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Appendices for the Master's degree programme(s) in Biology 2025-2026

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

The graduate:

1. a) 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

b) has acquired cross disciplinary knowledge of issues across scientific disciplines within the field of Biology and can use this knowledge to explain current societal and scientific challenges;

2. can design, and conduct scientific research, and systematically organize their work in 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 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 their actions in this context;
9. can independently acquire new knowledge and skills that are relevant for their professional career, in science, in policy & management or society.

Appendix II. Tracks/specializations (art. 3.6)

1. Within the degree programme Biology, the student chooses one of the following tracks:

   a. Integrative Biology track (IB-track), which provides training as a researcher within an inter- or multidisciplinary focus areas in integrative biology. The track offers the following profiles as specialisations:

   1. Human physiology, behaviour and health (PBH)
   2. Evolutionary medicine (EvM)
   3. Ecological sustainability (EcS)
   4. Biological data science (BDS)
   5. Modelling in the Life Sciences (MLS)
   6. Microbiome (M)
   7. Flexible Research profile (R)

   b. Science, Business and Policy track, (SBP-track), which prepares for professions in a societal, political and/or commercial context.

Appendix III. Content of the degree programme (art. 3.8)

The degree programme consists of one of the following tracks:

Integrative Biology Track:

Study elements	**Course code**	**ECTS**	**Entry requirements**
Research project (RP)*	WMBY90x-xx	40	see appendix V
Research project (RP)*	WMBY90x-xx	30	see appendix V
Colloquium	WMBY020-05	5	RP
Compulsory MSc courses: - *Skills for Biology 1 : Professional Perspectives and Career Orientation* - *Skills for Biology 2 : Quantitative Research Methods*(\$) - *Profile-specific compulsory courses***	 WMBY029-05 WMBY028-05	 5 5 10-18	see Ocasys
Electives***		≤25	see Ocasys

(\$) *Can be substituted with Data Science in Biomedicine (WMBM023-05) by students in the specialisation Biological Data Science*

Flexible Research profile:

Study elements	**Course code**	**ECTS**	**Entry requirements**
Research project (RP)*	WMBY90x-xx	40	see appendix V
Research project (RP)*	WMBY90x-xx	30	see appendix V
Colloquium	WMBY020-05	5	RP
Compulsory MSc courses**: - *Academic skills course* - *Quantitative skills course* - *Biology courses*	(see: category *I*, *II*, and *III* in table IV-1)	 5 5 10	see Ocasys
Electives***		≤25	see Ocasys

*Science Business and Policy-Track***:**

Study elements	**Course code**	**ECTS**	**Entry requirements**
Research project (RP)*	WMBY901-xx	≥30	see appendix V
Work placement Business & Policy*	WMSE901-40	40	RP
Colloquium	WMBY020-05	5	RP
Compulsory MSc courses: - *Skills for Biology 1 : Professional Perspectives and Career Orientation* - *Skills for Biology 2 : Quantitative Research Methods* - *Introduction Science and Business* - *Introduction Science and Policy*	 WMBY029-05 WMBY028-05 WMSE001-10 WMSE002-10	 5 5 10 10	see Ocasys
Electives***		≤ 15	see Ocasys

In addition to the above scheme, the following rules apply:

- *Study Mentor* The student chooses a mentor from the list of Biology to get advice on and discuss the contents of the individual degree programme before requesting approval from the Board of Examiners.

- *RP and Work Placement* (*) The first research project (preferably the 40 EC) must be an internal project. Internal projects 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 of the degree programme.
  The subject of the SBP work placement 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 of the master programme

- *Compulsory MSc courses* (**) Courses in the category compulsory MSc courses differ between tracks and specialisations within the Integrative Biology track (see appendix IV). Compulsory courses can be replaced by substitute options available at other departments, other universities in the Netherlands or even abroad, under the provision that the learning outcomes of the degree programme continue to be met (Appendix I). Any such deviations from the specified programme of compulsory courses require prior

consultation with the study mentor and are subject to approval by the Board of Examiners (use BoE form on student portal).

- *Electives* (***) The student may choose from the onset to use 10ECTS to extend a research project, prepare a manuscript related to a master research project (through a research assignment, no more than 10 ECTS, the assessment will be Pass or Fail), attend master courses (appendix IV), or perform a research assignment of 5, 10, 15 or 20 ECTS. Electives may include a maximum of 10 ECTS of courses from other relevant Life Sciences programmes, and/or courses that repair specific deficiencies.

