporates the list of specific questions addressing why s/he wants to follow this programme in particular, and what his/her expectations and ambitions are;
 - results of former research projects, like reports or articles;
 - (if desired) other documents that the student or the board of examiners deem useful in furthering the application.

This application should complete and be sent to the Admission Board of the Faculty of Science and Engineering before the deadline (see appendix G) .

9. Proficiency in English (see art.....),

10. The applicants will be informed in writing about the decision on their admission within 3 weeks after the deadline for submission. This may be a tentative decision, conditional on further information to be supplied by the candidate.