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Appendices for the Master's degree programme(s) in Biomolecular Sciences

I. Learning outcomes of the Master's degree programme
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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 field of Biomolecular Sciences 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 Biomolecular Sciences 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 Biomolecular Sciences students can follow the
   a. Research-track (R-track), which provides training as a researcher.

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

The degree programmes consist of:

Study elements	**Course code**	**ECTS**	**entry requirements**
Introduction to Biomolecular Research	WMBS024-05	5	
4 compulsory master courses#		20	see Ocasys
Research project (RP)*	WMBS90x-xx	40	see appendix V
Research project (RP)*	WMBS90x-xx	30	see appendix V
Colloquium	WMBS015-05	5	RP
Electives**		≤20	see Ocasys

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

- The student chooses a mentor from the list of Biomolecular Sciences mentors to get advice on and discuss the contents of the individual degree programme before requesting approval from the Board of Examiners.

- * 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) or the University Medical Centre Groningen under supervision of one of the examiners of the degree programme.

- ** 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 repair specific deficiencies or perform a research assignment of 5, 10, 15 or 20 ECTS.

- 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.

- #Students have to pass four courses out of the following courses:

Course	**Course code**
Tools and Approaches of Systems Biology	WMBS005-05
Molecular Dynamics	WMBS003-05
Advanced Light Microscopy	WMBY016-05
Molecular Modeling and analysis in structural biology	WMBS021-05
Advanced Membrane Biology	WMBS007-05
Next-generation sequencing methods and data analysis	WMBS023-05
Advanced Mammalian Cell Biology	WMBS022-05
Protein and Enzyme Engineering	WMBS004-05
Advanced Genetic Engineering	WMBS006-05
Electron Microscopy of Biological Macromolecules	WMBS011-05

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Appendix IV. Electives (art. 3.9.1)

The following lists present study elements that can be chosen as 'electives'. After consultation with the study mentor and approval of the Board of Examiners (through an individual request) students may also choose from options available from other programmes, or other universities in the Netherlands or abroad.

Electives organised by the research institute GBB:

Course		ECTS
Advanced Light Microscopy	WMBY016-05	5
Advanced Membrane Biology	WMBS007-05	5
Advanced Genetic Engineering and Complex Gene Regulatory Circuitries	WMBS006-05	5
Advanced Mammalian Cell Biology	WMBS022-05	5
Advanced Biocatalysis	WMCH033-05	5
Electron Microscopy of Biological Macromolecules	WMBS011-05	5
iGEM (International Genetically Engineered Machine competition)* (biennial, runs in 2026-2027)	WMBS013-xx	≤20
Molecular Dynamics and Modeling of Membranes and Proteins	WMBS003-05	5
Molecular modeling and analysis in structural biology	WMBS021-05	5
Next-generation sequencing methods and data analysis	WMBS023-05	5
Protein and Enzyme Engineering	WMBS004-05	5
Tools and Approaches of Systems Biology	WMBS005-05	5

* 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.

Electives organised by the research institutes GELIFES and ESRIG:

Course	Course code	ECTS
Advanced Statistics	WMBY018-06	6
Modelling Complex Biological Systems	WMBY027-05	5
Laboratory Animal Science*	WMBY026-05	5
Mathematical Models in Ecology and Evolution	WMEV013-06	6
Mathematical Models in Biology	WMBY031-05	5
Molecular Methods in Ecology & Evolution	WMEV007-05	5
Orientation on Non-academic Careers	WMBY032-05	5
Practical Computing for Biologists	WMBY008-05	5
Practical Modelling for Biologists	WMBY009-05	5
Programming in C++ for Biologists **	WMBY010-05	5

* Course unit only possible in combination with an MSc research project involving animals.

** Students who have already followed similar courses during their Bachelor's degree will be given a deepening version of the course more tailored to their individual background knowledge and skills.

Electives organised by Biomedical Sciences/GELIFES:*

Course	Course code	ECTS
Applied Statistics and Machine Learning	WMBM024-05	5
Big Data and Applications in Biomedicine	WMBM025-05	5
Data Science in Biomedicine	WMBM023-05	5
Microbiological Safety	WMMP004-01	1

*Students MSc Biomedical Sciences have priority in enrolment

Electives organised by Chemistry:

Course	Course code	ECTS
Advances in Chemical Biology	WMCH014-05	5
Biophysical Imaging & Manipulation Techniques	WMPH047-05	5
Synthetic Biology & Systems Chemistry	WMCH021-05	5

Electives organised by Science & Society:

Course	Course code	ECTS
Introduction to Science & Business	WMSE001-10	10
Introduction to Science & Policy	WMSE002-10	10

