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Appendices for the Master's degree programme in Medical Pharmaceutical Sciences

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

	General learning outcomes *At the end of the programme, the graduate is able to…*
1	*Knowledge and insight* Explain the major underlying principles in Medical Pharmaceutical Sciences including subdiciplines such as of drug discovery, sustainability of drug discovery, analysis of drugs and biomarkers, pharmacology, toxicology, biopharmacy, clinical pharmacoepidemiology and post-marketing surveillance, on a level that exceeds knowledge from a bachelor in pharmacy or a pharmacy related discipline.
2	*Apply knowledge and insight and learning skills* Formulate hypotheses, design and conduct scientific research, interpret data and demonstrate proficiency in statistical analyses in the respective subdiscipline in new and unknown situations.
3	*Judgement formation* Critically evaluate scientific data from experiments, literature or databases, and offer sound arguments to justify a position.
4	*Judgement formation* Identify societal and ethical implications of Medical Pharmaceutical Research and act according to the scientific code of conduct.
5	*Communication* Effectively communicate scientific knowledge, argumentations and conclusions to specialists as well as to a lay audience through oral and written presentations.
6	*Communication and Learning skills* Contribute knowledge and skills to a professional team and is able to give and receive feedback to optimize the performance of the team.
7	*Learning skills* Evaluate personal capabilities and motivations and employ this for professional development and career perspectives.

Pharmaceutical Design and Engineering

	Track specific learning Outcome *At the end of the programme, the graduate is able to…*
PDE1	*Knowledge and insight* Gain specialized knowledge in pre-clinical Medical Pharmaceutical Sciences and formulate realistic and original solutions for complex problems.
PDE2	*Knowledge and insight* To design and execute experimental procedures and data management in modern pharmaceutical laboratories in the perspective of pre-clinical Medical Pharmaceutical Sciences.

Pharmacotherapy & Toxicology

	Track specific learning Outcome *At the end of the programme, the graduate is able to…*
P&T1	*Knowledge and insight* Gain specialized knowledge in clinical Medical Pharmaceutical Sciences and formulate realistic and original solutions to complex problems.
P&T2	*Knowledge and insight* To design and execute scientific research and data management in a modern pharmaceutical research environment in the perspective of clinical pharmaceutical research.

Science, Business and Policy (SBP)

	Track specific learning Outcome *At the end of the programme, the graduate is able to…*
SBP	*Knowledge and insight* Gain specialized knowledge of Business and Policy and connect this to Medical Pharmaceutical Sciences to formulate realistic and original solutions to complex problems.

Sustainable Drug Discovery (S-DISCO)

	Track specific learning Outcome *At the end of the programme, the graduate is able to…*
S-DISCO 1	*Knowledge and insight* Understand the importance and impact of sustainability in drug discovery with local and global health systems.
S-DISCO 2	*Judgement formation* Explain how and where ecological and socio-economic systems interact to influence sustainability in the drug discovery process.
S-DISCO 3	*Judgement formation* Consider and include sustainability in drug discovery decision making.
S-DISCO 4	*Judgement formation* Analyse and explain regional and global sustainable drug discovery using a transdisciplinary and holistic approach.

Appendix II. Tracks/specializations (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 Medical Pharmaceutical Sciences, the R-track **Pharmacotherapy and Toxicology**, provides students training as a researcher with a focus on the clinical aspects of drug discovery and drug application. In this track students can specialize in themes such as: vaccinology, clinical toxicology, pharmaco-epidemiology, pharmaco-economics, big data management, clinical trials or postmarketing surveillance.

3. Within the degree programme Medical Pharmaceutical Sciences, the R-track **Pharmaceutical Design and Engineering**, provides students training as a researcher with a focus on the pre-clinical aspects of drug discovery. In this track students can specialize in themes such as: medicinal chemistry, chemical biology, pharmacology, bioanalysis, nanomedicine and pharmaceutics or molecular toxicology.

4. Within the degree programme Medical Pharmaceutical Sciences, students selected for the mobility programme Sustainable Drug Discovery are trained in inter-and trans-disciplinary skills in the different fields of drug discovery, with a focus on sustainability. For this mobility programme, specified Teaching and Examination Regulations and admission rules apply. Further information is available on: https://sustainabledrugdiscovery.eu/

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

The degree programme Medical Pharmaceutical Sciences offers the following tracks:

- Pharmaceutical Design and Engineering
- Pharmacotherapy and Toxicology
- Science Business & Policy
- Sustainable Drug Discovery – only open to students admitted to this mobility programme.

