

Assessment plan for the curriculum of the Master's degree programme in Biomedical Sciences, 2023/2024

Introduction

This assessment plan is a systematic description of the testing and assessment modes for all study components in the curriculum of the Master's degree programme in Biomedical Sciences, 2023/2024. The plan is based on the assessment policy of the Faculty of Science and Engineering, as set out in the 2013 version of the FSE Quality Assurance Manual (Chapter 6: Assessment) and the protocol setting out the duties and powers of the Faculty's Board of Examiners (December 2013).

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

1. 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 2023/2024 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 examiners and a detailed assessment mode for each study component. This overview is based on the curriculum approved by the Programme Committee, as set out in the appendices to the Teaching and Examination Regulations 2023/2024 for the degree programme.
 6. A matrix showing the relationship between the study components and the detailed 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 2021-2022 for the degree programme in Biomedical Sciences. 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 six tracks, five of them being research oriented (General Research (R), Biology of Ageing, Biology of Cancer and Immune System, Biology of Food and Nutrition, and Neuroscience) and a Science, Business and Policy (SBP) track. In their first year all students conduct a research project. Thereafter, they choose either to continue in the research oriented tracks or to enroll in the SBP-track.

The five research oriented tracks focus 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 study programme therefore consists of two research projects of ≥ 30 and ≥ 40 ECTS, 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 interpretation, discussion and presentation of results. Moreover, the students follow theoretical and practical courses, write an essay and present a colloquium on a selected scientific topic.

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.

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

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 ageing and age-related pathologies.

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 focused on disease but also on how immunity and mammalian cells behave in health.

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.

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.

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, students design their own study programme tailored to their interests. The board of examiners must approve each individual programme.

BMS focuses on the research area of life processes in health and in the course of disease development. It is a multidisciplinary research area at the interface between molecular and cellular biology, (epi)genetics, integral physiology and medical sciences but also big data management. Within the master programme students may focus on various research areas related to the aforementioned tracks. Within the tracks students may choose for track specific research ranging from the molecular cellular biology underlying normal cell functioning to integrative physiology as well as the molecular pathology of diseases (inflammation, autoimmunity, allergies and tumors, diseases of the brain and nervous system), and the biological, physiological and molecular aspects of various metabolic, genetic and (auto)immune diseases.

2. Learning outcomes of the degree programme

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).

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 1).

In addition to the 80 ECTS individual elements, maximally 40 ECTS of the student's programme is composed of course units. Of these, 30 ECTS have to be chosen from a list of 'obligatory' master modules. In these courses, the student increases his/her domain-specific knowledge and skills

With the individual elements the student acquires most of the qualifications/ learning outcomes (table 2). In the courses, the student increases his/her domain-specific knowledge and skills and acquires the qualifications/learning outcomes as indicated in table 2.

Master modules

Maximally 40 ECTS of the student's programme is composed of course units. Of these, 30 ECTS have to be chosen from a list of master modules. The student increases his/her domain-specific knowledge and skills in these course units. All of these course units may be chosen as elective (max 10 ECTS in an individual programme).

Students can also choose course units organized by the other biology master programmes (mainly Biology, Medical Pharmaceutical Sciences and Molecular Biology and Biotechnology). These programmes adhere to similar learning outcomes (3-10) except for the first two that describes domain specific knowledge and skills of the discipline. Therefore, see the assessment plan of these programme for further information regarding assessment and relationship to the learning outcomes.

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.

