

Assessment plan of the Master's degree programmes 2022-2023: Biology

Introduction

This assessment plan is a description of the testing and assessment modes for all study components in the curriculum of the Master's degree programme Biology. The plan is based on the assessment policy of the Faculty of Science and Engineering, as set out in the [FSE Quality Assurance Manual](#) (Chapter 6: Assessment appendix B) and the protocol setting out the duties and powers of the Faculty's Board of Examiners (Chapter 6: Assessment appendix G)

The assessment plan for the curriculum consists of the following parts:

1. the objective(s) of the degree programme
2. the learning outcomes of the degree programme
3. descriptions of the study components, as set out in the appendices to the Teaching and Examination Regulations 2022-2023 of the degree programme
4. descriptions of the content of each study component in Ocasys, the online course catalogue. The following elements are relevant in this context:
 - objectives
 - description of content
 - lecturers
 - assessment mode(s) and calculation of final mark
 - mode(s) of instruction.
5. an overview of the mentors and examiners (Appendix 1 and 2) and the assessment mode for each study component (Table 1 and Appendix 3). This overview is based on the curriculum approved by the Programme Committee, as set out in the appendices to the Teaching and Examination Regulations 2021-2022 for the degree programme.
6. A matrix showing the relationship between the study components and the learning outcomes for each competence area.

Parts 3 and 4 are not included in this document. For the descriptions of the study components, see the Appendix to the Teaching and Examination Regulations for the degree programme in Biology. Descriptions of the content of each study component can be found in Ocasys, the online course catalogue (<http://www.rug.nl/ocasys/>).

1. Objectives of the degree programme

The Master's programme is research oriented. It has three tracks: a research track, a Modelling in the Life Sciences track and a science business and policy (SBP) track.

The Research-track focuses entirely on research to prepare for a career in academia or other research institutes. The study programme therefore mainly consists of research projects, which focus on learning about conducting research by actually doing it. Students will not only independently perform experiments in the laboratory or the field, they will also go through the whole process of conducting science developing skills such as searching for and studying scientific literature, formulating hypotheses, designing and performing experiments, and presenting results.

The track Modelling in the Life Sciences is a research track that prepares for conducting research in this field of biology. Students choose one of the mentors of this track (Appendix 1).

The SBP- track comprises one year of research and one year aimed at the development of policy and management-related understanding and skills to prepare for a career in a company, consultancy or policy organization. This track is especially for students who are not only interested in science but also in the social and commercial aspects of scientific developments and products. Additional training in interactions with other disciplines, communication with non-scientists and general management skills is also part of this track.

In consultation with a study mentor (Appendix 1) students design their own study programme tailored to their interests. The board of examiners must approve of each individual programme.

2. Learning outcomes of the degree programme

The taxonomy of Bloom has been adopted as an adequate means to describe the teaching objectives and their level, the teaching and student activities to reach these objectives and the unambiguous assessment of the extent to which the objectives have been reached.

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 his/her 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 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.

Curriculum

The major part of the master's degree programme consists of 80 ECTS of compulsory individual elements (research projects, colloquium, essay, see table 1). These are graded by examiners appointed by the Board of Examiners (Appendix 2).

In addition to the 80 ECTS individual elements, maximally 40 ECTS of the student's programme is composed of course units. Of these, 20 ECTS have to be chosen from a list of master modules.

With the individual elements the student acquire most of the qualifications/ learning outcomes (table 3). In the courses, the student increases their domain-specific knowledge and skills and acquires the qualifications/learning outcomes as indicated in table 4.

Master modules,

At most 40 ECTS of the student's programme is composed of courses. Of these, 20 ECTS have to be chosen from a list of master modules. The student increases their domain-specific knowledge and skills in these courses. All of these courses may be chosen as elective too (max 20 ECTS in an individual programme).

