Assessment plan for the curriculum of the Master's degree programme in Medical Pharmaceutical 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 Medical Pharmaceutical Sciences (MPS), 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. Overview of examiners as well as testing and assessment modes for study components;
4. Relationship between course units and details of the learning outcomes.

   The following elements are relevant in the subparts 3 and 4:
   - objectives;
   - description of content;
   - lecturers;
   - assessment mode(s) and calculation of final mark;
   - mode(s) of instruction.

For the descriptions of the study components, see the Appendix to the Teaching and Examination Regulations 2023-2024 for the degree programme in Medical Pharmaceutical Sciences. The content of each study component is described in Ocasys, the online course catalogue (http://www.rug.nl/ocasys/).

1. Objectives of the degree programme

The master's programme has four tracks, three of them being research-oriented (R):

- Pharmaceutical Design and Engineering (PDE)
- Drug Toxicology and Translational Technology (DTTT)
- Pharmaco-epidemiology and Pharmacoeconomics (PP)

The master's programme also has a Science, Business and Policy (SBP) track.

The master's programme has one administrative track in Sustainable Drug Discovery to accommodate students from the International master in Sustainable Drug Discovery.

The field of Medical Pharmaceutical Sciences (MPS) is interdisciplinary, focusing on molecular intervention of disease by drugs, and covering all discipline fields from drug design and synthesis, molecular modelling of drug/target interactions, pharmacology, drug disposition, drug safety, drug formulation to pharmaco-epidemiology, pharmacovigilance and pharmaco-economics. Proper knowledge of molecular pathology combined with fundamental understanding of the mechanisms of actions of drugs and of their development result in the generation of new paradigms in drug development.

The MPS master programme is designed to provide the students with a profound scientific training in order to prepare them for a career in pharmaceutical research in academia, non-profit or commercial organizations. The programme combines general courses, track specific courses and two research two research projects of ≥30 and ≥40 ECTS. The courses provide a general orientation of the field of study and provide a basic training in theoretical skills, practical skills and academic skills. The research projects provide a versatile training in independent research. Students are included in modern pharmaceutical research projects in pharmaceutical research laboratories or in pharmaceutical patient care in which the student either generate their own data or use previously generated data sets for (meta)analysis. In their research projects the students go through the whole process of scientific knowledge generation to develop skills such as searching and analysing scientific literature, formulating hypotheses, designing and performing experiments, data analysis, data interpretation and statistics. During their research projects, the students are trained in writing and presentations skills, which are also trained in a separate colloquium and capita selecta. Altogether, the student receive a profound scientific training by a variety of supervisors in the field of Medical Pharmaceutical Sciences.

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

The R-track **Drug Toxicology and Translational Technology**, provides students training as a researcher mainly in the field of adverse drug reactions and novel technologies to perform toxicological analysis.

The R-track **Pharmacoepidemiology and Pharmacoeconomics**, provides students training as a researcher in the area of pharmacovigilance, database research, observational and trial intervention methodology, utilization and pharmacoeconomical studies.

The R-track **Pharmaceutical Design and Engineering**, provides students training as a researcher in the areas of target identification, drug design, biologics, biotechnology, and innovative drug and dosage forms.

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.

Students can enter the administrative track **Sustainable Drug Discovery** via the International master in Sustainable Drug Discovery. In this track, students are trained courses that also form part of the **Pharmaceutical Design and Engineering** track and the **Drug Toxicology and Translational Technology** track, which will gain focus on sustainability.

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.

2. Learning outcomes of the degree programme

Graduates of the master programme Medical Pharmaceutical Sciences are able to:

1 Explain in detail the major underlying principles within the field of Medical and Pharmaceutical Sciences and integrate knowledge of etiology and pathophysiology of disease to design and develop more effective and safer drugs (knowledge).

2 Identify new developments within the field of Medical Pharmaceutical Sciences and can become familiar with these developments (Lifelong learning skills)

3 Critically appraise the results of research in 'medical pharmaceutical sciences' and/or in the dedicated specialisms 'drug toxicology and translational technology, 'pharmaceutical design and engineering' or 'pharmacoepidemiology and pharmacoeconomics' (knowledge and judgement).

