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Guidance on the Master Degree Programme in Drug Sciences at the Faculty of Natural Sciences of the University of Basel

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1 General

The Master Degree Programme leading to the title of "Master of Science in Drug Sciences (MSc)" provides basic training in the discovery, development, efficacy and safety of bioactive substances (main focus on pharmaceuticals), enabling a high degree of competence in Drug Discovery/Drug Development and Safety related to substances and therapeutic agents. Successful participants are qualified primarily for employment in academic or industrial research and development and in regulatory authorities. The appropriate choice of elective subjects provides the theoretical basis for later certification as professional toxicologist (see section on "Study").

The body responsible for the Master Programme in Drug Sciences is the Education Committee of the Department of Pharmaceutical Sciences, whose composition and functions are regulated in the statute for the Master Degree Programme in Drug Sciences at the Faculty of Natural Sciences of the University of Basel [**Ordnung für das Masterstudium Drug Sciences an der Philosophisch-Naturwissenschaftlichen Fakultät der Universität Basel**].

The admission requirements and descriptions of the courses at the University of Basel are governed by regulations which are available on the internet (www.unibas.ch under >Universität >Rechtserlasse [in German]) and which are further explained in the present guidance.

The statutes for students at the University of Basel [**Studierenden-Ordnung der Universität Basel**] regulates, among other things: study courses and the European Credit Transfer System (ECTS), general rights and obligations of students, entry requirements, application, enrolment and registration. Detailed information on study admission procedures are online (www.unibas.ch, >Studium [in German]).

The statute for Bachelor's and Master's degrees and doctoral studies (abbr. "framework statute") [**Ordnung für die Bachelor- und Masterstudiengänge sowie die Doktoratsstudien (kurz: Rahmenordnung)**] provides general regulations for the Bachelor's and Master's degree programs and doctoral studies offered by the Faculty of Natural Sciences of the University of Basel (www.unibas.ch under >Dokumente >Rechtserlasse >Phil. Nat. Fakultät, or www.philnat.unibas.ch [in German]).

The statute for the Master Degree Programme in Drug Sciences at the Faculty of Natural Sciences of the University of Basel [**Ordnung für das Masterstudium Drug Sciences an der Philosophisch-Naturwissenschaftlichen Fakultät der Universität Basel vom 5. Dezember 2015**] regulates the Master Programme in Drug Sciences (www.unibas.ch, >Dokumente >Rechtserlasse >Phil.-Nat. Fakultät or www.philnat.unibas.ch [in German]). It is supplemented and explained by the present guidance. Both statute and guidance apply to all students beginning on or after 01 August 2016.

2 Admission to the programme

Application to study at the University of Basel is made centrally through the Admissions Office of the University (www.unibas.ch, >Studium >Bewerbung-Zulassung >Anmeldung). Holders of a Bachelor of Sciences in Pharmaceutical Sciences at the University of Basel are admitted to the Master programme without preconditions.

Admission for all other candidates requires nomination by the Rectorate on request by the examination committee. Admittance requires a Bachelor degree with 180 credit points that is equivalent to the Bachelor of Science in Pharmaceutical Sciences of the University of Basel.

Joining the Master Degree Programme is only possible in the autumn semester.

3 Study objectives

3.1 General objectives

The Master Programme in Drug Sciences aims to educate students on three levels: (1) specialist knowledge, (2) professional core competence, and (3) ethical and professional values.

Successful graduates of the Master Programme in Drug Sciences:

- obtain basic theoretical and practical knowledge in the entire field of bioactive substances, with emphasis on discovery and development, mechanisms of action and safety of pharmaceuticals
- understand the interactions of bioactive substances with the living organism, can estimate the effects and side-effects in exposed individuals, and propose preventive and therapeutic measures
- understand the interactions and effects of pharmaceuticals on whole populations
- understand molecular mechanisms for pharmaceutical effects and side-effects
- can analyse, critically evaluate and present research results
- recognize the importance of pharmaceuticals for the individual and for society, and are capable of interdisciplinary collaboration with other drug development specialists and health care professionals.

3.2 Expertise and methodological skills

In the Master Programme in Drug Sciences, expertise and methodological skills related to the interactions of drugs and other bioactive substances with the living organism and populations, at the molecular, cellular, systemic and population levels are gained through specialised lectures and a mainly experimental thesis. Based on these acquired skills, successful graduates are able to analyse and solve new problems.

3.3 Social skills

Students develop a sense of responsibility towards their own scientific activities. They recognize ethical issues in research and in the application of research results.

The interdisciplinary questions require good team work between professionals of various disciplines who are trained in seminars and in the Master thesis.