Students within the track *Modelling in the Lifes Sciences* start by taking 3 obligatory courses on mathematics and modelling (*Mathematics in the Life Sciences* (5 EC), *Biological Modelling and Model Analysis* (10 EC), *Programming C++ for biologists* (5 EC). Subsequently at least one research project is performed with a focus on modelling.

The coordinators of the courses have been asked to update or provide information in the form of a so called Course Unit Assessment Overview (CUAO) and to provide information on the contribution to the teaching outcomes of the programme. See table 4.

Students may also choose electives organized by other programmes of the FSE or elsewhere. These are not included in this assessment plan but are chosen in consultation with the mentor to make sure the individual programme of the student adheres to all learning outcomes of the programme (Appendix 1 mentors).

Table 1. An overview of the master's degree programmes per track.

Modelling in the Life Sciences:

COURSE UNIT	ECTS	TEACHING FORM	ASSESSMENT
Essay	5	Individual literature study	Written report
Research project	≥ 30	Research	Technical and/or laboratory skills, written report, oral presentation
Research project	≥ 40	Research	Technical and/or laboratory skills, written report, oral presentation
Colloquium	5	Individual literature study	Oral presentation
Mathematics in the Life Sciences	5	Lectures and computer practicals	Assignments
Biological Modelling and Model Analysis	10	Lectures and computer practicals	Assignments and oral presentation
Programming C++ for Biologists	5	Lectures, assignments and computer practicals	Assignments, computer practical and oral presentation
Electives	≤20	Various	Various

Research:

COURSE UNIT	ECTS	TEACHING FORM	ASSESSMENT
Essay	5	Individual literature study	Written report
Research project	≥ 30	Research	Technical and/or laboratory skills, written report, oral presentation
Research project	≥ 40	Research	Technical and/or laboratory skills, written report, oral presentation
Colloquium	5	Individual literature study	Oral presentation
Master courses	20	Various	Various
Electives	≤20	Various	Various

Science Business and Policy

COURSE UNIT	ECTS	TEACHING FORM	ASSESSMENT
Research project	≥ 40	Research	Technical and/or laboratory skills, written report, oral presentation
Colloquium	5	Individual literature study	Oral presentation
Master courses	5	Various	Various
Electives	≤10	Various	Various
SBP work placement	40	Project assignment	Performance, written report, reflection report
Modules SBP	20	Lectures, tutorials, project assignments	Assignments, exam

3. Overview of examiners and testing and assessment modes for study components

Table 2 shows the study components for each year of the programme, and the intended examiner(s) and assessment modes. Not all elective course units are part of this table but can be found in the Teaching and Examination Regulations (OERs) and/or Ocasys. This satisfies requirement 3 in the Protocol of Duties and Powers of the Board of Examiners of the Faculty of Science and Engineering.