Electives organised by Energy and Environmental sciences*:

Course	Course code	ECTS
Energy, Atmosphere and Resources	WMEE028-05	5
Ecology and Ecosystem Sustainability	WMEE021-05	5
Sustainable Society	WMEE020-05	5
Modelling Energy Systems	WMEE025-05	5

* Students MSc Energy and Environmental Sciences have priority in enrolment

Electives organised by Education and Communication*:

Course	Course code	ECTS
Research Methods in Science Education and Communication	WMEC005-05	5

Skills in Science Communication (2a only)	WMEC006-05	5

*Students MSc Science Education and Communication have priority in enrolment

Elective master courses organised by Teacher Education**

Course	**Course code**	**ECTS**
Neem Regie	TEM0110-24	10

** Dutch-speaking students only

Electives organised by The Donald Smits Center for Information Technology:

Course (max 2 ECTS per individual programme^)	**½ day unit^**
Access basic	5
Excel basic	3
Excel advanced	5

^ 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 (at a low fee for students), 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.

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

Course unit	Entry requirement
Colloquium	Research project
Research project 2	Research project 1

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

1. Requirements for admission to the selective Master's degree in Biomolecular Sciences

Holders of the following Bachelor's degrees are considered to have sufficient knowledge and skills to be admitted to the Master's degree programme in Biomolecular Sciences on that basis:

- Holders of a Bachelor's degree in Biology from the University of Groningen, with the major Molecular Life Sciences;
- 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 Molecular Life Sciences (15 EC).
- Holders of a Bachelor's degree in Pharmacy, from the University of Groningen, with the combination of the major Medical Pharmaceutical Sciences with the minor Molecular Life Sciences.
- Holders of a Bachelor's degree in Chemistry, from the University of Groningen, with the major Chemistry of Life.

For holders of another relevant academic Bachelor's degree with a specialization in Biochemistry, Molecular Biology, Biotechnology or Molecular Genetics 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.

2. Applications procedure for selective Master degree programmes:

All candidates have to register in Studielink before 1 May and submit the following documents (start academic year 1 September):

- ID card or passport
- Diploma of relevant Bachelor's degree programme (if possible)
- List of grades (transcript of records)
- Proof of English language proficiency
- CV
- Checklist:

Motivation
Reference contacts/letters
List of subjects/courses (to be) followed
Brief description of 5 key subjects/courses

- A report as a result of an academic assignment in the context of the programme. The report has to reflect the student's ability to produce a well-structured and concise report

After candidates have completed their registration in Studielink, applications will be processed in the following way:

For holders of a Dutch BSc diploma:

1. Admission Support FSE compiles the individual selection file
2. Admission Support FSE submits the individual selection file to the Admissions Board of the individual programme

For holders of a non-Dutch BSc diploma:

1. Admissions Office compiles the individual selection file
2. Admissions Office validates individual Bachelor's degree diploma
3. Admissions Office submits the individual selection file to the Admission Support FSE
4. Admission Support FSE submits the individual selection file to the Admission Board of the individual programme

3 Selection procedure

In order to select the appropriately suited and motivated students, the Admission Board requires a complete selection file from all candidates. The Admission Board of the individual programmes will review all individual applicants on the basis of their selection file. All candidates that have an appropriate background will be considered admissible and further considered for the selection procedure described below. All candidates who meet the selection criteria regarding 'academic performance' and 'motivation' (as specified by the different programmes) will be admitted to the programme.

At least two members of the Admission Board score the selection criteria. Scoring is on a 9-point scale from 1 to 5 (1 = insufficient to 5 = excellent with 0.5 steps). If the scores on academic performance and/or motivation deviate 1 point or more, the members of the Admission Board that gave the scores have to confer, after which they grade a second time. This outcome constitutes the final score. Candidates with minimally a sufficient average score of 3 for each criterion, and an average overall score of at least 3.5 are selected.

1. Academic performance (60%)

The score on academic performance is the average result of the scores on relevance (70%) and proficiency (30%). Maximum score 1 point per key subject for criterium on relevance and maximum 5 points for criterium on proficiency.

A) Relevance and affiliation/fit (70%) of the followed Bachelor programme to the Master programme (list of subjects/courses followed and grades obtained; brief description of the content of 5 key subjects/courses demonstrating the programme specific knowledge and skill(s) acquired by the student).

