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

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

Graduates Biomedical Sciences (BMS) are able to:

1. Explain in detail the major underlying principles of biomedical sciences (knowledge).

2. Manage and interpret (big) data and demonstrate proficiency in computing technology for biomedical sciences (application).

3. Formulate solutions to biomedical issues both theoretical, technical and in a practical laboratory setting (knowledge and application).

4. Critically evaluate scientific biomedical data and offer sound arguments to justify a position (judgement and communication).

5. Effectively communicate scientific concepts to specialists as well as to a lay audience through oral and written presentations (communication).

6. Critically appraise the role of ‘biomedical sciences’ and/or in the dedicated specialisms ‘Biology of Ageing’ or ‘Biology of Cancer and Immune System’, ‘Biology of Food and Nutrition’ and ‘Neuroscience’ research aiming on supporting healthy ageing (knowledge and judgement).

7. Work independently as well as in a team to solve scientific and societal challenges related to biomedical sciences (communication and application).

8. Independently draw conclusions on ethical issues in biomedicine and apply this to scientific or public discussions about the impact of such science on society (judgement).

9. Evaluate and reflect on personal capabilities and motivation for a (international) scientific, policy or business career (lifelong learning skills).

10. Develop an international perspective on on-going scientific advances and translational perspectives of biomedical research (knowledge and lifelong learning skills

Appendix II Tracks of the degree programme (art. 3.5)

1. Within the degree programmes, the student chooses one of the Research-tracks written below (R-track), or one chooses the **Science, Business and Policy**-track ("SBP-track"), which prepares for professions in a societal, political and/or commercial context.

2. Within the degree programme Biomedical Sciences, the general R-track **Biomedical Sciences Research** track, provides students training as a researcher in various fields of biomedical sciences.

3. Within the degree programme Biomedical Sciences, the R-track **Biology of Healthy Ageing and Disease**, provides students training as a researcher mainly in the field of age-related pathologies, and how to prevent or revert them. Themes related to deterioration of cellular processes that lead to DNA damage, protein aggregation and associated disease outcomes like cancer and Alzheimer's disease will be addressed.

4. Within the degree programme Biomedical Sciences, the R-track **Biology of Cancer and Immune System**, provides students training as a researcher mainly in the field of fundamentals and mechanisms of immunology, oncology, cell biology and related pathologies. This track is not only focussed on disease but also on how immunity and mammalian cells behave in health.

5. Within the degree programme Biomedical Sciences, the R-track **Biology of Food and Nutrition**, provides students training as a researcher mainly in the importance of food for a healthy microbiota in relation to brain function, metabolism and immunity.

6. Within the degree programme Biomedical Sciences, the R-track **Neuroscience,** provides students training as a researcher mainly in the field of Neuroscience. The track focuses on the role of higher brain functions both in health and in disease.

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Appendix III Content of the degree programme (art. 3.6)

The degree programme Biomedical Sciences offers the following Research tracks (R-track): Biomedical Sciences Research, Biology of Healthy Ageing and Disease, Biology of Cancer and Immune System, Biology of Food and Nutrition and Neuroscience as well as a Science, Business and Policy track (SBP-track).

General requirements for all BMS R-Track:

Course unit	ECTS	Assessment	Practical	Entry requirements
research project	40	technical and/or laboratory skills, written report, oral presentation	x	Safe Microbiological Technique certificate[#]
research project	30	technical and/or laboratory skills, written report, oral presentation	x	Safe Microbiological Technique certificate[#]
colloquium	5	oral presentation	x	RP1
essay	5	written report	x	-
master courses	30	see appendix IV	see app. IV	see appendix IV
electives	10	see appendix IV	see app. IV	see appendix IV

[#] Students who have not obtained a Safe Microbiological Technique certificate (VMT in Dutch) have to include the Microbiology Safety course in the first year of their study programme, unless the student will conduct a research project that does not involve any laboratory work.

General requirements for the SBP-track:

Course unit	ECTS	Assessment	Practical	Entry requirements
Biomedical Sciences:Professional Perspectives	5	Report		-
research project (RP1)	30	technical and/or laboratory skills, written report, oral presentation	x	Biomedical Sciences: Professional Perspectives, Safe Microbiological Technique certificate[#]
colloquium	5	oral presentation	x	RP
master courses	5	see appendix IV	see app.IV	see appendix IV
course units: Science & Business and Science & Policy	2x10 = 20	assignment, exam	x	-
Work Placement Business and Policy	40	performance, written report, reflection report	x	RP1, course units S&B and S&P

electives	15	see appendix IV	see app.IV	see appendix IV

[#] Students who have not obtained a Safe Microbiological Technique certificate (VMT in Dutch) have to include the Microbiology Safety course in the first year of their study programme, unless the student will conduct a research project that does not involve any laboratory work.