Course name	Course code	EC	Coordinator/ First examiner	Second examiner	Mode of assessment
Advanced genetic engineering (and complex gene regulatory circuitries)	WMBS006-05	5	Prof. Dr. T.E.F. Quax	Tba	WE/P/PR
Advanced light microscopy	WMBY016-05	5	Prof. Dr. I.J. van der Klei	Prof. Dr. M. Heinemann	WE/P/PR
Advanced Membrane Biology	WMBS007-05	5	Prof. Dr. B. Poolman	Prof. dr. D.J. Slotboom	WE/PR
Advanced protein crystallography	WMBS008-05	5	Dr. A.M.W.H. Thunnissen	Dr. A. Guskov	WE/PR
Advanced statistics	WMBY018-06	6	Prof. Dr. I.R. Pen	Dr. G.S. van Doorn	R
Advances in signal transduction	WMBS009-05	5	Dr. A. Kortholt	Dr. M.H.K. Linskens	R/P/PR
Laboratory Animal Science	WMBY026-05	2/5	Prof. Dr. G. van Dijk	prof. dr. E.A. van der Zee	WE/PR/AST
Biological Modelling and Model Analysis	WMBY005-10	10	Dr. G.S. van Doorn	Prof. dr. R.S. Etienne	P/AST
Electron microscopy of biological macromolecules	WMBS011-05	5	Dr. C. Batista Paulino	Dr. M.C.A. Stuart	WE/PR/AST
Evolutionary Medicine Diseases of Affluence (EMDA)	WMBY025-05	5	Prof. dr. H.L. Dugdale	M.G. Elliot PhD	MC/AST
Evolutionary Medicine Infectious Diseases (EMID)	WMBY024-05	5	Dr. S.J.J. Lequime	Dr.ir. M.G.J. de Vos	WE/P/AST
Flyway ecology (biennial, runs in 2022/2023)	WMEV010-05	5	Prof. Dr. J.A. van Gils	Prof. Dr.T. Piersma	R/P/PR
International Genetically Engineered Machine competition (iGEM)	WMBS013-20	20	S.K. Billerbeck, PhD	Dr. J.L. Kamenz	R/P
Marine ecosystem service & global change	WMMB008-05	5	Prof. Dr. K. Timmermans	Tba	WE/P/AST
Mathematical Models in Ecology and Evolution	WMEV013-06	6	Prof. Dr. I.R. Pen	Prof. Dr. F.J. Weissing	WE
Mathematics in the Life Sciences	WMBY006-05	5	Prof. dr. R.S. Etienne	Prof. Dr. F.J. Weissing	AST
Meta-analyses in Ecology (biennial, runs in 2022/2023)	WMBY013-05	5	Prof. Dr. B.D.H.K. Eriksson	H. Hillebrand	R/P
Molecular dynamics	WMBS003-05	5	Prof. Dr. S.J. Marrink	Dr. A.H. de Vries	WE/P/PR
Molecular Methods in Ecology and Evolution	WMEV007-10	5/ 10	Prof. Dr. B. Wertheim	Prof. Dr. J. Falcão Salles	P/PR/AST
Organelle and Membrane Biogenesis	WMBS012-05	5	Prof. Dr. A.J.M. Driessen	Prof. Dr. I.J. van der Klei	P/PR/AST
Orientation on International Careers	WMBY014-05	5	S. Grooters	B. Piersma	R/P/PR
Polar Ecosystems	WMMB009-05	5	Dr. W.H. van de Poll	Prof. Dr. R. Bintanja	WE/P
Practical Computing for Biologists	WMBY008-05	5	Prof. dr. P.J. Palsboll	Dr. S.J.J. Lequime	PR/AST
Practical modelling for biologists	WMBY009-05	5	Prof. dr. J. van de Koppel	t.b.d.	P/AST
Programming C++ for biologists	WMBY010-05	5/ 10	Dr. G.S. van Doorn	J. Bakker	IT/P/PR/AST
Radioisotopes in Experimental Biology	WMBY011-05	5	Drs. E.J. Bunscoeke	Dr. M.H.K. Linskens	WE/MC/R
Research proposal Ecology and Evolution	WMEV012-05	5	Prof. Dr. B.I. Tieleman	Tba	R/P
Skills and Scopes in Biology	WMBY007-05	5	Dr. B. Buwalda	Prof. dr. A.J.W. Scheurink	R/P/AST
Tools and approaches of systems biology	WMBS005-05	5	Prof. Dr. M. Heinemann	Andreas Miliadis-Argeitis	WE/PR
Transcriptomics: DNA microarrays and RNAseq	WMBS014-05	5	Dr. A. de Jong	Dr. D. Incarnato	R/P/PR

Assessment abbreviations:

(WE) Written Exam
(MC) Multiple choice

- (IT) Interim Test
 (OE) Oral Exam
 (R) Report
 (P) Presentation
 (PR) Practical Work
 (AST) Assignment

4. Relationship between course units and details of the learning outcomes

Table 3 (individual elements) and table 4 (Master and elective courses) show the relationship between the learning outcomes and the course units of the curriculum.