- *Individual study components* Research projects and colloquium must deal with different subjects, and be approved of by the Board of Examiners. Research projects 1 and 2 must be supervised by a different first examiner. In addition, it is advisable that research projects and colloquium all are supervised by different examiners.

- The course unit Laboratory Animal Science is mandatory for students planning to participate in an “animal experiment” as defined by law (directive 2010/63/EU) during their research project.

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Appendix IV. Electives (art. 3.9.1)

1. Compulsory Master courses and electives

Table IV-1 specifies the programme of 'compulsory MSc courses' for each of the different tracks and specialisation within the track Integrative Biology. Tracks are abbreviated as IB (integrative Biology), and SBP (Science, Business and Policy); specializations within the IB-track are: Human physiology, behaviour and health (PBH), Evolutionary medicine (EvM), Ecological sustainability (EcS), Biological data-science (BDS), Modelling in the life sciences (MLS) and flexible Research profile (R).
An 'x' in table IV-1 indicates that a course unit is compulsory for a given track or specialization; Roman numbers ('*I*, *II*, *III*,…'; applicable only to students in the flexible Research profile R) indicate sets of course units from which students must select a specified minimum number of ECTS:
I : students must select at least 5 ECTS from these 'academic skills' courses
II : students must select at least 5 ECTS from these 'quantitative skills' courses
III : students must select at least 10 ECTS from these 'biology' courses.
Course units from the complete table can also be chosen as an elective.
Recommended electives for each specialisation in IB are indicated with an asterisk '*'. Access to courses may be restricted by entry requirements or additional regulations (see Ocasys and table notes).

Table IV-1 Compulsory MSc courses per track/specialization and electives

		Track/specialisation	IB								SBP
Course unit	**Course code**	**ECTS**	PBH	Ev M	EcS	BDS[a]		MLS	M	R	
Academic skills and professionalisation											
Skills for Biology 1: Professional Perspectives and Career Orientation	WMBY029-05	5	x	x	x	x	x	x	x	I	x
Orientation on Non-academic Careers	WMBY032-05	5								I	
Scientific Writing	WMBM013-05	5								I	
Research proposal Ecology and Evolution[f]	WMEV012-05	5								I	
Laboratory Animal Science[b]	WMBY026-05	5	*							I	
Microbiological Safety	WMMP004-01	1								I	
Quantitative biology											
Skills for Biology 2: Quantitative Research Methods	WMBY028-05	5	x	x	x	x		x	x	II	x
Mathematical Models in Biology	WMBY031-05	5						x		II	
Programming in C++ for Biologists[c]	WMBY010-05	5				*	*	x		II	
Modelling Complex Biological Systems	WMBY027-05	5						x	*		
Practical Computing for Biologists	WMBY008-05	5				x	*	*	*	II	

Course unit	Course code	ECTS	Track/specialisation IB: PBH	Ev M	EcS	BDS[a]		MLS	M	R	SBP
Practical Modelling for Biologists	WMBY009-05	5						*	*	II	
Advanced Statistics	WMBY018-06	6				x				II	
Mathematical Models in Ecology and Evolution	WMEV013-06	6						*		II	
Genomics in Ecology and Evolution	WMEV011-05	5		*		*			*		
Statistical Genomics[e]	WMMA008-05	5				*	*				
Tools and Approaches of Systems Biology[!]	WMBS005-05	5				*	*	*	*	II	
Next-generation sequencing methods and data analysis[!]	WMBS023-05	5				*	*			II	
Data Science in Biomedicine	WMBM023-05	5					x		*	II	
Big Data & Applications in Biomedicine	WMBM025-05	5		*		*	x				
Applied Statistics and Machine Learning	WMBM028-05	5				*	*			II	
From Big Data to Personalised Medicine	WMBM008-05	5					*				
Biochemistry and biomolecular sciences											
Advanced Biocatalysis	WMCH033-05	5									
Bioinspired Designer Materials	WMCH009-05	5									
Synthetic Biology and Systems Chemistry	WMCH021-05	5									
Biocatalysis for Engineers	WMCE015-05	5									
Advanced light microscopy	WMBY016-05	5	*							III	
Advanced Membrane Biology[!]	WMBS007-05	5								III	
Advanced genetic engineering and complex gene regulatory circuitries[!]	WMBS006-05	5								III	
Advanced Mammalian Cell Biology[!]	WMBS022-05	5	*							III	
Electron Microscopy of Biological Macromolecules	WMBS011-05	5								III	
Molecular Modeling and Analysis in Structural Biology	WMBS021-05	5						*			
Molecular Dynamics[!]	WMBS003-05	5						*			
iGEM (International Genetically Engineered Machine competition)[e,f]	WMBS013-xx	≤20									
Molecular Methods in Ecology and Evolution	WMEV007-10	5				*				III	
Protein and Enzyme Engineering	WMBS004-05	5									
Biomedical and neuro-sciences											
Advanced metabolism and nutrition	WMBM004-05	5								III	
Microbiome in Ecosystem Health	WMBY033-05	5		*	*				x	III	

