Assessment plan for the curriculum of the Master's degree programme in Medical Pharmaceutical Sciences 2022-2023

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, 2022-2023. 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 2022-2023 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 five tracks, four of them being research-oriented (R):

- General Research
- Pharmaceutical Design and Engineering
- Drug Toxicology and Translational Technology
- Pharmaco-epidemiology and Pharmacoeconomics

and a Science, Business and Policy (SBP) track.

The program is designed to give the students a profound scientific training in order to prepare them for a career in pharmaceutical research in academia, non-profit or commercial organizations. The program 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.

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.

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 general **Medical Pharmaceutical Sciences Research** track, provides students training as a researcher in various fields of medical pharmaceutical sciences, allowing the students to design their tailored programme.

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.

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.

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.

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 acquire 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.

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.

Each track has its own track-specific mandatory courses and space for electives. 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.

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

The student increases their domain-specific knowledge and skills in these courses. All of the other available listed courses may be chosen as elective as well.

Students can also choose courses organized by the other master programmes (mainly Pharmacy, Biomedical Sciences and Biology). Except for their domain-specific contents, these programmes adhere to comparable learning outcomes. Therefore, see the assessment plan of these programme for further information regarding assessment and relationship to the learning outcomes.

Students within the track Pharmaco-epidemiology and Pharmacoeconomics also follow some course units from the Clinical and Psychosocial Epidemiology master, organized by the Faculty of Medicine.

Students may also chose 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. 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.

Course unit name	Course code	ECTS	Practical	First examiner	Second examiner	Mode of assesment
Academic Skills	WMMP012-05	5	Yes	Prof. Dr. E. Hak	Dr. S. de Vos	WE, P, AST
Advanced Pharmacokinetics	WMMP005-05	5	No	Dr. C. Åberg	Prof. Dr. D.J. Touw	WE, AST
Clinical Pharmacoepidemiology	WMFA042-05	5	Yes	Prof. Dr. E. Hak	Dr. S. de Vos	WE, IT
Drug Development from Design to Evaluation	WMMP006-05	5	No	Dr P. Olinga	Prof. Dr. B.N. Melgert	WE, AST
Microbiological Safety	WMMP004-01	1	Yes	Dr. B.L. Waarts	Ing. S.B. Koopmans	MC, PR
Molecular Toxicology	WMMP007-05	5	No	Dr. ir. I.A.M. de Graaf	Prof. dr. A. Salvati	WE, P, AST
Pharmaceutical Design and Engineering	WMMP008-05	5	No	Prof. Dr. F.J. Dekker	Prof. dr. R. Gosens / prof. dr. G.J. Poelarends / prof. dr. M. Schmidt / Dr. Nagelkerke / prof. Dr. A. Salvati	P
Pharmacovigilance (biennially scheduled; available in 22-23)	WMMP011-05	5	Yes	Prof. Dr. E.P. van Puijenbroek	Drs. R.van Eekeren-Buiten	MC, AST
Reproductive Toxicology	WMMP010-05	5	Yes	Dr. C.C.M Schuiling-Veninga	Dr. A.P. Nagelkerke	WE, R, P
Colloquium	WMMP001-05	5	no	Appointed examiner*		R, P
Research project(s)	WMMP902-30 and WMMP901-40	≥ 30 + ≥ 40	yes	Appointed examiner*		R, P, PR
Essay	WMMP002-05	5	no	Appointed examiner*		R
SBP Work Placement	WMSE902-40	40	Yes	Appointed examiner *		R, P, PR, AST

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

Medical Pharmaceutical Sciences	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
Drug development	++	++	+	+	+	++	+++	+	++	++
Academic Skills	+	+	+++	+++	+++	+++	++	+++	+++	+
Molecular Toxicology	+++	++	+++	+	+	+++	++	+++	+	+
Advanced Pharmacokinetics	+++	+	++	++	+	++	+	++	+	+
Reproductive Toxicology and Epidemiology	++	++	+++	+	++	+++	+	++	+	+
Pharmacovigilance	+++	+	++	++	+	++	+	+++	++	++
Clinical Pharmacoepidemiology	+++	++	+++	+++	+	+	+	+	+	+
Pharmaceutical Design and Engineering	+	+++	+++	+	+	+++	+++	+++	++	+
Microbiological Safety	+	+	+	+	+	+	+	+	++	++
Master research project	++	++	+++	+++	+++	+++	+++	+++	+++	++
Essay	++	+++	++	++	++	+++	++	+++	++	+
Colloquium	++	+++	+++	++	++	+++	++	+++	+++	+
SBP courses	+++	+	++	+	++	+++	+++	+++	++	+
SBP Work placement	+	++	+++	+	+	+++	+++	+++	+++	++

Table 2.
+: limited contribution to the learning outcomes;
++: substantial contribution to the learning outcomes;
+++: large contribution to the learning outcomes.

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 (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 and FSE Infonet.

The Board of Examiners can also appoint one-time examiners to a specific individual project.

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 the Student Portal.

Name	Initials	Department	Mentor
Åberg	P. H. C.	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	
Dömling	A.	Drug Design	
El Aidy	S.	Molecular Immunology & Microbiology	
Faber	K.N.	Gastrointestinal and liver diseases	
Feenstra	T.L.	PharmacoTherapy, -Epidemiology and -Economics	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	I.H.	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	
Kosterink	J.G.W.	Clinical Pharmacy and Pharmacology / FE2	
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	
Puijenbroek, van	E.P.	Pharmacotherapy and Pharmaceutical Care	
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
Schuiling-Veninga	C.C.M.	PharmacoTherapy, -Epidemiology and -Economics	
Smit	J.M.	Medical Microbiology - Molecular Virology	
Taxis	K.	Pharmacotherapy and Pharmaceutical Care	
Touw	D.J.	Clinical Pharmacy and Pharmacology	
Verpoorte	E.M.J.	Pharmaceutical Analysis	
Woerdenbag	H.G.	Pharmaceutical Technology and Biopharmacy	
Zuhorn	I.S.	Biomedical Engineering	

SBP Supervisors		
Berger	M.	Science and Society
Boer, de	M.K.	Science and Society
Euverink	G.J.W.	Science and Society
Grooters	S	Science and Society
Laugs	G.A.H	Science and Society
Rijssel, van	M.	Science and Society
Zevenberg	J.	Science and Society