For this Sustainable Drug Discovery programme, specified Teaching and Examination Regulations and admission rules apply. Further information is available on: https://sustainabledrugdiscovery.eu/ and https://studiekiezer.ugent.be/2022/international-master-of-science-in-sustainable-drug-discovery-en/programma

The following rules apply to all tracks:

- At the start of their programme, the student chooses or is assigned a study mentor to advise and discuss the contents of the individual degree programme. Each track has designated study mentors as listed on the Student Portal.
- The student requests approval from the Board of Examiners before starting a research project, a colloquium, an SBP work placement or an essay via the proposal form.

The following rules apply to the PDE/PT&T track:

The research projects must deal with different research subjects, and must be supervised by different MPS-examiners. Both first and second examiners should be different people.

- Students are allowed to have one of the four examiners from the research projects as a first or second examiner for their colloquium or essay.
- An examiner is allowed to be a student's examiner twice at the most. This means they can be an examiner for the research project + colloquium, research project + essay, or colloquium + essay.
- The first research project must be performed at the Faculty of Science and Engineering (FSE) or the University Medical Centre Groningen, under supervision of one of the appointed examiners

The following rules apply to the SBP-track:

The research project and the work placement SBP must be supervised by different MPS-examiners. Both first and second examiners should be different people. One of the examiners for the work placement SBP is an SBP-examiner.

- To conduct an SBP-internship, you will need 1. an SBP-examiner, and 2. a 'non-SBP examiner', from the list of MPS-examiners.
- Students are allowed to have one of the three MPS-examiners from the research project or work placement as a first or second examiner for their colloquium or essay.
- An MPS-examiner is allowed to be a student's examiner twice at the most, keeping in mind the initial rule. So, they can be the examiner for the research project + colloquium, or the work placement SBP + colloquium, but not for the research project + work placement SBP.
- An SBP-examiner is not allowed to supervise a student's colloquium or essay, only the work placement SBP.
- The first research project must be performed at the Faculty of Science and Engineering (FSE) or the University Medical Centre Groningen, under supervision of one of the appointed examiners.

Requirements for the track Pharmacotherapy and Toxicology

Mandatory:

Course unit	ECTS	Course code	Practical	Entry requirements
Research project 1 (RP)	≥ 30	WMMP901-XX	X	Safe Microbiological Technique certificate *
Research Project 2 (RP2)	≥ 30	WMMP902-XX	X	Safe Microbiological Technique certificate * Research Project 1 Academic Skills
Colloquium	5	WMMP001-05	X	
Drug Development: From Design to Evaluation	5	WMMP006-05		
Academic Skills	5	WMMP012-05	X	
Track-specific courses	20	See below	See below	See below
Electives	25	See below	See below	See below

* Students who have not obtained a Safe Microbiological Technique certificate (VMT in Dutch) have to include the Microbiological Safety course in the first year of their study programme.

The subject of one of the research projects and the subject of the colloquium has to be in a track-related field.

Track-specific courses:

Students in the track PT&T have to do at least four from the seven courses listed below:

Course unit	Course code	ECTS
Clinical Pharmacoepidemiology *	WMMP015-05	5
Clinical Toxicology	WMFA042-05	5
Introduction to Vaccines and Vaccinology	WMMP020-05	5
Molecular Toxicology	WMMP007-05	5
Pharmacoeconomics	WMFA040-05	5
Reproductive Toxicology and Epidemiology	WMMP010-05	5

* students who passed the course Pharmacoepidemiology (WBFA028-05) in their bachelor programme are not allowed to take this course due to overlap.

Electives can be:

- an extension of a research project. Research Project 1 can be registered as 30 or 35 ECTS. Research Project 2 can be registered as 30, 35 or 40 ECTS. Arrangements for extensions should be made during the midterm evaluation.
- course units (see appendix IV).
- a research assignment of 5 or 10 ECTS.
- an essay of 5 ECTS.

Requirements for the track Pharmaceutical Design and Engineering

Mandatory:

Course unit	ECTS	Course code	Practical	Entry requirements
Research project 1 (RP)	≥ 30	WMMP901-XX	X	Safe Microbiological Technique certificate *
Research Project 2 (RP2)	≥ 30	WMMP902-XX	X	Safe Microbiological Technique certificate * Research Project 1 Academic Skills
Colloquium	5	WMMP001-05	X	
Drug Development: From Design to Evaluation	5	WMMP006-05		
Academic Skills	5	WMMP012-05	X	
Track-specific courses	20	See below	See below	See below
Electives	25	See below	See below	See below

* Students who have not obtained a Safe Microbiological Technique certificate (VMT in Dutch) have to include the Microbiological Safety course in the first year of their study programme.