3.4 Further study and employment

With successful completion of the Master Programme in Drug Sciences, graduates are in principle able to enrol for a doctoral thesis in the field of pharmaceutical sciences/toxicology (e.g. in Pharmacology, Pharmaceutical Sciences, or Toxicology). Experience shows that a doctorate is advantageous for entry into the pharmaceutical industry.

Major areas of activity of graduates are:

- Basic or applied research at universities or in industry
- Research and development in industry
- Regulatory affairs in government authorities or industry
- Marketing of pharmaceuticals

4 Study

4.1 Quality of teaching

The quality of the lectures is regularly evaluated according to the learning evaluation criteria of the Natural Sciences Faculty of the University of Basel.

4.2 Credit point system

The calculation of credit points is based on the "European Credit Transfer System" (ECTS). The annual study time is equivalent to 60 credits, consisting of 1 credit per 30 hours work time (attendance at lectures plus individual work). By assigning credit points to individual lectures, the average work requirement for students can be calculated.

Successful completion of the program requires 120 credit points, with 64 credits obtained by attending lectures, seminars and courses in the first year, and another 56 credits obtained from the master thesis and examination and attendance at 2 seminars in the second year. The master programme thus requires 2 years of full-time study. If done part-time, the study period is correspondingly longer.

Grading of student performance is by examination in lecture modules (see 4.4), and in the master thesis (4.7) and master thesis examination (4.8) in accordance with the learning agreement [Studienvertrag] for work performed outside of lectures.

Credits are issued only for satisfactory performance. Performance is deemed satisfactory when an examination is graded at least 4 or rated as a "pass". A failed examination may be repeated. The number of credit points allocated for lectures attended is documented in the applicable lecture timetable.

4.3 Teaching language

The language of tuition throughout the master programme is English.

4.4 Examinations

All compulsory modules in the Drug Sciences Master Programme include examinations in accordance with article § 13 of the framework statute.

Students are automatically registered for these examinations when enrolled in the corresponding module (except for master thesis and thesis examination). Cancellations must be reported to the lecturer responsible for the module.

Details of examination type, scope and grading (pass/fail or numerical grade) for the modules are given in the online lecture schedule (Vorlesugsverzeichnis) (www.unibas.ch/vv/).

Examinations for elective subjects (see 4.5) are defined separately.

Module examinations can have several forms (cf. framework statutes):

- Oral tests, 20-60 minutes with an examiner;
- Written tests, 30-180 minutes;
- Computer-based tests, 30-180 minutes;
- Multiple Choice Tests;
- Portfolio: Written reports or presentations (from individual or group work);
- Colloquium: Active participation in a small group multidisciplinary thesis examinations.

These examination forms test knowledge, ability and skills. Their content consists of module-specific information or portfolio-based individual detailed investigations.

4.5 Courses in the first year

The first year of the Master Programme teaches theoretical basics in lectures, seminars and practicals. There are a total of 7 modules (including 1 Practical Training and 1 elective topic), for a total of 64 credits.

Module / Lectures	CP	Semester
1. Introduction and Basis of Human Diseases (8 CP)		
a. Molecular and Pathologic Basis of Disease (V).....	3	HS
b. Cancer: Basics, Cause and Therapy (V)	2	HS
c. Genetic Approaches in Biomedical Research (V).....	1	HS
d. Case Studies in Drug Sciences (S)	1	HS
e. Drug Sciences (S - former Seminars on Drug Discovery and Development)	1	FS*
2. General Skills and Experimental Tools (5 CP)		
a. Molecular Modeling in Drug Design (V).....	1	FS
b. Computer Modeling of Adverse Effects (V)	1	HS
c. Biostatistics and Experimental Planning (V).....	2	HS
d. Regulatory Aspects for Approval of Therapeutics (V).....	1	FS
3. Target Identification/Validation to Discovery of Modulators (8 CP)		
a. Mechanisms of Drug Action (V).....	2	HS
b. Target Validation, and Identification of Target Modulators as Exemplified by Novel Immunotherapeutics (V)	1	HS
c. Concepts of Medicinal Chemistry (V)	2	HS
d. Development of Therapeutic Antibodies (V).....	1	HS
e. From Novel Targets to Novel Therapeutic Modalities (V).....	2	FS
4. Translating Pharmacology and Drug Safety to Humans (12 CP)		
a. Mechanisms of Toxicity (V).....	1	HS
b. Early Safety Assessment and Alternatives to Animal Testing, 3Rs (V)	1	HS
c. Pharmacogenomics (V)	1	FS
d. Organ directed Toxicity (V).....	1	FS
e. Reproductive Toxicology (V)	1	FS
f. Psychopharmacology and Neurotoxicology (V).....	1	FS
g. Immunosafety (V)	1	FS
h. Drug Metabolism and Pharmacokinetics (V)	1	HS
i. Animal Experimentation for Regulatory Purposes (V)	2	HS
j. Safety Assessment for "First-in-Human Clinical Trials" (V)	2	FS
5. Clinical Drug Development: the Basis for Market Approval (8 CP)		
a. Clinical Toxicology (V)	1	HS
b. Good Clinical Practice (V).....	1	HS
c. Special Topics of Clinical Pharmacology (V)	2	HS
d. Industrial Pharmacy (V)	2	HS
e. Drug Delivery and Targeting (V).....	2	HS
6. Practical Training (8 CP)		FS
Laboratory Methods in Drug Sciences	8	FS