The following rules apply to all programmes:

- the first research project must be performed at the Faculty of Science and Engineering (FSE) or the University Medical Center Groningen, under supervision of one of the appointed examiners for the respective master programme. The grade of the first research project must be registered before a second research project or the SBP-internship can be started.

- the student chooses or is awarded a study mentor from the list of the master programme to advise and discuss the contents of the individual degree programme, before sending a signed programme proposal for approval to the Board of Examiners. All the tracks have designated mentors, as mentioned on the student portal.

- all elements of the individual programme must be approved by the Board of Examiners before their start and require two appointed examiners.

- The research projects, colloquium and essay must deal with different research subjects, and must be supervised by different examiners appointed for BMS. The subject of the SBP-track internship must be clearly related to the scientific domain of the chosen master programme (see Appendix I). To conduct an SBP-internship, you will need 1. an SBP-examiner, and 2. a 'non-SBP BMS examiner'. The colloquium cannot be done in the Science & Society group (or under supervision of an SBP-examiner) in case you follow the SBP-variant.

- At least one of the two research projects must involve lab work. SBP students are exempted from this rule

Electives can be:

- an extension of a research project. The research project can be registered as 30, 35, 40, 45 or 50 ECTS project. Propositions for extensions of 10-15 ECTS must be requested before the start of the research project. Arrangements for extensions of 5-10 ECTS may also be made during the midterm evaluation. The research project cannot exceed 50 ECTS.
- extra master course units, including course units that are especially assigned as possible elective course units (see appendix IV).
- a research assignment of 5, 10, 15 or 20 ECTS.

Additional requirements for Biomedical Sciences

Additional requirements for the general research track Biomedical Sciences Research

- 30 ECTS master courses are filled with the following courses:
  a. Courses (10 ECTS)

Course unit	ECTS
Biomedical Sciences: Professional Perspectives	5
Data Science in Biomedicine	5

  b. 20 ECTS of other master courses chosen from the BMS master courses as listed in appendix IV.

Additional requirements for the research track Biology of Healthy Ageing and Disease:

- topics of both research projects, essay, and colloquium are chosen within the biology of ageing research area.
- 30 ECTS master courses are filled with the following courses:
  a. Courses (20 ECTS)

Course unit	ECTS

Biomedical Sciences: Professional Perspectives	5
Data Science in Biomedicine	5
Current Themes in Healthy Ageing	5
Molecular Biology of Ageing and Age-related Diseases	5

b. 5 ECTS from the following list of courses:

Course unit	ECTS
Advanced Metabolism & Nutrition	5
Immunology: from Bedside to Bench and Back	5
Neurodegenerative Diseases	5
Stem Cells & Regenerative Medicine	5
Microbiome and Health	5

c. 5 ECTS from the following list of courses:

Course unit	ECTS
Advanced Light Microscopy	5
Practical Bioinformatics for Biologists	5
Scientific Writing	5
From Big Data to Personalised Medicine	5
Editing, Regulating and Targeting Genomes with CRISPR-Cas9	5

Additional requirements for the research track Biology of Cancer and Immune System:

- the subject of one research project (≥40 ECTS) and the subject of either the essay or the colloquium is chosen in the field of cancer and immune system research area.
- 30 ECTS master courses are filled with the following courses:

a. Courses (15 ECTS)

Course unit	ECTS
Biomedical Sciences: Professional Perspectives	5
Data Science in Biomedicine	5
Immunology: from Bedside to Bench and Back	5

b. 15 ECTS from the following list of courses:

Course unit	ECTS
Current Themes in Oncology[#]	5
Cancer Research[#]	5
Stem Cells & Regenerative Medicine	5
Microbiome and Health	5
Editing, Regulating and Targeting Genomes with CRISPR-Cas9	5
From Big Data to Personalised Medicine	5
Translational Research in Respiratory Disease	5

choose at least one of these 2 course units

Additional requirements for the research track Biology of Food and Nutrition:

- topics of both research projects, essay, and colloquium are chosen within the food and nutritional life sciences research area.
- 30 ECTS master courses are filled with the following courses:
  a. Courses (15 ECTS)

Course unit	ECTS
Biomedical Sciences: Professional Perspectives	5
Data Science in Biomedicine	5
Advanced Metabolism & Nutrition	5

b: 15 ECTS from the following list of courses:

Course unit	ECTS
Nutrition research in Health and Disease	5
Neurobiology of Nutrition	5
Microbiome and Health	5
Nutrition, Brain Development and Cognition	5
From Big Data to Personalised Medicine	5

Additional requirements for the research track Neuroscience:

- topics of both research projects, essay, and colloquium are chosen within the neuroscience research area.
- 30 ECTS master courses are filled with the following courses:
  a. Courses (20 ECTS)