The subject of one of the research projects and the subject of the colloquium has to be in a track-related field.

Track-specific courses:

Students in the track PDE have to do at least four from the six courses listed below:

Course unit	Course code	ECTS
Advanced Pharmacokinetics	WMMP005-05	5
Green Chemistry	WMMP017-05	5
Molecular Toxicology	WMMP007-05	5
Nanomedicine and Advanced Pharmaceutics	WMMP018-05	5
Quantitative Bioanalysis	WMFA049-05	5
Sustainable Drug Design and Engineering	WMMP016-05	5

Electives can be:

- an extension of a research project. Research Project 1 can be registered as 30 or 35 ECTS. Research Project 2 can be registered as 30, 35 or 40 ECTS. Arrangements for extensions should be made during the midterm evaluation.
- course units (see appendix IV).
- a research assignment of 5 or 10 ECTS.
- an essay of 5 ECTS.

Requirements for the SBP-track:
Mandatory:

Course unit	ECTS	Course code	Practical	Entry requirements
research project (RP)	≥30	WMMP901-XX	x	Safe Microbiological Technique certificate[#]
colloquium	5	WMMP001-05	x	
Drug Development: from Design to Evaluation	5	WMMP006-05		
Academic Skills	5	WMMP012-05	x	
Introduction to Science & Business	10	WMSE001-10	x	-
Introduction to Science & Policy	10	WMSE002-10	x	-
work placement SBP	40	WMSE902-40	x	RP Intro S&B Intro S&P
Electives	15	See below	See below	See below

[*] Students who have not obtained a Safe Microbiological Technique certificate (VMT in Dutch) have to include the Microbiological Safety course in the first year of their study programme.

Electives can be:

- an extension of the research project. Research Project 1 can be registered as 30 or 35 ECTS.
- a research assignment of 5 or 10 ECTS.
- an essay of 5 ECTS
- course units from the following table:

Course unit	Course code	ECTS
Advanced Pharmacokinetics	WMMP005-05	5
Clinical Pharmacoepidemiology *	WMMP015-05	5
Clinical Toxicology	WMFA042-05	5
Green Chemistry	WMMP017-05	5
Introduction to Vaccines and Vaccinology	WMMP020-05	5
Laboratory Animal Science	WMBY026-05	5
Microbiological Safety	WMMP004-01	1
Molecular Toxicology	WMMP007-05	5
Nanomedicine and Advanced Pharmaceutics	WMMP018-05	5
Pharmacoeconomics	WMFA040-05	5
Reproductive Toxicology and Epidemiology	WMMP010-05	5
Quantitative Bioanalysis	WMFA049-05	5
Sustainable Drug Design and Engineering	WMMP016-05	5

* students who passed the course Pharmacoepidemiology (WBFA028-05) in their bachelor programme are not allowed to take this course due to overlap.

Requirements for Sustainable Drug Discovery

Students selected for themobility programme Sustainable Drug Discovery follow this set of courses while registered at the University of Groningen.

For this mobility programme, specified Teaching and Examination Regulations and admission rules apply. Further information is available on: https://sustainabledrugdiscovery.eu/ and https://studiekiezer.ugent.be/2022/international-master-of-science-in-sustainable-drug-discovery-en/programma

Course unit	Course code	ECTS
Drug Development: from Design to Evaluation	WMMP006-05	5
Sustainable Drug Design and Engineering	WMMP016-05	5
Advanced Pharmacokinetics	WMMP005-05	5
Green Chemistry	WMMP017-05	5
Nanomedicine and Advanced Pharmaceutics	WMMP018-05	5
Essay or Colloquium or Quantitative Bioanalysis	WMMP002-05 or WMMP001-05 or WMFA049-05	5
Research Project SDISCO	WMMP903-30	30

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Appendix IV. Electives (art. 3.9.1)

Table 1 lists study elements that can be chosen as electives in MPS within the tracks Pharmaceutical Design and Engineering or Pharmacotherapy and Toxiology.

The electives possible within the track Science Business & Policy are listed in Appendix III under the Requirements for the SBP-track

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.

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.

