Appendices Master's degree programmes Biology, Ecology and Evolution, Molecular Biology and Biotechnology, Marine Biology

Appendix A. Teaching outcomes of the degree programme (art. 1.3)

The graduate:

1A	(Biology) has detailed knowledge of one or more of the scientific disciplines within the area of biology
1B	(Ecology & Evolution) has detailed knowledge of one or more of the scientific disciplines within the area of Ecology & Evolution with emphasis on evolutionary ecology & genetics, behavioural ecology & ecophysiology, conservation biology, or community ecology
1C	(Marine Biology) has detailed knowledge of one or more of the scientific disciplines within the area of marine biology with emphasis on biological oceanography or coastal marine ecology
1D	(Molecular Biology & Biotechnology) has detailed knowledge of one or more of the scientific disciplines within the area of of biomolecular sciences, with emphasis on structural biology, biochemistry, molecular and cellular biology, microbiology, biotechnology or bioinformatics
2	is capable of designing and conducting scientific research
3	is capable of independently investigating, and critically evaluating, scientific literature
4	is capable of identifying new developments in the relevant disciplines, and to become familiar with these developments
5	is organised and creative in the approach to scientific research and 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	is aware of the potential societal and ethical implications of scientific research, and is able to critically reflect on his/her actions in this context
9	is prepared for a professional career, either in science or in management & policy

Appendix B. Specializations of the degree programme (art. 2.2)

1. Within the degree programmes, the student chooses one of the following profiles:
   a. degree profile P-variant, "PhD-variant", which provides training as a researcher
   b. degree profile, M-variant, "Management and policy-variant " which prepares for professions that require the application of knowledge of the scientific domains of the degree programs in a societal, political and/or commercial context.
2. Within the degree programme Biology students can follow the specialization Behavioural and Neurosciences, which prepares for conducting research in this field of biology.
   Within the degree programme Ecology & Evolution qualified students can follow the Top programme Evolutionary Biology, an intensified programme which prepares for conducting top quality research in this field of ecology.
   Within the degree programme Molecular Biology & Biotechnology qualified students can follow the Top programme Biomolecular Sciences, an intensified programme which prepares for conducting top quality research in this field of molecular biology and biotechnology

Appendix C. Content of the degree programme (art. 2.3)

1. The degree programmes consist of either the P- or the M-variant programme:

P- variant:

module	ECTS	entry requirements	Assessment	practical
research project (RP)*	40 or ≥	-	technical and/or laboratory skills, written report, oral presentation	x
research project (RP)*	30 or ≥	-	technical and/or laboratory skills, written report, oral presentation	x
colloquium	5	RP	oral presentation	x
essay	5	-	written report	x
optional modules	20	see appendix D	see appendix D	see app. D
electives**	≤20	see appendix D	see appendix D	see app. D

M-variant:

Module	ECTS	entry requirements	Assessment	practical
research project (RP)*	40 or ≥	-	technical and/or laboratory skills, written report, oral presentation	x
optional modules	5	see appendix D	see appendix D	see app. D
colloquium	5	RP	oral presentation	x
Stagetraject bedrijf en beleid	40	RP	performance, written report, reflection report	x
Module *Beleid & Bedrijf*	20	-	assignment, exam	x
electives**	≤ 10	see appendix D	see appendix D	see app. D

2. In addition to the above scheme to following rules apply to all programmes:
   - The student chooses a mentor - an assistant professor or 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 must be performed at the School of Life Sciences (or liaised institutes) under supervision of one of the examiners.
   - ** The student may choose to use 5, - 20 ECTS to extend a research project, attend master modules (appendix D), attend bachelor modules (no more than 10 ECTS), or perform a research assignment of 5, 10, 15 or 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.

3. **Additional requirements for the specialization *Behavioural and Neurosciences*** (Master Biology)
   Students within the specialization *Behavioural and Neurosciences* generally follow the P-variant scheme and choose their mentor from the list for this specialization.