4 Formulate hypotheses, design and conduct scientific research, manage and interpret data and demonstrate proficiency in statistical analyses for Medical Pharmaceutical Sciences (application).

5 Systematically organize her/his work in scientific research and formulate realistic and original solutions to complex problems (application).

6 Critically evaluate scientific data from experiments or literature, and offer sound arguments to justify a position (judgment and communication).

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

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

9 Identify societal and ethical implications of Medical Pharmaceutical Research and act according to the scientific code of conduct (judgement).

10 Evaluate and reflect on personal capabilities and motivation for a (international) scientific, policy or business career, and has knowledge and skills to develop their own career (lifelong learning skills).

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

In addition to the 80 ECTS of individual elements, maximally 40 ECTS of the student's programme is composed of course units.

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

Mandatory course units
Maximally 40 ECTS of the student's programme is composed of course units.

Of these, the course units Drug Development: From Design to Evaluation and Academic Skills are mandatory for all MPS students. Both are 5 ECTS.

Track-specific mandatory courses
Each track has its own track-specific mandatory courses. The student increases their domain-specific knowledge and skills in these track-specific mandatory courses.

The track-specific courses are all 5 ECTS with the exception of Basics in Medicine within the **Pharmacoepidemiology and Pharmacoeconomics** track, which is 8 ECTS. This course is organized by the Faculty of Medicine and is from the master programme Clinical Pyschosocial Epidemiology.

Elective space
Details on the elective space in each track can be found in the TER appendix of Medical Pharmaceutical Sciences.

Students can choose track-specific mandatory courses from a different track as an elective.

Students can also choose courses organized by the other master programmes from within FSE (mainly Pharmacy, Biomedical Sciences and Biology) or other faculties. 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. Final approval of these for the study programme is up to the Board of Examiners.

3. Overview of examiners as well as 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 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.

Mandatory for all MPS students

Course unit name	Course code	ECTS	Practical	First examiner	Second examiner	Mode of assesment
Drug Development from Design to Evaluation	WMMP006-05	5	No	Dr P. Olinga	Prof. Dr. B.N. Melgert	WE, AST
Academic Skills	WMMP012-05	5	Yes	Prof. Dr. E. Hak	Dr. S. de Vos	WE, P, AST
Colloquium	WMMP001-05	5	no	Appointed examiner*	Appointed examiner*	R, P
Research project(s)	WMMP902-30 and WMMP901-40	≥ 30 + ≥ 40	yes	Appointed examiner*	Appointed examiner*	R, P, PR
Essay	WMMP002-05	5	no	Appointed examiner*	Appointed examiner*	R

Essay is not mandatory for students in the SBP-track

* 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.

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

Track-specific mandatory courses (available as electives for MPS students from other tracks

Course unit name	Course code	ECTS	Practical	First examiner	Second examiner	Mode of assesment
Track DTTT						
Molecular Toxicology	WMMP007-05	5	No	Dr. ir. I.A.M. de Graaf	Prof. dr. A. Salvati	WE, P, AST
Advanced Pharmacokinetics	WMMP005-05	5	No	Dr. C. Åberg	Prof. Dr. D.J. Touw	WE, AST
Track PP						
Clinical Pharmacoepidemiology	WMMP015-05	5	Yes	Prof. Dr. E. Hak	Dr. C.C.M Schuiling-Veninga	WE

Track PDE

Sustainable Drug Design and Engineering	WMMP016-05	5	No	Prof. Dr. F.J. Dekker	Dr. A. Nagelkerke Prof. R. Gosens, Prof. M. Schmidt, Dr. K Haslinger, Prof. M. Groves, Prof. E. Frijlink, Prof. Salvati	P, AST
Green Chemistry	WMMP017-05	5	No	Prof. Dr. G.J. Poelarends	Dr. P. Fodran	P

Track SBP

Introduction Science and Business	WMSE001-10	10	Yes	Drs. S. Grooters	Drs. J. Zevenberg	WE, R, AST
Introduction Science and Policy	WMSE002-10	10	Yes	Drs. S. Grooters	Drs. J. Zevenberg	WE, R, AST
SBP Work Placement	WMSE902-40	40	Yes	Appointed examiner *	Appointed examiner	R, P, PR, AST