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

Table 1 shows the study components for each year of the programme, and the intended examiner(s) and assessment modes. Not all elective course units are not 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 unit name	ECTS	Practical	First examiner	Second examiner	Mode of assessment
Molecular Biology of Ageing and Age-related Diseases	5	No	Dr. L.M. Veenhoff	Dr. Michael Chang	MC/R
Immunology from Bedside to Bench and back	5	No	Dr. M.C Nawijn	Prof. Dr. P. Heeringa	AST/P
CT in Healthy Ageing	5	No	Dr. M. DeMaria	Dr. J.T.M.L. Paridaen	R/P/AST
Advanced Metabolism & Nutrition	5	Yes	Dr. J.K. Kruit	Dr. ir. M.H. Oosterveer	WE/R
Scientific Writing	5	No	Dr. G. Krenning	Prof. Dr. M.C. Harmsen	AST
Biomedical Sciences: Professional Perspectives	5	No	Dr. J.C. Graver	Dr. S. Grooters	R, P
Data Science in Biomedicine	5	Yes	Dr. J. Broos	Dr. Victor Guryev	AST/PR/P/R
Editing, regulating and targeting genomes with CRISPR-Cas9	5	Yes	Dr. Kai Yu Ma	Dr. A.J.A van de Sluis	WE/R/P/PR/A ST
From Big Data to Personalised Medicine	5	Yes	Dr. I.H. Jonkers	Dr. S. Withoff	WE/R/PR
Microbiome, Diet, Health and Disease	5	Yes	Dr S. El Aidy	Prof. Dr. G. van Dijk	R/P/PR/OR
Nutrition, Brain Development and Cognition	5	Yes	Dr. R. Havekes	Dr. J.D.A. Olivier	WE/R/P/PR
Neurodegenerative disease	5	No	Prof. Dr. U.L.M. Eisel	Prof. Dr. W. Baron	WE/P
Stem Cells & Regenerative Medicine	5	No	Prof. Dr. M.C. Harmsen	Dr. J. Burgess	IT/R/P/AST
Research Proposal Cancer Research	5	No	Prof. Dr. F.A.E. Kruyt	Prof. Dr. S. de Jong	P/R
Nutrition Research in Health and Disease	5	Yes	Dr. E. Corpeleijn	Prof. Dr. G.J. Navis	WE/R
Neurobiology of Nutrition	5	No	Prof. Dr. G. van Dijk	Prof. Dr. A.J.W. Scheurink	R/P
CT Oncology	5	No	Prof. Dr. J.J.Schuringa	Prof. Dr. F.A.E. Kruyt	WE/AST
Neurobiology of Psychiatric Disorders	5	No	Prof. Dr. M.J.H. Kas	Prof. D.S. Verbeek	P/AST
Translational Research in Respiratory Disease	5	Yes	Dr. J. K. Burgess	Dr. M. de Vries	MC/AST/P
Applied statistics and Machine Learning	5	Yes	Prof. Dr. G Lunter	Dr. Ir. P. van Ooijen	P/R/WE
Big Data & Applications in biomedicine	5	Yes	Dr. Ir. P. van Ooijen	Prof. Dr. G Lunter	P/R/WE

Advanced Research Skills in BMS	5	Yes	Dr. Kai Yu Ma	Dr. H. Westers	PR/P/R
Colloquium	5	No	Appointed examiner*		P/ R
Research project(s)	$\geq 30 +$ ≥ 40	Yes	Appointed examiner*		PR/ P/ R
Essay	5	No	Appointed examiner*		R

Table 1. Assignment (AST), Interim test (IT), Multiple choice exam (MC), Oral exam (OR), Practical work (PR), Presentation (P), Report (R), Written exam (WE).

* Appointed examiner: before the academic year commences, the Board of Examiners determines the examiners responsible for carrying out testing and assessment in the degree programme.

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

Table 2 shows the relationship between the learning outcomes and the course units of the curriculum. Not all elective course units are not part of this table but can be found in the Teaching and Examination Regulations (OERs) and/or Ocasys.

Master Biomedical Sciences	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
Molecular Biology of Ageing and Age-related Diseases	X			x	X	x				X
Immunology from Bedside to Bench and back	X			X	X			X	X	X
CT in Healthy Ageing	x		x	X	X	X			x	x
Advanced Metabolism & Nutrition	X	x	X	x	X	X	X			x
Scientific Writing		x		x	X				X	X
Biomedical Sciences: Professional Perspectives	X			X		X		X	X	X
Data Science in Biomedicine		X	x	x	x	X	x			
Editing, regulating and targeting genomes with CRISPR-Cas9	x	X	x		x		X	X		X
From Big Data to Personalised Medicine	x	X		x	x	X	x	x		
Microbiome, Diet, Health and Disease	x	X	X	x	X	X	X	x	X	X
Nutrition, Brain Development and Cognition	x		x		X	X				
Neurodegenerative disease	X		x	X	X	X		x	x	x
Stem Cells & Regenerative Medicine	x			X	X	X	X	x	x	x
Cancer Research	X		X	X	X		X			X
Nutrition research in Health and Disease	X		x	X	X	X	x		x	x
Neurobiology of Nutrition	x		X	X	X	x	x	x		
CT in Oncology	x			X		X				
Neurobiology of Psychiatric Disorders	X		x	X	X	x	X		x	X
Translational Research in Respiratory Disease	x	X	x	X	X		X			X
Applied statistics and Machine Learning		X	x	X						
Advanced Research Skills in BMS	x		X	x	x		X	x		
Big Data & Applications in biomedicine		X	x	X				x		
Colloquium	X	x	x	X	X	X	x	x	x	x
Research project(s)	x	x	X	X	X	X	X	x	X	X
Essay	X	x	x	X	X	X	x	x	x	x