Course unit	ECTS
Biomedical Sciences: Professional Perspectives	5
Data Science in Biomedicine	5
Neurodegenerative Diseases	5
Neurobiology of Psychiatric Disorders	5

b. 5 ECTS from the following list of courses:

Course unit	ECTS
Nutrition, Brain Development and Cognition	5
Molecular Biology of Ageing and Age-related Diseases	5

c. 5 ECTS from the following list of courses:

Course unit	ECTS
Behavioural Pharmacology	5
Neurobiology of Nutrition	5

Appendix IV Electives

(art. 3.7.1)

Table 1-3 below list study elements that can be chosen as 'master courses' or 'electives' in BMS. Additional knowledge may be required in specific course units. These requirements will be published on Ocasys. For up to date information regarding the courses, such as assessment, entry requirements and learning objectives, Ocasys is leading.
Table 4 and 5 list courses that can only be chosen as 'electives' in BMS. 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.

Table 1: Master courses available for BMS

Course	ECTS
Advanced Metabolism & Nutrition	5
Big Data & Applications in biomedicine	5
Applied statistics and modelling	5
Current Themes in Healthy Ageing	5
Current Themes in Oncology	5
Immunology: from Bedside to Bench and Back	5
Molecular Biology of Ageing and Age-related Diseases	5
Neurodegenerative Diseases	5
Scientific Writing	5
Stem Cells & Regenerative Medicine	5
Cancer Research	5
Nutrition research in health and disease	5
Neurobiology of Nutrition	5
Microbiome and Health	5
Nutrition, Brain Development and Cognition	5
Editing, Regulating and Targeting Genomes with CRISPR-Cas9	5
Advanced Research Skills in Biomedical Sciences	5
Data Science in Biomedicine	5
From Big Data to Personalised Medicine	5
Translational Research in Respiratory Disease	5
Neurobiology of Psychiatric Disorders	5

Table 2: Medical Pharmaceutical Sciences and Pharmacy Master courses

Course	ECTS
Drug Development: from Design to Evaluation	5
Pharmacovigilance (biannual 21-22)	5
Nanomedicine and Nanosafety	5
Microbiological Safety*	0

***** Entry requirement for research

Table 3: General Life Sciences master courses

Course	ECTS
Advanced Light Microscopy	5
Advanced Statistics	6
Laboratory Animal Science^	2 or 5
Behavioural Pharmacology	5

Evolutionary Medicine Diseases of Affluence	5
Evolutionary Medicine Infectious diseases	5
Science & Business[#]	10
Science & Policy[#]	10
Orientation on non-academic Careers	5
Programming in C^{++} for Biologists	5/10
Radioisotopes in Experimental Biology	5
Practical Computing for Biologists	5
Tools and approaches of systems biology	5

^ The LAS course will be offered in two variants: a 5-ECTs and a 2-ECTs variant. After successful completion of the 5-ECTS variant the student will receive the Article 9 certificate upon graduation. This certificate is not awarded when the 2-ECTS variant is followed.

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

Table 4: Elective master courses organized by other Master Programmes

Course	**ECTS**
Next-generation sequencing methods and data analysis	5
Skills in Science Communication (2a)	5
iGEM (International Genetically Engineered Machine competition)*	20
Basiscursus Master Lerarenopleiding^	5
Masterstage 1^	5

* Selection for this competition takes place in winter time, an advertisement about application details will be announced via the student portal during the academic year. Maximum of 10 ECTS of the available 20 ECTS can be registered within elective space, the rest will be extracurricular credits.
^ Course unit offered in Dutch only.

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

Course unit	Entry requirement
Research project 1	Safe Microbiological Technique certificate# and Biomedical Sciences: Professional Perspectives
Colloquium	Research project 1
Research project 2	Safe Microbiological Technique certificate# and Research project 1
Work placement Science Business & Policy	Research project 1 + courses Science & Business and Science & Policy

only when the projects entails lab work

Appendix VI Admission to the degree programme

(art. 2.1A.1 + 2.1B.1)

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 programme will review all individual applicants based on their selection file. All candidates that have an appropriate background will be considered (conditionally) admissible (step 1) and further considered for the selection procedure (step 2) described below.

1. Requirements for admission to the master degree in <u>Biomedical Sciences</u>

Holders of the following Bachelor's degrees from the University of Groningen are considered to have sufficient knowledge and skills and are admissible to the Master's degree programme in Biomedical Sciences on that basis:

- a Bachelor's degree in Biology with one of the following majors:
  - Biomedical Sciences.
  - Behavioural & Neurosciences

Students with a comparable Bachelor's degree from another Dutch or foreign university, focusing on knowledge and skills at the interface of (human) physiology, genetics, molecular biology, neurology, biochemistry and/or behaviour, and medical sciences, may also qualify for admission. Admission is always granted on an individual basis by the Admission Board.

2. Selection procedure Master Biomedical Sciences

All candidates that are considered admissible will be allowed to proceed with the selection procedure, which is described below.