Track SDISCO

Drug Development from Design to Evaluation	WMMP006-05	5	No	Dr P. Olinga	Prof. Dr. B.N. Melgert	WE, AST
Advanced Pharmacokinetics	WMMP005-05	5	No	Dr. C. Åberg	Prof. Dr. D.J. Touw	WE, AST
Sustainable Drug Design and Engineering	WMMP016-05	5	No	Prof. Dr. F.J. Dekker	Dr. A. Nagelkerke Prof. R. Gosens, Prof. M. Schmidt, Dr. K Haslinger, Prof. M. Groves, Prof. E. Frijlink, Prof. Salvati	P, AST
Green Chemistry	WMMP017-05	5	No	Prof. Dr. G.J. Poelarends	Dr. P. Fodran	P
Nanomedicine and Advanced Pharmaceutics	WMMP018-05	5	No	Prof. dr. A. Salvati	Prof. dr. K. Poelstra	WE, P

Available as elective

Course unit name	Course code	ECTS	Practical	First examiner	Second examiner	Mode of assesment
Microbiological Safety	WMMP004-01	1	Yes	Dr. B.L. Waarts	Ing. S.B. Koopmans	MC, PR
Pharmacovigilance (biennially scheduled; available in 24-25)	WMMP011-05	5	Yes	Prof. Dr. E.P. van Puijenbroek	Drs. R.van Eekeren-Buiten	MC, AST
Reproductive Toxicology	WMMP010-05	5	Yes	Dr. A.P. Nagelkerke	Dr. C.C.M Schuiling-Veninga	WE, R, P
Nanomedicine and Advanced Pharmaceutics	WMMP018-05	5	No	Prof. dr. A. Salvati	Prof. dr. K. Poelstra	WE, P

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 part of this table, but can be found in the Teaching and Examination Regulations (OERs) and/or Ocasys.

++: substantial contribution to the learning outcomes;
+++: large contribution to the learning outcomes.

Mandatory for all MPS students

Medical Pharmaceutical Sciences	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
Drug development	++	++				++	+++		++	++
Academic Skills			+++	+++	+++	+++	++	+++	+++	
Colloquium	++	+++	+++	++	++	+++	++	+++	+++	
Master research project	++	++	+++	+++	+++	+++	+++	+++	+++	++
Essay	++	+++	++	++	++	+++	++	+++	++	

Essay is not mandatory for students in the SBP-track

Track-specific mandatory courses (available as electives for MPS students from other tracks

Medical Pharmaceutical Sciences	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	Track
Molecular Toxicology	+++	++	+++			+++	++	+++			DTTT
Advanced Pharmacokinetics	+++		++	++		++		++			DTTT
Clinical Pharmaco-epidemiology	+++	++	+++	+++							PP
Sustainable Drug Design and Engineering		+++	+++			+++	+++	+++	++		PDE
Green Chemistry				++	+++	+++	++	+++	++	++	PDE
SBP courses	+++		++		++	+++	+++	+++	++		SBP
SBP Work placement		++	+++			+++	+++	+++	+++	++	SBP

Available as elective

Medical Pharmaceutical Sciences	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
Reproductive Toxicology and Epidemiology	++	++	+++		++	+++		++		
Pharmacovigilance	+++		++	++		++		+++	++	++
Microbiological Safety									++	++
Nanomedicine and Advanced Pharmaceutics	+++	+++	+++			+++	+++	++		

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

Research projects, essays, work placements or colloquia carried out under the supervision of a staff member not mentioned in the list, require the participation of two Examiners who take 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 and FSE Infonet.

The Board of Examiners can also appoint one-time examiners to a specific individual project, and appoint aspirant-examiners who do not (yet) meet the requirements of being an examiner.

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.

The Board of Examiners has also appointed examiners who can assess courses, but not individual projects.

Contact details also are available on the Student Portal.