Course	Course code	ECTS
Advanced Light Microscopy	WMBY016-05	5
Advanced Pharmacokinetics	WMMP005-05	5
Advanced Research Skills in BMS	WMBM026-05	5
Advanced Statistics	WMBY018-06	6
Advances in Chemical Biology	WMCH014-05	5
Applied Statistics and Machine Learning	WMBM028-05	5
Behavioural Pharmacology	WMBC003-05	5
Big Data & Applications in biomedicine	WMBM025-05	5
Clinical Pharmacoepidemiology *	WMMP015-05	5
Clinical Toxicology	WMFA042-05	5
Essay	WMMP002-05	5
From Big Data to Personalised Medicine	WMBM008-05	5
Green Chemistry	WMMP017-05	5
iGEM (International Genetically Engineered Machine competition) **	Varies	20
Innovative Therapeutics ^	WMFA037-05	5
Introduction to Science & Business	WMSE001-10	10
Introduction to Science & Policy	WMSE002-10	10
Introduction to Vaccines and Vaccinology	WMMP020-05	5
ISCOMS conference	WMBM029-01	1
Klinische Chemie en Pathofysiologie ^	WMFA036-05	5
Laboratory Animal Science	WMBY026-05	5
Microbiological Safety	WMMP004-01	1
Molecular Toxicology	WMMP007-05	5
Nanomedicine and Advanced Pharmaceutics	WMMP018-05	5
Neem Regie ^	TEM0110-24	10

Next-generation sequencing methods and data analysis	WMBS023-05	5
Neurobiology of Psychiatric Disorders	WMBM018-05	5
Organic Synthesis: Methods and Strategy 1	WMCH017-05	5
Organic Synthesis: Methods and Strategy 2	WMCH024-05	5
Orientation on Non-academic Careers	WMBY032-05	5
Oriëntatie op Onderwijs in de Bètawetenschappen ^	WMEC013-05	5
Pharmacoeconomics	WMFA040-05	5
Programming C++ for Biologists	WMBY010-05	5
Quantitative Bioanalysis	WMFA049-05	5
Reproductive Toxicology and Epidemiology	WMMP010-05	5
Skills in Science Communication (2a)	WMEC006-05	5
Sustainable Drug Design and Engineering	WMMP016-05	5
Tools and Approaches of Systems Biology	WMBS005-05	5
Translational Research in Respiratory Disease	WMBM015-05	5

* Students who passed the course Pharmacoepidemiology (WBFA028-05) in their bachelor programme are not allowed to take this course due to overlap.

** 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 (art. 4.4)

Course unit	Entry requirement
Research project 1	Safe Microbiological Technique certificate
Research project 2	Research project 1 + Academic Skills
Work placement Science Business & Policy	Research project 1 + 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 <u>Medical Pharmaceutical Sciences</u>

From other Dutch universities:

- a Bachelor's degree in Pharmacy from the Utrecht University (croho-code 56157)
- a Bachelor's degree in Bio-Pharmaceutical Sciences from Leiden University (croho-code 50207)

From the University of Groningen:

- a Bachelor's degree in Pharmacy.

- a Bachelor's degree in Biology with one of the following majors:
  - Biomedical Sciences with the following course units from Pharmacy:
    - Medicine Groups: Endocrine System and Digestive and Respiratory Tract (WBFA039-05)
    - Medicinal Chemistry & Biophysics (WBFA038-05)
    - Organic & Biosynthesis (WBFA008-05) OR Bio-organic Chemistry (WBBY050-05)
    - Pharmacokinetics (WBFA018-05)
    - Metabolism & Toxicology (WBFA016-05)

  - Molecular Life Sciences with the following course units from Pharmacy:
    - Medicine Groups: Endocrine System and Digestive and Respiratory Tract (WBFA039-05)
    - Medicinal Chemistry & Biophysics (WBFA038-05)
    - Organic & Biosynthesis (WBFA008-05) OR Bio-organic Chemistry (WBBY050-05)
    - Pharmacokinetics (WBFA018-05)
    - Metabolism & Toxicology (WBFA016-05)

- A Bachelor's degree in Life Science & Technology (new curriculum from 2020/2021 onwards) with the following courses:
  - Pharmacokinetics (WBFA018-05)
  - Metabolism and Toxicology (WBFA016-05)
  - Biostatistics (WBFA011-05)
  - Pharmacoepidemiology (WBFA028-05)
  - One from:
    - MG: Endocrine System and Digestive and Respiratory Tract (WBFA039-05)
    - MG: Circulatory Tract (WBFA040-05)
    - MG: Infectious Diseases and Oncology (WBFA041-05)
    - Drugs for the Central Nervous System (WBFA033-5)
  - A Bachelorproject in a field suitable for MPS – Course code WBFA902-15