Table 2: X: makes a substantial contribution to the specified learning outcome; x: makes a limited contribution to the specified learning outcome.

Appendix 1: list of examiners/study mentors

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 Biomedical Sciences. Examiners can be contacted for research projects, essays, colloquia and research assignments. Research projects, carried out under the responsibility of an Examiner will be considered as an internal project.

Research projects, essays or colloquia carried out under the supervision of a staff member not mentioned in the list, require the (co-)participation of an Examiner who takes the formal responsibility, including that of the final assessment of the work. This arrangement is limited to so-called second research projects, essays and colloquia.

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 internship of the SBP-track only. For the SBP internship, 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	Initials	Department	Mentor
Calkhoven	C.F.	Ageing Biology	
Chang	M.	Ageing Biology	BMS
Demaria	M.	Ageing Biology	
Foijer	F.	Ageing Biology	
Fu	J.	Ageing Biology	
Guryev	V.	Ageing Biology	
Yu Ma	K.	Ageing Biology	
Nollen	E.A.A.	Ageing Biology	
Veenhoff	L.M.	Ageing Biology	
Bischoff	R.P.H.	Analytical Biochemistry	
Horvatovich	P.L.	Analytical Biochemistry	
Barazzuol	L.	Biomed. Science of Cells and Systems	
Baron	W.	Biomed. Sciences of Cells and Systems	
Bergink	S.	Biomed. Sciences of Cells and Systems	
Boddeke	H.W.G.M.	Biomed. Sciences of Cells and Systems	
Curcic-Blake	B	Biomed. Sciences of Cells and Systems	
Eggen	B.J.L.	Biomed. Sciences of Cells and Systems	BMS
Kampinga	H.H.	Biomed. Sciences of Cells and Systems	
Laman	J.D.	Biomed. Sciences of Cells and Systems	
Giepmans	B.N.G.	Biomed. Sciences of Cells and Systems - Medical Electron Microscopy	
Ijzendoorn, van	S.C.D.	Biomed. Sciences of Cells and Systems - Membrane Cell Biology	
Sibon	O.C.M.	Biomed. Sciences of Cells and Systems - Radiation and Stress Cell Biology	BMS
Sommer	I.E.C.	Biomedical Sciences of Cells & Systems, section CNC	
Linskens	M.H.K.	Cell Biochemistry	
Reggiori	F.M.	Cell Biology	
Laan, van der	M. J.	Chirurgie	
Deelman	L.	Clinical pharmacy & pharmacology	

Bock	G.H.	Epidemiology	
Corpeleijn	E.	Epidemiology	
Vries, de	M.	Epidemiology	
Boer, de	R.A.	Experimental cardiology	
Faber	K.N.	Gastrointestinal and liver diseases	BMS
Moshage	A.J.	Gastrointestinal and liver diseases	
Buwalda	B.	GELIFES	
Dijk, van	G.	GELIFES	BMS
Eisel	U.L.M.	GELIFES	
Havekes	R.	GELIFES	
Hut	R.A.	GELIFES	
Kas	M.J.H.	GELIFES	
Meerlo	P.	GELIFES	
Olivier	J.D.A.	GELIFES	
Scheurink	A.J.W.	GELIFES	BMS
Schoemaker	R.G.	GELIFES	
Zee, van der	A.E.	GELIFES	BMS
Jonkers	I.H.	Genetics	
Sijmons	R.H.	Genetics	
Verbeek	D.S.	Genetics	
Westers	H.	Genetics	
Withoff	S.	Genetics	
Borst	M.H.	Groningen Kidney Centre	
Franssen	C.F.M.	Groningen Kidney Centre	
Meijer	E.	Groningen Kidney Centre	
Schuringa	J.J.	Hematology	
Smink	A.M.	Immunoendocrinology	
Born, van der	J.	Internal Medicine - Nephrology	
Navis	G.J.	Internal Medicine, Nephrology	
Kema	I.P.	Laboratory Medicine	
Buist	G.	Medical Microbiology	
Dijl, van	J.M.	Medical Microbiology	BMS
Harmsen	H.J.M.	Medical Microbiology	
Niesters	H.G.M.	Medical Microbiology	
Waarts	B.L.	Medical Microbiology	
Daemen	C.A.H.H.	Medical Microbiology - Molecular Virology	
Huckriede	A.L.W.	Medical Microbiology - Molecular Virology	
Smit	J.M.	Medical Microbiology - Molecular Virology	
Jong, de	S.	Medical Oncology	
Kruyt	F.A.E.	Medical Oncology	BMS
Vugt, van	M. A.T.M.	Medical Oncology	
El Aidy	S.	Microbial Physiology	
Klei, van der	I.J.	Molecular Cell Biology	
Kok	J.	Molecular Genetics	