Course unit	Track/specialisation Course code	ECTS	IB PBH	Ev M	EcS	BDS[a]		MLS	M	R	SBP
Evolutionary Medicine: Diseases of Affluence	WMBY025-05	5	x	x						III	
Evolutionary Medicine: Infectious Diseases	WMBY024-05	5	*	x					x	III	
ISCOMS conference	WMBM029-01	1									
Nutrition, Brain Development and Cognition(!)	WMBM020-05	5	x							III	
Microbiome & Health(!)	WMBM01005	5	*	*						III	
Molecular Biology of Ageing and Age-related Diseases(!)	WMBM017-05	5	*	*						III	
Neurobiology of nutrition(!)	WMBM011-05	5	*							III	
Neurodegenerative diseases(!)	WMBM012-05	5	*							III	
Neurobiology of Psychiatric Disorders(!)	WMBM018-05	5	*							III	
Ecology & Evolution and Marine Biology											
Evolutionary Theory(!)	WMEV006-05	5	*	x				*			
Behaviour, Ecology & Evolution (!,j)	WMEV003-10	10	*	*				*			
Conservation Ecology Practices(!)	WMEV004-05	5			x					III	
Ecology of Sustainable Farming(e)	WMEV009-05	5			*					III	
Flyway Ecology	WMEV010-05	5			*					III	
Island Biology	WMEV016-05	5								III	
Marine Conservation(!)	WMMB011-05	5			*						
Marine Ecosystem Service and Global Change(!)	WMMB008-05	5			*					III	
Polar Ecosystems(!)	WMMB009-05	5			*					III	
Principles of Population Genetics in Natural Populations	WMMB005-05	5				*	*	*			
NIOZ Marine Masters' Summer Course		4									
Energy and environmental sciences											
Ecology and Ecosystem Sustainability (!)	WMEE021-05	5			x						
Energy, Atmosphere and Resources (!)	WMEE028-05	5			*						
Sustainable Society (!)	WMEE020-05	5			*						
Modelling Energy Systems (!)	WMEE025-05	5			*						
Interdisciplinary											
Language, Brain and Cognition(!)	LTR022M10	10	*								
Anthropocene(!)	LPR002M10	10			*						
Nature, Landscape and Heritage	GEMNLH	5			*						
Neural Networks and Computational Intelligence	WMCS010-05	5				*	*				
Science, business & policy											
Introduction to Science & Business	WMSE001-10	10									x

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Course unit	Course code	ECTS	IB: PBH	IB: Ev M	IB: EcS	IB: BDS[a]	IB: MLS	IB: M	IB: R	SBP
Track/specialisation										
Introduction to Science & Policy	WMSE002-10	10								x
Science education and communication										
Research Methods in Science Education and Communication[!]	WMEC005-05	5								
Skills in Science Communication[!]	WMEC006-05 (2a only)	5								
Teacher's education[g]										
Neem Regie	TEM0110-24	10								
Computer skills[h]	**½ day unit**									
Access basic	5									
Excel basic	3									
Excel advanced	5									

Table notes:

(a) This specialisation has two variants, one focusing on data science in biomedicine; the other with a broader biological focus.

(b) Only in combination with an MSc research project involving animals.

(c) This course is suitable for students irrespective of their prior programming experience. Students who have already completed a BSc-level C++ programming course will be able to learn advanced programming techniques tailored to their individual background knowledge and skills.

(d) Biennial, runs in 2026/2027

(e) Biennial, runs in 2025/2026

(f) Selection for this biennial course takes place in wintertime, an advertisement about application details is announced via Brightspace and other means during the academic year.

(g) For Dutch-speaking students only.

(h) These elective master courses are organised by The Donald Smits Center for Information Technology. Please consult their website for further information, time schedules and enrolment details (courses are not listed in Ocasys). Participants in these courses have to pay a course fee (reduced rate for students; at the student's own cost). A minimum of 5 half day units is required for a study load of 1 ECTS, for 2 ECTS 11 units are needed. No more than 2 ECTS can be allocated to computer skills courses from this category.