At least two members of the Admissions Board score the selection criteria. Scoring is on a 9-point scale from 1 to 5 (1 = insufficient to 5 = excellent). If the members' scores on the academic performance and/or the motivation deviate 1 point or more, the members of the admissions board that gave scores have to confer, after which they score a second time. This outcome constitutes the final score. Candidates who receive a score of 1 (= insufficient) at any part of the academic performance or the motivation will not be eligible for selection. Candidates with minimally a sufficient average score of 3 for each criterion, and a weighted overall score of at least 3.5 are selected.

Academic performance (70%)
The score on academic performance is the result of the scores on relevance and affiliation/fit of the followed bachelor programme to the master programme (based on a checklist of subjects/courses followed or that will still be completed before finalisation of the Bachelor's degree programme). The candidate must include a brief description, using the checklist, of the content of multiple key disciplines demonstrating the knowledge and skill(s) acquired by the student that provide the sufficient background to initiate the master programme Biomedical Sciences.

Motivation (30%)
The candidate has to provide a motivation letter (max. 500 words) demonstrating a suitable stance and talent to follow the master programme. The letter 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 degree, please briefly explain the cause(s) of the delay.*
4. *How does this master's degree programme prepare you for your future career and/or serve your ambitions?*
5. *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 2024 will open on the 1st of October 2023 and will close on the 1st of May 2024. In September 2023, the details of the entire application procedure will be published on the Admission and Application website for the individual Master's degree programme.

After registration in Studielink, and candidates have successfully submitted all necessary documents to the School of Science and Engineering (for holders of a Dutch BSc diploma,) or the Admissions Office (for holders of a non-Dutch BSc diploma) the receiving office at the UG will send the candidate a confirmation of receipt.

When students upload the necessary document before a given deadline, a decision letter will be communicated within 4 weeks after that deadline. These deadlines will be communicated via the admissions website.

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.

Pre-master

The master programme Biomedical Sciences offers a pre-master programme for excellent students from Universities of Applied Sciences. After fulfilling the requirements for the pre-master the student is automatically admitted to the master programme Biomedical Sciences. Admission to the pre-master is always granted on an individual basis by the Admission Board.

The following requirements apply;

1. Student holds a diploma in Biomedical Laboratory Research or similar
2. The weighted GPA on the moment of application is 7.5 or higher (Dutch grading scale)
3. Student meets the language requirements before the start of the pre-master programme
4. Students that follow the pre-master programme as part of their Biomedical Laboratory Research or similar studies at the University of Applied Sciences (fast-track) are exempted from the first requirement.

Selection procedure Pre-master
In order to select the best-suited and motivated students, the Admission Board requires a complete selection file from all candidates. The Admission Board of BMS will review all individual applicants based on their selection file.

At least two members of the Admissions Board score the selection criteria. Scoring is on a 9-point scale from 1 to 5 (1 = insufficient to 5 = excellent). If the scores on the academic performance and/or the motivation deviate 1 point or more, the members of the admissions board that gave scores have to confer, after which they score a second time. This outcome constitutes the final score. Candidates who receive a score of 1 = insufficient at any part of the academic performance or the motivation will not be eligible for

selection. Candidates with minimally a sufficient average score of 3 for each criterion, and an average overall score of at least 3.5 are selected.

Academic Performance (70%)
The weighted GPA is used to determine the level of performance. The minimum requirement is a GPA of 7.5.

Motivation (30%)
The candidate has to provide a motivation letter (max. 500 words) demonstrating a suitable stance and talent to follow the master programme. The letter should address the following specific questions/issues:

1. *Why did you choose this specific pre-master's degree programme?*
2. *How did your previous degree programme, extracurricular activities, and/or other experiences prepare you for this specific pre-master programme?*
3. *In case it took you longer than nominal to acquire your degree, please briefly explain the cause(s) of the delay.*
4. *How does this pre-master's degree programme prepare you for your future career and/or serve your ambitions?*
5. *Free space to mention anything you feel is relevant and is not addressed by the questions above.*

Application Procedure
All candidates have to register in Studielink and upload the following documents before the **1st of May** (start the 1st of September):

- ID card or passport
- Diploma of relevant Bachelor's degree programme (if possible)
- List of grades (including the Grade Point Average)
- Proof of English language proficiency
- CV
- Motivation letter (according to the instructions)
- List of subjects/courses followed or that will still be completed before finalisation of the Bachelor's degree programme (using the checklist)

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

For holders of a Dutch BSc diploma:

1. The SSE compiles the individual selection file
2. The SSE 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 SSE
4. SSE submits the individual selection file to Admissions Board of the individual programme

Translational provisions (art. 7.1)

N.a.

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Appendix VIII Additional Requirements Open degree Programmes (Art. 5.6)

N.a.