Kuipers	O.P.	Molecular Genetics	
Bianchi	F.	Molecular Immunology & Microbiology	
Bogaart, van den	G.	Molecular Immunology & Microbiology	
Quax	T.E.F.	Molecular Microbiology	
Dolga	A.M.	Molecular Pharmacology	
Schmidt	M.	Molecular Pharmacology	
Vries, de	E.F.J.	Nuclear Medicine and Molecular Imaging	
Hoek	A.	Obstetrics and Gynaecology	
Bakker	B.M.	Paediatrics	
Jonker	J.W.	Paediatrics	
Kruit	J.K.	Paediatrics	
Bank	R.	Pathology & Medical Biology - Medical Biology	
Faas	M.M.	Pathology & Medical Biology - Medical Biology	BMS
Harmsen	M.C.	Pathology & Medical Biology - Medical Biology	BMS
Heeringa	P.	Pathology & Medical Biology - Medical Biology	BMS
Heijink	I.H.	Pathology & Medical Biology - Medical Biology	
Kamps	J.A.A.M.	Pathology & Medical Biology - Medical Biology	
Krenning	G.	Pathology & Medical Biology - Medical Biology	
Molema	G.	Pathology & Medical Biology - Medical Biology	
Nawijn	M.C.	Pathology & Medical Biology - Medical Biology	
Popa	E.R.	Pathology & Medical Biology - Medical Biology	
Rots	M.G.	Pathology & Medical Biology - Medical Biology	
Vos, de	P.	Pathology & Medical Biology - Medical Biology	
Berg, van den	J.H.M.	Pathology & Medical Biology - Pathology	
Goor, van	H.	Pathology & Medical Biology - Pathology	
Hillebrands	J.L.	Pathology & Medical Biology - Pathology	
Hylkema	M.N.	Pathology & Medical Biology - Pathology	
Brandsma	C.A.	Pathology & Medical Biology	
Burgess	J.K.	Pathology & Medical Biology	
Koonen	D.P.Y.	Pediatrics - Molecular Genetics	
Sluis, van de	A.J.A.	Pediatrics - Molecular Genetics	
Haslinger	K.	Pharmaceutical Biology	
Olinga	P.	Pharmaceutical Technology and Biopharmacy	
Melgert	B.N.	Pharmacokinetics, Toxicology and Targeting	
Poelstra	K.	Pharmacokinetics, Toxicology and Targeting	
Coppes	R.P.	Radiotherapy	
Westra	J.	Rheumatology and Clinical Immunology	
Helfrich	W.	Surgery	
Laan	M.	Surgery	
Leuvenink	H.G.D.	Surgery	
Baarle, van	D.	Translational Immunology	
Smink	A.M.		

SBP Examiners

Boer, de	M.K.	Science and Society	
Euverink	G.J.W.	Science and Society	
Grooters	S.	Science and Society	
Krooneman	J.	Science and Society	
Maqbool	A.S.	Science and Society	
Nieuwenhof-Schilstra, van den	M.J.	Science and Society	
Ree	C.M.	Science and Society	
Zevenberg	J.	Science and Society	
Berger	M.	Science and Society	
Rijssel, van	M.	Science and Society	
Laugs	G.A.H	Science and Society	