* must be attended twice, either in the 1st/2nd or in the 2nd/3rd semester (depending on the study planning for Master thesis)

7. Elective subjects (total 15 CP¹)		HS/FS
The following are for specialist toxicology training (recognized for certification as professional toxicologist in accordance with the Swiss Register of Toxicologists http://www.swisstox.ch/swisstox-de/register/reglement.php)		
a. Chemical Risk Assessment (V)	1	FS
b. Specific Toxic Agents (V).....	1	HS
c. Environmental Toxicology: Compounds, mechanisms, bioaccumulation, effects (V)	1	FS
d. Environmental Toxicology: Effects on organisms and populations (V).....	1	FS
e. Food Toxicology and Risk Assessment (V)	1	FS
Further elective subjects (recommended lectures from the Department of Pharmaceutical Sciences):		
f. Bioactive Compounds in Nutritional Plants (V)	1	HS
g. Clinical Chemistry (V)	1	HS
h. Evaluation of Compound Properties (V) - <i>cancelled for spring semester 2018</i>	1	FS19
i. Information Retrieval (P)	1	HS
j. International Workshop or Conference (Learning contract).....	1	(HS/FS)
k. Modern Cancer Therapy (V)	1	FS
l. Natural Toxins, and Toxin Producing Organisms (V)	1	HS
m. NMR in Drug Discovery (V)	1	HS
n. Scientific Writing (S)	3	FS
o. Analytics in the Pharmaceutical Industry - <i>offered first-time spring semester 2018...</i>	1	FS
Total	64	

Legends:

HS	Herbstsemester (autumn semester)
FS	Frühjahrssemester (spring semester)
CP	ECTS xredit points
P	Practical
S	Seminar
V	Vorlesung (lecture)

¹ Of the 15 CPs in the elective subject, at least 11 must be obtained within the faculty (Pharmacological Sciences lectures). Maximum 4 CPs can be acquired outside the faculty, through self-administration activities towards the University (max. 1 CP) or in tutorial activities (requires a study contract through MOuA).

4.6 Courses in the second year

Courses comprise master thesis and examination (see 4.7 and 4.8) and attendance at 2 seminars (continuation of modules 1 and 2). First-year courses should be completed before beginning the master thesis.

Module / Lectures	CP	Semester
Master thesis (50 CP)		
Master thesis (incl. preparation of written report)*	50	(HS+FS)
Master examination (4 CP)		
Master examination (incl. preparation)**	4	(HS or FS)
1. Introduction and Basis of Human Diseases (1 CP)		
e. Drug Sciences (S).....	1	HS
2. General Skills and Experimental Tools (1 CP)		
e. Research Projects in Drug Sciences (S) (to be attended during Master's Thesis in 3 rd or 4 th semester)	1	(HS or FS)
Total	56	

* A master work contract must be completed before beginning the master thesis

(<http://philnat.unibas.ch/dokumente/masterstudium>)

** Application for oral thesis examination must be submitted on the completed form

(<http://philnat.unibas.ch/dokumente/masterstudium>) at the latest when the thesis report is submitted.

Legends:

HS Herbstsemester (autumn semester)
FS Frühjahrssemester (spring semester)
CP ECTS credit points
S Seminar

4.7 Master thesis

4.7.1 Goal and prerequisites

The master thesis should provide students the opportunity to apply the skills learned during their studies in a longer self-contained project in the field of drug sciences or toxicological research. The emphasis is on learning to conduct independent scientific work. In addition, students gain insight into the workings of a scientific research group. For a successful thesis, independence, flexibility and dedication are essential.

4.7.2 Choice of topic and supervision

The thesis can be completed at the University of Basel or externally, supervised by a lecturer. The thesis supervisor can be a lecturer with an "Habilitation" (professor or junior professor) or an equivalent academic qualification in the Drug Sciences master programme of the Department of Pharmaceutical Sciences. The thesis supervisor is responsible for the master thesis and thesis examination (see 4.8). With the approval of the Education Committee, the supervisor may transfer responsibility to another qualified person at the University of Basel or another University or Technical University or industry, but remains responsible for the thesis.