Key subjects[1]:

1. Genetics (Genetics Ecology & Evolution, Molecular Genetics, Bioinformatics)
2. Biochemistry (Molecules of Life, Basic Cell & Molecular Biology, Bio-organic Chemistry)

3. Microbiology (Microbiology, Host-Microbe Interactions, Enzymology & Thermodynamics)
4. Cell Biology (Basic Cell & Molecular Biology, Cell Biology & Immunology, Cell Biology & Microscopy)
5. Practical skills in Molecular Biology (Lab Course, Research Skills In Life Sciences 1+2+3, Bioinformatics, Practical Carrousel, Modelling Life)

[1] *Key subjects/courses; the nature of the knowledge and relevant skill(s) are defined by the programme director in consultation with the programme committee, and are approved by the director of the Graduate School.*

Please consult our online catalogue www.rug.nl/ocasys/ for the intended learning outcomes of the course units that cover these subjects

B) Academic and analytical skills/Proficiency (30%) in completing an academic assignment in the context of the programme and in individually producing a written report on the assignment topic. The report has to reflect the student's ability to produce a well-structured and concise report. It also has to show that the student is developing a critical attitude and is capable of critical thinking. The assignment handed in is free of choice and can be a report on a practicum, experiment, field-work, a literature review, a bachelor thesis, etc.[2])

[2] *If the student has not made an individually written report in English during the Bachelor programme, he/she should contact the Admission Support FSE to receive an assignment on the basis of which a written report should be prepared.*

2. Motivation (40%)

The candidate has to provide a motivation form (max. 500 words, part of the checklist) demonstrating a suitable stance and talent to follow the programme. Maximum score 1 point (1 point for excellent, 0,5 point for satisfying) per question/issue 1-5. In case a specific motivation is covered under question/issue 6, the Board of Admissions members will together discuss the scoring of this answer, and note this in the scoring sheet. The motivation table in the checklist should address the following specific questions/issues:

1. Why did you choose this specific Master's degree programme?

2. How did the Bachelor's degree programme, extracurricular activities, and/or other experiences prepare you for this specific Master programme?

3. In case it took you longer than nominal to acquire the Bachelor's degree, please briefly explain the cause(s) of the delay

4. How will this Master's degree programme prepare you for your future career and/or serve your ambitions?

5. Please shortly address specific topics in Biomolecular Sciences that particularly interest you

6. Free space to mention anything you feel is relevant and is not addressed by the questions above

Timeline for the application and selection procedure
The application procedure for the start on the 1st of September will open on the 1st of October and will close on the 1st of May. The details of the entire application procedure are published on the *Admission and Application* website for the individual Master's degree programme.

After registration in Studielink, all candidates will receive an email with an overview of the application procedure, the deadlines and instructions on how to proceed.

After candidates have successfully submitted all necessary documents, the Admission Support FSE (for holders of a Dutch BSc diploma,) or the Admissions Office (for holders of a non-Dutch BSc diploma) will send the candidate a confirmation of receipt.

Candidates with minimally a sufficient average score of 3 for each criterion, and an average overall score of at least 3.5 are selected and will be offered a place in the programme.

Candidates who are not selected can lodge a written appeal against this decision within four weeks of the date of sending, with the Board of Appeal for Examinations, P.O. Box 72, 9700 AB Groningen, the Netherlands.

Appendix VII. Pre-master programmes

1. FSE offers Pre-Master's programmes for access to the MSc Biomolecular Sciences and individually determined Pre-Master's programmes. The overview below shows:
   - which NVAO-accredited HBO diploma grants access to the MSc Biomolecular Sciences:
   - The content and student workload for these fixed programmes.

   a. The following types of HBO qualification qualifies for participation in the selection procedure:
      - Biology and Medical Laboratory Research (specializing in molecular biology / biochemistry / diagnostics; a research specialization is best) (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.

3. For selective masters, pre-master's students are selected on the basis of the following selection criteria and selection procedure:
   a. the Pre-master's programme is intended for students at a University of Applied Sciences who are performing above average: the Admissions Board assesses students on the strength of the knowledge/major and skills they have already acquired and motivation. As part of the selection procedure, the Admissions Board therefor requests a nomination letter from the HBO programme.
   b. a completed premaster in Biomolecular Sciences also gives access to the MSc Biology.

* subject to availability

Appendix VIII. Transitional provisions (art. 7.1)

The essay, WMBS016-05 can be listed as elective if a result has already been achieved in previous academic years before termination of this individual item.

Introduction to Biomolecular Research (WMBS024-05) is not mandatory for previous cohort students who passed Protein and Enzyme Engineering (WMBS004-05) as first mandatory course offered in 1A1.

Obligatory MSc Biology courses Skills for Biology 1: Professional Perspectives and Career Orientation (WMBY029-05) and Skills for Biology 2: Quantitative Research Methods (WMBY028-05) can be listed as electives if a result has already been achieved before transferring to the selective MSc Biomolecular Sciences.

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

In exceptional circumstances students wishing to pursue an open degree programme 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.