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

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 up-to-date scientific advances and on-going biological science-related issues (knowledge and lifelong learning skills).

Appendix II Tracks of the degree programme (art. 3.6)

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 Ageing**, provides students training as a researcher mainly in the field of ageing and age-related pathologies.
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.

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

The degree programme Biomedical Sciences offers the following Research tracks (R-track): Biomedical Sciences Research, Biology of Ageing, 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-Tracks:

Course unit	ECTS	Assessment	Practical	Entry requirements
research project (RP)	40	technical and/or laboratory skills, written report, oral presentation	x	Safe Microbiological Technique certificate[#]
research project (RP)	30	technical and/or laboratory skills, written report, oral presentation	x	Safe Microbiological Technique certificate[#]
colloquium	5	oral presentation		RP
essay	5	written report		-
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.

General requirements for the SBP-track:

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

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. The tracks Biology of Ageing, Biology of Cancer and Immune system, Biology of Food and Nutrition and Neuroscience 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.
  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.
- 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 Ageing:

- 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 machine learning	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 course for Research	5
Behavioural Pharmacology	5

Evolutionary Medicine Diseases of Affluence	5
Evolutionary Medicine Infectious diseases	5
Science & Business#	10
Science & Policy#	10
Orientation on International Scientific 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

^ You could also follow the course 'handling laboratory animals' for 4 ECTS extracurricular. You will receive a certificate (ex. Art.9 Experiments on Animals Act). However, this will cost a fee and PhD students have priority to enrollment.

Students who follow a R-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**
Transcriptomics	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.

Table 5: Elective master courses organised by The Donald Smits Center for Information Technology:

Course (max 2 ects per individual programme^)	**Half day unit^**
Access basic	5
Excel basic	5
Excel module draaitabellen	1

^ 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 (low student tariff), which are at the student's own expenses. These courses are not available in Ocasys. Please consult the Center for Information Technology for further information, time schedules, language of instruction and enrollment details.

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

Course unit	Entry requirement
Research project	Safe Microbiological Technique certificate
Colloquium	Research project
Research project 2	Research project 1
Internship Science Business & Policy	Research project + courses Science & Business and Science & Policy

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

1. Requirements for admission to the master degree in Biomedical Sciences[1]
Holders of the following Bachelor's degrees from the University of Groningen are considered to have sufficient knowledge and skills and can be admitted to the Master's degree programme in Biomedical Sciences ranking list on that basis:

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

- a Bachelor's degree in Life Science and Technology* including the following courses:

  - Molecular genetics
  - Integrative Neuroscience
  - Bioinformatics
  - Host Microbe interactions
  - Immunology
  - Modelling Life

  5 EC from the following list:
  - Food and Metabolism
  - Biology of Cancer
  - Endocrinology

  and
  - Research project Biomedical Sciences (10 EC)
  - Thesis with a biomedical topic (5 EC)
  - Or a combined 15 EC research project with a biomedical topic.

* Only applicable for the cohorts started in 2020 and 2021. Later LS&T cohorts will not be admissible for BMS.

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

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 (use the Grade Point Average when necessary)
- Proof of English language proficiency
- CV
- Motivation letter (according to the instructions)
- List of subjects/courses (to be) followed (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. Education Support Centre compiles the individual selection file
2. Education Support Centre 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 ESC
4. ESC submits the individual selection file to Admissions Board of the individual programme

Selection procedure
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. All candidates who meet the selection criteria 'academic performance' (as specified by the programme) will be admitted to the selection procedure. A maximum number of 90 students will be admitted into the programme.

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.

1. 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 (list of subjects/courses followed including grades). The candidate must include a brief description of the content of 3 key disciplines demonstrating the knowledge and skill(s) acquired by the student and must be chosen from the following disciplines: immunology, oncology, neurosciences, (medical) cell biology, endocrinology and business/policy (using the checklist) and their grade point average (GPA).

2. 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 serves 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 2022 will open on the 1st of October 2021 and will close on the 1st of May 2022. In September 2021, 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, 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 to the Education Support Centre (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.

The selected candidates (top 90) will be offered placements between the 1st of May and the 1st of June (start 1 september). The Admission Board can offer a maximum of 9 early admission placements to excellent students between the 1st of October and the 1st of May.

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 Transitional provisions (art. 7.1)

Discontinued course units			Substitute course units			
Course name	Course code	Final exam period	Course name	Course code	Equivalent? Yes/No	Explanation
Nutrition in Medicine	WMBM 019-05	-	Nutrition Research in Health and Disease	WMBM 019-05	Yes	The name of the course is changed to better suit the content. The content of the course will not change. Students from earlier cohorts can follow the new course
Big Data & Applications in Biomedicine	WMBM 025-05	-	Big Data & Machine Learning	WMBM 025-05	Yes	The name of the course is changed to better suit the content. The content of the course will not change. Students from earlier cohorts can follow the new course
Practical Bioinformatics for Biologists	WMBY 008-05	-	Practical Computing for Biologists	WMBY0 08-05	Yes	The name of the course is changed to better suit the content. The content of the course will not change. Students from earlier cohorts can follow the new course
Animal experimentation	WMBY 019-05	-	Laboratory Animal Science course for Research		Yes	The discontinued course will be replaced by a new course.

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

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Appendix IX, MSc programme Specific TER

Application and decision deadlines for admission (art. 2.7.1 and 2.7.3)

Programmes starting on 1 September 2022

Programme	Deadline of Application	Deadline of decision
Artificial Intelligence	1 May 2022	1 June 2022
Behavioural and Cognitive Neurosciences	1 May 2022	1 June 2022
Biology	1 May 2022	1 June 2022
Biomedical Engineering	1 May 2022	1 June 2022
Biomedical Sciences	1 May 2022	1 June 2022
Biomolecular Sciences	1 May 2022	1 June 2022
Chemistry	1 May 2022	1 June 2022
Computational Cognitive Science	1 May 2022	1 June 2022
Ecology and Evolution	1 May 2022	1 June 2022
Energy and Environmental Sciences	1 May 2022	1 June 2022
Industrial Engineering & Management	1 May 2022	1 June 2022
Marine Biology	1 May 2022	1 June 2022
Mechanical Engineering	1 May 2022	1 June 2022
Medical Pharmaceutical Sciences	1 May 2022	1 June 2022

Nanoscience: for non-EU/EEA students	1 February 2022	1 June 2022
Nanoscience: for EU/EEA students	1 May 2022	1 June 2022
Science Education and Communication	1 May 2022	1 June 2022

Programmes starting on 1 September 2022 and 1 February 2023

Programme	**Deadline of Application for 1 September**	**Deadline of decision for 1 September**	**Deadline of Application for 1 February**	**Deadline of decision for 1 February**
Applied Mathematics	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Applied Physics	1 May 2022	1 June 2022	15 October 2022	15 November 2022
~~Artificial Intelligence~~	~~1 May 2022~~	~~1 June 2022~~	~~15 October 2022~~	~~15 November 2022~~
Astronomy	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Chemical Engineering	1 May 2022	1 June 2022	15 October 2022	15 November 2022
~~Chemistry~~	~~1 May 2022~~	~~1 June 2022~~	~~15 October 2022~~	~~15 November 2022~~
Computing Science	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Farmacie	1 May 2022	1 June 2022	15 October 2022	15 November 2022

~~Industrial Engineering and Management~~	~~1 May 2022~~	~~1 June 2022~~	~~15 October 2022~~	~~15 November 2022~~
Mathematics	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Physics	1 May 2022	1 June 2022	15 October 2022	15 November 2022