*Table 3. Relation between learning outcomes compulsory individual elements of the master's degree programme, Modelling in the Life Sciences, Research and SBP track**

Research track→	Essay	Research projects	Colloquium		
Modelling in the Life Sciences track→	Essay	Research projects	Colloquium		
Science Business & Policy Track→		Research project	Colloquium	Work placement	SBP courses
1 knowledge	+++	+++	+++	+	++
2 research design		+++		+	
3 scientific literature	+++	+++	+++	++	+
4 new developments	+++	+++	+++	++	+
5 solving complex problems	++	+++	++	+	++
6 team contribution		+++		+++	+++
7 communication	+++	+++	+++	+++	+++
8 reflection	++	+++	++	+++	++
9 learning abilities	+++	++	+++	++	+

*The number of + indicates to what extent the module contributes to the learning outcomes. Numbers correspond to learning outcomes of the master's degree programmes. Course units for both tracks are marked grey.

Students are allowed to do a research assignment of 5-20 ECTS as an elective. Since these research assignments are individual assignments, their contribution to the degree programme's end terms vary as well.

Appendix 1. Mentors

Behaviour & Neuroscience

Name	Research Group
Dr. B. Buwalda	Neurobiology
Prof. Dr. G. van Dijk	Neurobiology
Prof. Dr. U.L.M. Eisel	Neurobiology
Dr. R. Havekes	Molecular Neurobiology
Prof. Dr. R.A. Hut	Neurobiology
Prof. Dr. A.J.W. Scheurink	Neurobiology
Prof. Dr. E.A. van der Zee	Neurobiology

Modelling in the Life Sciences

Dr. G.S. van Doorn	Theoretical Research in Evolutionary Life Sciences
Prof. Dr. R. Etienne	Theoretical Research in Evolutionary Life Sciences
Prof. Dr. I.R. Pen	Theoretical Research in Evolutionary Life Sciences

Ecology and Evolution

Prof. Dr. L.W. Beukeboom	Evolutionary Genetics, Development & Behaviour
Prof. Ir. C. Both	Conservation Ecology
Prof. Dr. R. Etienne	Theoretical Research in Evolutionary Life Sciences
Prof. Dr. J. Falcao Salles	Genomics Research in Ecology & Evolution in Nature
Dr. L.L. Govers	Conservation Ecology
Prof. Dr. J. Komdeur	Behavioural & Physiological Ecology
Prof. Dr. H. Olff	Conservation Ecology
Prof. Dr. I.R. Pen	Theoretical Research in Evolutionary Life Sciences
Prof. Dr. T. Piersma	Conservation Ecology
Prof. Dr. Ir. C. Smit	Conservation Ecology
Prof. Dr. B.I. Tieleman	Behavioural & Physiological Ecology
Prof. Dr. S. Verhulst	Behavioural & Physiological Ecology
Prof. Dr. B. Wertheim	Evolutionary Genetics, Development & Behaviour

Marine Biology

Prof. Dr. B.D.H.K. Eriksson	Genomics Research in Ecology & Evolution in Nature
Dr. L.L. Govers	Conservation Ecology
Prof. Dr. P.J. Palsboll	Genomics Research in Ecology & Evolution in Nature
S.E.T. van der Meij, PhD	Genomics Research in Ecology & Evolution in Nature
Dr. W.H. van de Poll	Ocean Ecosystems

Biomolecular Sciences

Dr. S. El Aidy	Microbial Physiology
Dr. S.K. Billerbeck	Molecular Genetics
Prof. Dr. G van den Bogaart	Molecular Immunology

Prof. Dr. A.J.M. Driessen	Molecular Microbiology
Prof. Dr. M.W. Fraaije	Biotransformation and Biocatalysis
Prof. Dr. M. Heinemann	Molecular Systems Biology
Prof. Dr. I.J. van der Klei	Molecular Cell Biology
Dr. A. Kortholt	Cell Biochemistry
Prof.Dr. G. Maglia	Chemical Biology
Prof. Dr. B.Poolman	Membrane Enzymology
Prof. Dr. D.J. Scheffers	Molecular Microbiology
Prof. Dr. D.J. Slotboom	Membrane Enzymology
Dr. A.H. de Vries	Molecular Dynamics

Appendix 2. Examiners

List of appointed examiners

The list presented in this chapter provides names of staff members that are formally appointed as Examiner by the Board of Examiners of Biology. Examiners can be contacted for research projects, essays, colloquia and research assignments.