4. **Additional requirements for the Top programme *Evolutionary Biology*** (Master Ecology and Evolution)

4.1 Students within the Top programme Evolutionary Biology generally follow the P-variant scheme but have to pass the following Top programme modules*:
   * These modules are challenging both in content and time constraints

   - Adaptation, biocomplexity and conservation; 8 ECTS
   - Theoretical ecology and evolution; 8 ECTS
   - Phylogenetics and genomics in ecology; 8 ECTS

4.2. Two seminar series of 2 ECTS each are required. These are chosen from a list of the "current/classic themes" seminar series.

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

4.4 The study load of the electives is ≤ 12 ECTS which can be used for modules, research or individual assignments

5. **Additional requirements for the Top programme *Biomolecular Sciences*** (Master Molecular Biology and Biotechnology)

5.1 Students within the Top programme Biomolecular Sciences generally follow the P-variant scheme but have to pass the following Top programme modules*:

* These modules are challenging both in content and time constraints

1. Introduction to membrane proteins and bioinformatics; 2 ECTS
2. Advances in signal transduction; 5 ECTS
3. Advanced genomics and proteomics; 5 ECTS
4. Organelle and membrane biogenesis; 5 ECTS
5. Molecular Dynamics and modeling of Membranes and Proteins ; 5 ECTS
6. Protein and Enzyme Engineering by Mutagenesis and Directed Evolution; 5 ECTS
7. Advanced protein crystallography; 5 ECTS

5.2 Literature study written in the form of a research proposal; 5 ECTS.

5.3 The study load of the electives is ≥ 3 ECTS which can be used for modules, research or individual assignments

Appendix D. Optional modules (art. 2.4) plus Appendix E. Entry requirements and compulsory order of examinations (art. 3.2)

The following list presents optional modules. The column on the right indicates the master programmes for which the modules were developed in particular. B: Biology, BN: specialization Behaviour and Neurosciences in the study programme Biology, EE: Ecology and Evolution, MB: Marine Biology, MBB: Molecular Biology and Biotechnology. (w.t. = working title)

General modules within the school of Life Sciences:

Module	ECTS	entry requirements	assessments	practical	programme
Animal and human experimentation: Design, Practice and Ethics	5	-	laboratory skills, written report, oral presentation	x	B, BN, EE, MB, MBB
Orientation on International Scientific Careers	5	-	laboratory skills, written report, oral presentation	x	B, BN, EE, MB, MBB
Radioisotopes in experimental biology	5	- *	laboratory skills, written exam	x	B, BN, EE, MB, MBB
Advanced statistics (w.t.)	5		written exam	x	B, BN, EE, MB, MBB
Programming C++	5	-	assignment	x	B, BN, EE, MB, MBB

Modules organised by the research institute CBN :

Module	ECTS	entry requirements	assessments	practical	programme

Advanced imaging techniques (w.t.)	5	*	written exam, oral presentation	x	B, BN
Neurodegenerative diseases	5	*	written exam, oral presentation	x	B, BN
Behavioural pharmacology	5	-	written exam, oral presentation	x	B, BN
Introduction BCN	5	-	written reports	x	B, BN
Current themes in inflammation and cancer	5	immunologie I	written exam, oral presentation	x	B, BN, MBB
Advanced metabolism & nutrition (w.t.)	5	metabolisme & voeding	written exam, assignment	x	B, BN
Nutrigenomics (w.t.)	5	metabolisme & voeding	written exam, assignment	x	B
Current themes in healthy aging	5	-	written reports, oral presentation	x	B, BN, MBB
Stem cells & tissue engineering	5	regenerative medicine or moleculaire biologie & medische biologie, or immunologie I	oral presentation, written report	x	B, MBB
Immunology: from bed side to bench and back (w.t.)	5	immunologie I+II	written exam, oral presentation, report	x	B

Modules organised by the research institute CEES:

Module	ECTS	entry requirements	assessments	practical	programme
Current themes seminar series	2	-	assignments	x	B, EE, MB
Groningen lectures in theoretical biology	2-6		Written report		B, BN, EE, MB
Mathematical models in ecology and evolution	6	*	Witten exam		B, BN, EE, MB
Selforganisation, cognition and Social Systems	5	*	assignments	x	B, EE, MB,
Ecosystems Mediterranean rocky shores (w.t.)	5	*	Assignments	x	MB
Marine community ecology (w.t.)	5		Assignments	x	B, EE, MB