- A Bachelor's degree in Chemistry with:
  - Chemistry of Life track
  - The following courses in their minor:
    - Pharmacokinetics (WBFA018-05)
    - Metabolism & Toxicology (WBFA016-05)

Students with a Bachelor's degree in a discipline closely related to pharmacy from another Dutch or foreign university may also qualify for admission. The respective bachelor program will be evaluated for relevant courses in molecular and cellular biology, biochemistry/organic chemistry, pharmaceutical sciences, chemical analysis, statistics. practical lab skills in medical pharmaceutical sciences and proof of academic scientific writing skills . The completeness and compatibility of the

individual admission files is independently evaluated by two members of the Admission Board upon which a common decision for admission or rejection is reached. Both admission and rejection decisions have as a primary aim to warrant the interest of the student.
It is possible to appeal to the decision of the admission board via standardized procedures at the University of Groningen.

Appendix VII. Pre-master programmes

1. FSE offers fixed Pre-Master's programmes of 30 ECTS for access to the MSc Medical Pharmaceutical Sciences individually determined Pre-Master's programmes. The overview below shows:
   - Which NVAO-accredited HBO diploma grants access to the MSc ;
   - The content and student workload for these fixed programmes, depending on whether the student starts in the first or second semester.

   a. Bachelor
      - A bachelor's degree in Biology and Medical Laboratory Research - 34397
      - A bachelor's degree in Biotechnology - 34331
      - A bachelor's degree in Chemistry - 34396
      - A bachelor's degree in Forensic Laboratory Research - 39305

Semester	Course Title	Course Code	ECTS
1A	Medicine Groups: Endocrine System and Digestive and Respiratory Tract	WBFA039-05	5
1A	Medical Structural Biology	WBBY007-05	5
1A	Biostatistics	WBFA011-05	5
1B	Pharmacoepidemiology	WBFA028-05	5
1B	Metabolism and Toxicology	WBFA016-05	5
1B	Pharmacokinetics	WBFA018-05	5
Totaal			**30**

   - Starting date 1 September

   b. Bachelor
      - A bachelor's degree in Biology and Medical Laboratory Research - 34397
      - A bachelor's degree in Biotechnology - 34331
      - A bachelor's degree in Chemistry - 34396
      - A bachelor's degree in Forensic Laboratory Research - 39305

Semester	Course Title	Course Code	ECTS
2A	Receptorfarmacologie	WBFA036-05	5
2A	Introduction to Pharmacoeconomics	WBFA047-05	5
2A	Organic and Biosynthesis	WBFA008-05	5
2B	Immunopharmacology	WBFA015-05	5
2B	Medicines Group: Drugs for the Central Nervous System	WBFA033-05	5
2B	Bioanalysis	WBFA032-05	5
Totaal			**30**

   - Starting date 1 February

2. For HBO programmes not listed above, the Board of Admissions decides:
   a. The content and the student workload of a tailormade Pre-Master's programme.
      or
   b. Admission is not accepted.

Appendix VIII. Transitional provisions (art. 7.1)

Changes 2025-2026 MPS

Major and minor changes that take effect in the Medical Pharmaceutical Sciences programme as per 2025/2026 are listed below.

Tracks/track requirements

The track Drug Toxicology and Translational Technology has been discontinued as of 2024/2025. Students from earlier cohorts in that track will still be able to graduate in it until 31st of August 2026. After that, the decision is up to the Board of Examiners.

The track name for the track Pharmacoeconomics and Pharmacoepidemiology will change per September 2025. The new name will be Pharmacotherapy & Toxicology. Students who started in the track Pharmacoeconomics and Pharmacoepidemiology will still be able to re-register for that track name and receive a diploma that lists that track.

Entry requirements
No changes

Courses
- The course Pharmacovigilance (WMMP011-05) will no longer be running.
- The course Pharmacoepidemiology in Practice (WMFA041-05) will no longer be running
- For changes in courses from other programmes such as Pharmacy or Biomedical Sciences, consult the Student Portal or Ocasys page of that programme!

Schedule
- To be announced via the Ocasys/Brightspace/Student Portal
- The course Introduction to Vaccines and Vaccinology (WMMP020-05) will move from 1A3 to 1B2.
- For changes in the schedule of other programmes such as Pharmacy or Biomedical Sciences, consult the Student Portal or Ocasys page of that programme!

Appendix IX. Additional Requirements Open degree Programmes (art. 3.10)

Students wishing to pursue an open degree programme should file a request with the Board of Examiners.