New Examiners can be appointed during the year by the Board of Examiners. Their names and (other) revisions of the list of Examiners will be published on the Student Portal.

It should be noted that most SBP- track staff members are appointed as Examiner for the modules science and business, science and policy and the work placement of the SBP-track only. For the SBP work placement, besides the SBP- Examiner, you also need to have an appointed 'Science Examiner' from this list.

Contact details also are available on Student Portal.

Name	Field of expertise/ Research group
Dr. S. El Aidy	Microbial Physiology
Dr. W. Baron	Cell Biology-Membrane Cell Biology
Dr.C. Batista Paulino	Electron Microscopy
Dr. M. Bérubé	Genomics Research in Ecology & Evolution in Nature
Prof. Dr. Matty P. Berg	Community and Conservation Ecology
Prof. Dr. L.W. Beukeboom	Evolutionary Genetics, Development & Behaviour
Dr. S.K. Billerbeck	Molecular Microbiology
Prof. Dr. J.C. Billeter	Evolutionary Genetics, Development & Behaviour
Prof. H.W.G.M. Boddeke	Medical Physiology
Dr. P. Boelen	Ocean Ecosystems
Dr. M.K. de Boer	Marine Biology Science and Society Group
Prof. Dr. G van den Bogaart	Molecular Immunology
Prof. ir. C. Both	Conservation Ecology
Prof.dr. T.J. Bouma	Conservation Ecology
Prof. Dr. R.A.L. Bovenberg	Molecular Microbiology
Dr. J. Broos	Protein Crystallography
Prof. Dr. W.R. Browne	Synthetic Organic Chemistry
Dr. B. Buwalda	Neurobiology
Dr. M.W. Dietz	Behavioural & Physiological Ecology
Prof. Dr. G. van Dijk	Neurobiology
Prof. J.M. van Dijk	Medical Microbiology
dr. G.S. van Doorn	Theoretical Research in Evolutionary Life Sciences
Prof. Dr. A.J.M. Driessen	Molecular Microbiology
Prof. H. Dugdale	Evolutionary Medicine, Quantitative genetics
Dr. B.J.L. Eggen	Neuroscience
Prof. Dr. U.L.M. Eisel	Neurobiology
Dr. M.G.Elliot	Evolutionary Biology Reproductive Biology Physiology
Prof. Dr. J.T.M. Elzenga	Genomics Research in Ecology & Evolution in Nature
Prof. Dr. B.D.H.K. Eriksson	Genomics Research in Ecology & Evolution in Nature
Prof. Dr. R. Etienne	Theoretical Research in Evolutionary Life Sciences