Modules organised by the research institute GBB:

Module	ECTS	entry requirements	assessments	practical	programme
Advanced protein crystallography	5	-	Written exam, oral presentation	x	B, MBB

Protein crystallography 2	5	-	Written exam	X	B, MBB
Multidimensional NMR 2	5	-	Written exam, oral presentation	x	B, MBB
Electron microscopy of biological macromolecules	5	-	Written exam, oral presentation	x	B, MBB
DNA microarray analysis	5	*	Written exam, oral presentation	x	B, BN, EE, MB, MBB
Introduction to membrane proteins and Bioinformatics	2	*	Written exam, oral presentation	x	B, MBB
Advances in signal transduction	5	*	Written exam, oral presentation	x	B, MBB
Advanced genomics and proteomics	5	*	Written exam, oral presentation	x	B, MBB
Organelle and membrane biogenesis	5	*	Written exam, oral presentation	x	B, MBB
Molecular Dynamics and modeling of Membranes and Proteins	5	*	Written exam, oral presentation	x	B, MBB
Protein and Enzyme Engineering by Mutagenesis and Directed Evolution	5	*	Written exam, oral presentation	x	B, MBB
Biocatalysis & green chemistry	5	*	Written exam, assignments		B, MBB
Topics in Enzymology	5	-	Written exam	x	B, BMS, MBB, MPS

Modules organised by Science & Society:

Module	ECTS	entry requirements	examination	practical	programme
Beleid & Bedrijf[a]	10,20	-	assignments	x	B, BN, EE, MB, MBB
Stagetraject bedrijf en beleid[a]	40	*Beleid & Bedrijf*[a]	laboratory skills, written report, oral presentation	x	B, BN, EE, MB, MBB

Modules organised by Education and Communication[a]:

Module	ECTS	entry requirements	examination	practical	programme
Communiceren en presenteren (compres)	5	-	assignments	x	B, BN, EE, MB, MBB
Ontwerpen	10	*	assignments	x	B, BN, EE, MB, MBB
Wetenschap media en publiek	10	*	assignments	x	B, BN, EE, MB, MBB
Inleiding onderzoeksmethoden	5	*	assignments	x	B, BN, EE, MB,

Modules organised by Energy and Environmental sciences:

Module	ECTS	entry requirements	examination	practical	programme
Introduction energy and environmental studies I	5	-	assignments	x	B, EE, MB
Resources and sustainable development	15	*	assignments	x	B, EE, MB

*For entry requirements see module description in Ocasys
[a] These modules are instructed in Dutch.

Appendix F. Admission to the degree programme and different specializations (art. 4.1.1 + art. 4.2)

1. **Requirements for admission to the master's degree in Biology**
   Holders of a Bachelor's degree in Biology from the University of Groningen are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in Biology on that basis.

2. **Requirements for admission to the master's degree in Ecology and Evolution**
   Holders of a Bachelor's degree in Biology from the University of Groningen with the specialization *Ecologie* or *Mariene Biologie* are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in Ecology & Evolution on that basis.
   Holders of a Bachelor's degree in Biology from the University of Groningen with the major *Ecologie & Evolutie* or *Mariene Biologie* are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in Ecology & Evolution on that basis.

3. **Requirements for admission to the master's degree in Marine Biology**
   Holders of a Bachelor's degree in Biology from the University of Groningen with the specialization *Mariene Biologie*, or the specialization *Ecologie* plus the modules *Oceanografie* and *Mariene Biologie* 1, are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in *Marine Biology* on that basis.
   Holders of a Bachelor's degree in Biology from the University of Groningen with the major *Mariene Biologie* or the major *Ecologie & Evolutie* plus the modules *Biologische oceanografie* and *Mariene biologie* are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in Marine Biology on that basis.