(!) Students from another MSc programme have priority in enrolment for this course (except for students in the track Integrative Biology, when the course unit is a compulsory course in their specialisation).

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

Course unit	Entry requirement
Colloquium	Research project 1
Research project 2	Research project 1
Work placement Business & Policy	Research project, Introduction Science & Policy, Introduction Science & Business

Appendix VI. Admission to the degree programme (art. 2.1A.1 + 2.1B.1)

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

Holders of the following Bachelor's degrees 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 Biology from the University of Groningen or other Dutch research universities;
- Holders of a Bachelor's degree in Life Science & Technology (curriculum from 2020/2021 onwards) from the University of Groningen on the basis of a Research project (15 EC) in the discipline of interest (major Ecology and Evolution, major Molecular Life Sciences)

For holders of another relevant academic Bachelor's degree in life sciences there is an individual admission procedure based on the content of the bachelor's programme and language skills, see https://www.rug.nl/fse/programme/admissions/msc/language-requirements. It is possible to appeal to the decision of the admission board via standardized procedures at the University of Groningen.

Appendix VII. Pre-master programmes

1. *FSE offers a Pre-Master's programme for access to the MSc Biology and individually determined Pre-Master's programmes. The overview below shows:*
   - *which NVAO-accredited HBO (University of Applied Sciences) diploma grants access to the MSc Biology;*
   - *The content and student workload for these fixed programmes.*

   a. *The following types of HBO qualification qualifies for participation in the premaster:*
      - *(Applied) Biology (CROHO 30009)*
      - *Environmental Management (CROHO 34859)*
      - *Animal Management (CROHO 34333)*

The Pre-master's programme of 38 ECTS comprises the following course units (more detailed descriptions of the course units can be found on Ocasys):*

- *Systems Ecology & Ecological Interactions I (period 1a), 5 ECTS*
- *Systems Ecology & Ecological Interactions II (period 1a), 5 ECTS*
- *Genes and Evolution (period 1a), 5 ECTS*
- *Microbiology (period 1b), 5 ECTS*
- *Lab Course (period 1b), 3 ECTS*
- *Biostatistics 1 (period 1b), 5 ECTS*
- *Biostatistics II (period 2a), 5 ECTS*
- *Bachelor Thesis (whole year), 5 ECTS*

   b. *The following types of HBO qualification qualifies for participation in the premaster:*
      - *Biology and Medical Laboratory Research (CROHO 34397)*
      - *Biotechnology (CROHO 34331)*
      - *Bioinformatics (CROHO 39215)*

The Pre-master's programme of 40 ECTS comprises the following course units (more detailed descriptions of the course units can be found on Ocasys):*

- *Molecular Genetics (period 1a), 5 ECTS*
- *Medical Structural Biology (period 1a), 5 ECTS*
- *Bioinformatics (period 1a), 5 ECTS*
- *Modelling Life (period 1b), 5 ECTS*
- *Cell Biology and Microscopy (period 2a, 5 ECTS)*
- *Bio-organic Chemistry (period 2a), 5 ECTS*
- *Enzymology and Thermodynamics (period 2b), 5 ECTS*
- *Bachelor Thesis (whole year), 5 ECTS*

Starting date(s): 1 September

2. *For HBO programmes not listed above, the Board of Admissions decides:*
    a. *The content and the student workload of a tailormade Pre-Master's programme.*

or

    b. *Admission is not accepted.*

** subject to availability*

Appendix VIII. Transitional provisions (art. 7.1)

The following tracks/courses will no longer be offered; the new curriculum contains alternative profiles/ courses for each one of them, or an alternative combination of courses with equivalent learning outcomes, so that the transition between old and new curriculum is smooth:

Track/Course unit(s) in old curriculum	Course code	Replaced by:
Research track		Flexible Research profile listed under Integrative Biology track without change in content.
Modelling in the life sciences track		Modelling in the life sciences profile listed under Integrative Biology track without change in content.
Essay	WMBY021-05	The essay can be listed as elective if a result has already been achieved in previous academic years before termination of this individual item.

Appendix IX. Additional Requirements Open degree Programmes (art. 3.10)

The flexible Research profile caters for an individual degree programme. In exceptional circumstances students wishing to pursue an open degree programme outside the set requirements of the R-profile 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.