Prof. Dr. G.J.W. Euverink	Products and Processes for Biotechnology in the Biobased Economy Science and Society Group
Prof. Dr. J. Falcao Salles	Genomics Research in Ecology & Evolution in Nature
Prof. Dr. M.W. Fraaije	Biotransformation and Biocatalysis
Prof. Dr. J.A. van Gils	Conservation Ecology
Dr. L.L. Govers	Conservation Ecology
Dr. A. Guskov	Structural Biology
Prof. Dr. V. Guryev	Evolutionary Biology, Genetics & Heredity
Dr. R. Havekes	Molecular Neurobiology
Prof. Dr. T. van der Heide	Conservation Ecology
Prof. Dr. M. Heinemann	Molecular Systems Biology
prof. dr. R.H. Henning	Pharmacology
Prof. G.J. ter Horst	Neuro Imaging Center
Prof. Dr. R.A. Hut	Neurobiology
Dr. D. Incarnato	Molecular Genetics
dr. J.L. Kamenz	Biochemistry, cellbiology, Computational Biology
Prof. dr. M.J.H. Kas	Neurobiology
Prof. Dr. I.J. van der Klei	Molecular Cell Biology
Prof. Dr. J. Komdeur	Behavioural & Physiological Ecology
Prof. Dr. J. van de Koppel	Community & Conservation ecology
Dr. A. Kortholt	Cell Biochemistry
Prof. Dr. O.P. Kuipers	Molecular Genetics
Dr. M.H.K. Linskens	Cell Biochemistry
Dr. M.J.J.E. Loonen	Arctic Centre
prof.dr. G. Maglia	Chemical Biology
Prof. Dr. S.J. Marrink	Molecular Dynamics
C. Mayer PhD	Biomolecular chemistry & Catalysis
Dr. P. Meerlo	Neurobiology
S.E.T. van der Meij, PhD	Genomics Research in Ecology & Evolution in Nature
Dr. A. Milias Argeitis	Molecular Systems Biology
Prof. Dr. ir. A.J. Minnaard	Chemical Biology
Prof. Dr. E.A.A. Nollen	Molecular Neurobiology of Ageing (ERIBA)
Dr. Ing. J.D.A. Olivier	Neurobiology
Prof. Dr. H. Olff	Conservation Ecology
Dr. G.T. Oostergetel	Electron Microscopy
Prof. Dr. P.J. Palsboll	Genomics Research in Ecology & Evolution in Nature
Prof. Dr. I.R. Pen	Theoretical Research in Evolutionary Life Sciences
Prof. Dr. T. Piersma	Conservation Ecology
Dr. W.H. van de Poll	Ocean Ecosystems
Prof. Dr. B.Poolman	Membrane Enzymology
Prof. Dr. J.G. Roelfes	Synthetic Organic Chemistry
Prof. Dr. D.J. Scheffers	Molecular Microbiology
Prof. Dr. A.J.W. Scheurink	Neurobiology
Prof. Dr. M. Schmidt	Molecular Farmacology
Prof. Dr. D.J. Slotboom	Membrane Enzymology
Prof.dr.ir. C. Smit	Conservation Ecology

Prof. Dr. E.J. Stamhuis	Ocean Ecosystems
Dr. J. Stefels	Genomics Research in Ecology & Evolution in Nature
Dr. M.A. Swertz	Bioinformatics Center
Dr. D.W. Thieltges	Department of Coastal Systems
Dr. A.M.W.H. Thunnissen	Protein Crystallography
Prof. Dr. B.I. Tieleman	Behavioural & Physiological Ecology
Prof.Dr. K.R. Timmermans	Ocean Ecosystems
Dr. L.M.Veenhoff	Cellular Biochemistry (ERIBA)
Prof. Dr. S. Verhulst	Behavioural & Physiological Ecology
Prof. Dr. M.E. Visser	Chronobiology
dr. ir. M.G.J. de Vos	Genomics Research in Ecology & Evolution in Nature
Dr. A.H. de Vries	Molecular Dynamics
Dr. M.T.C. Walvoort	Chemical Biology
Prof. Dr. F.J. Weissing	Theoretical Research in Evolutionary Life Sciences
Prof. Dr. B. Wertheim	Evolutionary Genetics, Development & Behaviour
Dr. M.D. Witte	Chemical Biology
Prof. Dr. E.A. van der Zee	Neurobiology

SBP Supervisors	
Drs M. Berger	Science and Society
Dr. M.K. de Boer	Science and Society
Prof. Dr. G.J.W. Euverink	Science and Society
Drs. S. Grooters	Science and Society
G.A.H Laugs, MSc	Science and Society
M. J. van den Nieuwenhof- Schilstra, MSc	Science and Society
Dr. B. Piersma	Science and Society
J. Zevenberg, MSc	Science and Society