4. **Requirements for admission to the master's degree in Molecular Biology and Biotechnology**
   - Holders of a Bachelor's degree in Biology from the University of Groningen with the specialization Moleculaire Biologie of Biotechnologie,

specialization *Medische biologie* plus the modules *Algemene chemie* and *Bioinformatica* are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in Molecular Biology & Biotechnology on that basis. Holders of a Bachelor's degree in Biology or a Bachelor's degree in Life Science & Technology from the University of Groningen with the major *Moleculaire Levenswetenschappen*, major Biomedische wetenschappen or the combination of the major Gedrag en Neurowetenschappen and the minor Moleculaire Levenswetenschappen, are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in Molecular Biology and Biotechnology on that basis.

- Holders of a Bachelor's degree in Chemistry with specialization Biochemistry or Biophysical Chemistry are admitted to this master's programme.
- Holders of the Bachelor's degree in Life Science and Technology, specialization Genomics and Proteomics or Molecular Medical Cell biology are admitted into this master's programme.

5. Admission requirements to specializations and Top programmes

In addition to the provisions in 4, the following admission requirements apply to the specialization or Top programmes:

1. Master *Biology*, specialization *Behavioural and Neurosciences* : a Bachelor's degree in Biology of the University of Groningen, specialization *Gedrags en Neurowetenschappen*. A Bachelor's degree in Biology or a Bachelor's degree in Life Science& Technology of the University of Groningen with major *Gedrag en Neurowetenschappen*.
2. Master *Ecology and Evolution*, Top programme *Evolutionary Biology*: a relevant Bachelor's degree and an individual selection procedure (see below). Excellent MSc students from Ecology & Evolution and Marine Biology may apply during their first year for the Top Programme Evolutionary Biology.
3. Master *Molecular Biology and Biotechnology*, Top programme *Biomolecular Sciences* : a relevant Bachelor's degree and an individual selection procedure (see below). Excellent MSc students from Molecular Biology & Biotechnology may apply during their first year for the Top Programme Biomolecular Sciences

6. Applications procedure for a Top programme (art. 4.2)

1. Students in possession of an admission permit can be admitted to the top programme.

2. Students who meet the requirements are provided with an admission permit by the Admission Board.

3. An admission permit is only valid for the academic year following the academic year in which the permit is granted.

4. There may be other conditions attached to the admission permit. The requirements must be met before the top programme has started.

5. 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 Top programme.

6. The Board of Examiners establishes an Admissions Board that judges the student's fulfilment of the requirements. This Board consists of three members of the top programme's Board of Examiners, completed by a university employee.
One of the members is appointed as chairperson.

7. The decisions of the Admissions Board can be appealed to at the Board of Appeal for Examinations.

8. Students apply to the admission procedure by sending in the following documents:
- a completed application form;
- a complete *curriculum vitae*;
- a survey of the study results attained in academic courses so far;
- a letter in which the student states why s/he wants to follow this top programme in particular, what his/her expectations and ambitions are;
- (if desired) results of former research projects, like reports or articles;
- the names of three scientists willing to provide personal information on the applicant;
- (if desired) other documents that the student thinks useful in furthering his/her application.

These documents are to be sent to the Faculty of Mathematics and Natural Sciences by the 1th of February for non-EER* students and by the 15th of April for EER students (and EEA-sudents that do not apply for a University of Groningen Talent Grant) preceding the start of the top programme.
*European Economic Area: all EU countries + Norway, Switzerland, Liechtenstein and Iceland.

9. Sufficient knowledge of the English language can be proved by
- Cambridge Certificate of Proficiency in English (A, B or C);
- Cambridge Certificate in Advanced English (A, B or C);
- an overall score of 6.5 or higher in the International English Language Testing System (Academic version);
- a score of at least 580 on the paper-based form of the Test of English as a Foreign Language;
- a score of at least 237 on the computer-based form of the Test of English as a Foreign Language;
- a score of at least 92 on the internet-based form of the Test of English as a Foreign Language.

An original certificate of the test, not older than two years, needs to be sent in. The Admissions Board may accept other proofs of knowledge of the English language that guarantee a comparable level of knowledge of English.

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.

Appendix G Application deadlines for admission (art. 4.5)

Deadline of Application	Non-EU students	EU students
Biomolecular Sciences (Top programme)	February 1st 2009	April 15th 2009
Evolutionary Biology (Top programme)	February 1st 2009	
	February 1st 2009	
Remaining FMNS Masters	April 15th 2009	June 1st 2009