Students apply directly to the relevant responsible person in whose area they wish to do a thesis. This person defines the topic, scope, and start time of the thesis in consultation with the student. This is documented in a Master thesis agreement [Masterarbeitsvertrag] (see <https://philnat.unibas.ch/dokumente/masterstudium/>), which is signed by the responsible

person, the student, and the education committee chairperson before the start of the thesis work.

4.7.3 Duration, grading, and possibility to repeat

The thesis normally begins after successful completion of the first 2 semesters, lasts 10 months, and is completed by a written report within that time. The thesis must be accompanied by a statement on scientific integrity (see <https://philnat.unibas.ch/dokumente/masterstudium/>). The evaluation of the thesis is carried out by the thesis supervisor in consultation with researchers directly involved in the work, and is graded in increments of half notes. If the thesis is assessed as adequate, it is awarded 50 credit points. A failed thesis may be repeated once with a new topic. The grade awarded for the thesis will be notified immediately after the oral examination (see 4.8).

4.8 Thesis examination

The thesis examination takes place within 4 weeks after submission of the thesis, in the form of a 45-minute oral colloquium on the topic of the thesis and related areas (approximately 15 minute presentation of the master thesis, 30 minutes of questions/discussion). The examiners are the thesis supervisor, and as a rule the researchers who were directly involved in the thesis work. The Education Committee may exceptionally at the request of the thesis supervisor permit another appropriately qualified person to deputize for the supervisor.

Performance is rated in half step notes. For successful completion of the thesis examination, 4 credits are awarded. A failed thesis examination may be repeated once.

The date of the thesis examination must be agreed in advance by the student with the thesis supervisor. A written application for the thesis examination must be submitted to the administrative office secretariat no later than the submission date of the master thesis.

4.9 Master pass / grades

Successful completion of the master programme in drug sciences requires the following credit points (CPs):

- a) 66 CPs from lectures/seminars/practicals (see 4.5)
- b) 50 KCPs from the master thesis (see 4.7)
- c) 4 CPs from the thesis examination (see 4.8)

The master degree grade is the mean of the master thesis grade (weight 2/3) and the master examination grade (weight 1/3). The master degree grade is rounded to one decimal place.

Students who do not successfully complete the Master Programme will be informed of exclusion from the Programme by decree of the Dean.

5 Credits for other coursework and examinations

Allocation of credit points for comparable courses and examinations from another programme at the University of Basel or from programmes at other universities, as well as recognition of credit points acquired in other subjects at the University of Basel or another university, will be decided by the examination committee of the Faculty of Natural Sciences at the request of the education committee.

Procedure: A written request, with a detailed list of the coursework for which credits are requested, is sent to the study office of the Faculty of Natural Sciences. The application should include all relevant certificates of academic achievements along with a brief summary of the contents of courses for which credits are requested.

The applicant will be notified of the recognition of studies and examinations and credit points in writing by the study office of the Faculty.

6 Effective date

This guidance is applicable from autumn semester (HS) 2016 for all students of the Master Degree Programme in Drug Sciences at the University of Basel.

7 Relevant addresses for advice

*Chairperson of the education committee Pharmaceutical Sciences
and operational head of programme Drug Sciences*
[*Vorsitzender der Unterrichtskommission Pharmazeutische Wissenschaften und operativer
Leiter des Studiengangs Drug Sciences*]:
Prof. A. Odermatt, alex.odermatt(at)unibas.ch, <http://pharma.unibas.ch/Odermatt/>

Departmental study office
[*Studienkoordination Pharmazeutische Wissenschaften*]:
studienkoordination-pharma(at)unibas.ch, Tel. +41 (0)61 267 15 53,
<https://pharma.unibas.ch/teaching/studienkoordination/>
<http://pharma.unibas.ch/teaching/msc-drug-sciences/>

Natural Sciences Faculty study office
[*Studiendekanat der Philosophisch-Naturwissenschaftlichen Fakultät*]:
Klingelbergstrasse 50, 4056 Basel
Tel.: +41 (0)61 267 30 54
studiendekanat-philnat@unibas.ch, www.philnat.unibas.ch

University study office/admission office
[*Studiensekretariat der Universität Basel*]:
Kollegienhaus, Petersplatz 1, 4003 Basel
Tel. +41 (0)61 267 30 23,
<https://www.unibas.ch/de/Studiensekretariat.html>, <https://www.unibas.ch/de/Studium.html>