Name	Initials	Department	Mentor	Aspirant
Åberg	P. H. C.	Pharmaceutical Analysis		
Baarsma	H.A.	Lecturers Team		
Balogh	M.	Pharmaceutical Analysis		
Berg, van den	J.H.M.	Pathology & Medical Biology - Pathology		
Bock, de	G.H.	Epidemiology		
Boven, van	J.F.M.	Clinical Pharmacy & Pharmacology		
Burgess	J.K.	Pathology and Medical Biology		
Daemen	C.A.H.H.	Medical Microbiology - Molecular Virology		
Deelman	L.	Clinical pharmacy & pharmacology		
Dekker	F.J.	Chemical and Pharmaceutical Biology		
Denig	P.	Clinical pharmacy & pharmacology		
Dolga	A.M.	Molecular Pharmacology		
El Aidy	S.	Molecular Immunology & Microbiology		
Faber	K.N.	Gastrointestinal and liver diseases		
Feenstra	T.L.	PharmacoTherapy, -Epidemiology and -Economics		
Fodran	P.	Chemical and Pharmaceutical Biology	Yes	Yes

Frijlink	H.W.	Pharmaceutical Technology and Biopharmacy		
Gosens	R.	Molecular Pharmacology	Yes	
Graaf, de	I.A.M.	Pharmacokinetics, Toxicology and Targeting	Yes	
Groves	M.R.	Drug Design		
Hak	E.	PharmacoTherapy, -Epidemiology and -Economics	Yes	
Haslinger	K.	Chemical and Pharmaceutical Biology		
Heeringa	P.	Pathology & Medical Biology - Medical Biology		
Heijink	H.I.	Pathology & Medical Biology - Medical Biology		
Henning	R.H.	Clinical pharmacy & pharmacology	Yes	
Hinrichs	W.L.J.	Pharmaceutical Technology and Biopharmacy		
Horvatovich	P.L.	Analytical Biochemistry		
Huckriede	A.L.W.	Medical Microbiology - Molecular Virology		
Ijzendoorn, van	S.C.D.	Biomed. Sciences of Cells and Systems - Membrane Cell Biology		
Jansman	F.G.A.	PharmacoTherapy, -Epidemiology and -Economics		
Janssen	D.B.	Biotechnology		
Kampinga	H.H.	Biomed. Sciences of Cells and Systems		
Kamps	J.A.A.M.	Pathology & Medical Biology - Medical Biology		
Klont	F.	PharmacoTherapy, -Epidemiology and -Economics		Yes
Kosterink	J.G.W.	Clinical Pharmacy and Pharmacology / FE2		
Lageveen-Kammeijer	G.S.M.	Analytical Biochemistry		Yes
Lambers-Heerspink	H.J.	Clinical pharmacy & pharmacology		
Melgert	B.N.	Molecular Pharmacology		
Mol	P.G.M.	Drug Regulatory Science		
Molema	G.	Pathology & Medical Biology - Medical Biology		
Moshage	A.J.	Gastrointestinal and liver diseases		
Nagelkerke	A.P.	Pharmaceutical Analysis		
Olinga	P.	Pharmaceutical Technology and Biopharmacy		
Poelarends	G.J.	Chemical and Pharmaceutical Biology		
Poelstra	K.	Pharmacokinetics, Toxicology and Targeting	Yes	
Puijenbroek, van	E.P.	PharmacoTherapy, -Epidemiology and -Economics		
Quax	W.J.	Chemical and Pharmaceutical Biology		
Salvati	A.	Pharmacokinetics, Toxicology and Targeting		
Scheurink	A.J.W.	Endocrinology and Metabolism / Neurobiology		
Schmidt	M.	Molecular Pharmacology	Yes	
Schmidt	S.	Chemical and Pharmaceutical Biology		Yes
Schuiling-Veninga	C.C.M.	PharmacoTherapy, -Epidemiology and -Economics		
Taxis	K.	PharmacoTherapy, -Epidemiology and -Economics		
Touw	D.J.	Clinical Pharmacy and Pharmacology		
Verpoorte	E.M.J.	Pharmaceutical Analysis		

Vos, de	S.	PharmacoTherapy, -Epidemiology and -Economics		
Woerdenbag	H.G.	Pharmaceutical Technology and Biopharmacy		
Zuhorn	I.S.	Biomedical Engineering		

Examiners who can assess courses

Name	Initials	Department	Course
Eekeren, van	R	PharmacoTherapy, -Epidemiology and -Economics	Pharmacovigilance
Koopmans	S.	UMCG	Microbiological Safety
Waarts	B.L.	UMCG / Medical Microbiology and Infection Prevention	Microbiological Safety

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