2009 curriculum provisions for the Master of Science Programme in Pharmaceutical Sciences at the Faculty of Health and Medical Sciences, University of Copenhagen

These curriculum provisions come into force on September 1 2015 and apply to students admitted to the programme since September 1 2009.

The curriculum provisions were approved by the Dean in May 2009 with changes approved in March 2014, August 2015, August 2016, March 2017, March 2018 and March 2019.

This subject-specific curriculum, the course or module descriptions in the overall University of Copenhagen course database and the general curriculum provisions together comprise the curriculum for the degree of Master of Science (MSc) in Pharmaceutical Sciences.

Part 1 Objectives and qualification profile

§1 Objectives

The objectives of the Master of Science in Pharmaceutical Sciences programme are:

1. To enhance the student’s academic knowledge and ability, and to increase the theoretical and methodological qualifications together with the independency acquired by the student on a bachelor programme in the natural, health or technical sciences on the basis of the highest international research within this field.
2. To educate the students in becoming pharmaceutical experts who are capable of identifying, formulating and solving complex pharmaceutical problems independently and at an academic level.
3. To provide the student with a considerable degree of academic depth through the application of basic and advanced academic elements from within the pharmaceutical disciplines and methods, and training in scientific work and methods that develop the student’s ability to work in related jobs in the industry.
4. To qualify the student to continue his or her studies, possibly at PhD level.

Successful completion of the programme gives the right to use the title of Successful completion of the programme gives the right to use the title of kandidat i lægemiddelvidenskab (cand.scient. i lægemiddelvidenskab) and the English title of Master of Science (MSc) in Pharmaceutical Sciences.

1.2. The programme is worth 120 ECTS credits.

1.3. The programme belongs under the Study Board for the Pharmaceutical Sciences.

1.4. The programme belongs under the corps of external examiners for pharmaceutical degree programmes in Denmark.
§2 Admission requirements

To qualify for admission to the programme, applicants must

1. Have completed a bachelor programme in the health, natural, or technical sciences at a university in Denmark or abroad.
2. Have accumulated at least 120 ECTS credits in chemical and/or biological disciplines.
3. Have accumulated at least 15 ECTS credits within the following biological disciplines; biochemistry and/or molecular biology and/or microbiology.
4. Have accumulated at least 15 ECTS credits in chemistry subjects, of which at least 7.5 ECTS credits must be in organic chemistry.

Scandinavian applicants (including Danish applicants) are required to document proficiency in English corresponding to at least English B level if they do not have a Bachelor's degree from a Danish or Scandinavian university. Applicants from an English-speaking country and/or those who have completed a Bachelor's degree in English do not need to document their English proficiency. Applicants from outside of Scandinavia who speak or write English as a second language must pass the International English Language Testing System (IELTS/Academic) or the Test of English as a Foreign Language (TOEFL) to document their qualifications in English. The minimum acceptable score for IELTS is 6.5 and the minimum acceptable score for TOEFL is 560 on the paper test, or 83 on the internet-based test. For more information about the tests: www.ielts.org and www.toefl.org (external links).

2.2. The requirements for admission stipulated in 2.1. above must be met before commencing on the programme.

2.3. The bachelor’s degree in question must have been gained no more than five years before commencement of the first semester of the programme.

2.4. Motivational Statement and CV

All applicants must write a motivational statement depicting reasons for applying for admission, how the programme will build on pre-existing knowledge and skills, and describe other relevant experiences. The motivational statement will solely be used for ranking applicants who are qualified for enrolment at the Msc Programme in Pharmaceutical Sciences. Applications will be assessed by an admission committee. Selection of the admitted students will be made on the basis of an overall evaluation including bachelor’s degree grade average, CV, research experience, any professionally relevant stays abroad and the motivational statement.

2.5. In special circumstances the admissions panel may waive the requirements stipulated in 2.1 and 2.3.

2.6. List of Danish bachelor’s degrees known to the University of Copenhagen where the above criteria can be met:

Bachelor of Science (BSc) in Biochemistry at Copenhagen University and Bachelor of Science (BSc) in Biochemistry as a specialisation under Molecular Biology at Aarhus University

Bachelor of Science (BSc) in Molecular Biology at Aarhus University and Roskilde University
Bachelor of Science (BSc) in Biomedicine at University of Southern Denmark

Bachelor of Science (BSc) in Biochemistry and Molecular Biology at University of Southern Denmark

Bachelor of Science (BSc) in Biology with minors in Chemistry at University of Southern Denmark

Bachelor of Science (BSc) in Molecular Biomedicine at Copenhagen University and Aarhus University

Bachelor of Science (BSc) in Chemistry at Copenhagen University, Aarhus University, Roskilde University, Aalborg University and University of Southern Denmark

Bachelor of Science (BSc) in Pharmacy at Copenhagen University

Bachelor of Science (BSc) in Engineering in Biotechnology at Technical University of Denmark

Bachelor of Science (BSc) in Engineering (Chemical Engineering and Biotechnology) at Aalborg University

Bachelor of Science in Engineering in Human Life Science and Engineering at Technical University of Denmark

2.7. 60 students may be admitted per annum.

2.8. If more than 60 applicants meet the admission requirements stipulated above, applicants with the highest unweighted average grade for all components of the bachelor programme in question will be given top priority.

2.9. One third of the seats may be reserved for students from countries outside of the EU/EEA.

§3 Competency profile

Knowledge

A graduate with an MSc in the Pharmaceutical Sciences:

- Has knowledge at the highest international level in the key academic disciplines of drug discovery, development, production and application.
- Can understand the chief multi-disciplinary processes and relationships between the main phases of drug development on the basis of knowledge of the individual academic disciplines.
- Has, regardless of programme speciality, broad knowledge of pharmacology and physiology, medicinal chemistry, the formulation and production of pharmaceuticals and related disciplines. Also understands and is able to reflect over the correlation between these disciplines in relation to how drugs ultimately influence disease in humans, and how complex biosystems influence drugs in the widest sense.
- Can understand and identify scientific problems in the areas of drug discovery, development, production and application in society.
• Has knowledge of the national and international regulatory requirements as well as the quality standards set for the drug development process on the whole.

**Skills**

A graduate with an MSc in the Pharmaceutical Sciences:

• Masters key scientific experimental methods related to academic disciplines: quantitative analysis of data, complex mathematical calculations, scientific reporting including assessing and discussing experimental or collected data, a critical approach to literature in the field, quality assurance and knowledge of the requirements that general and scientific ethics place on these methods in terms of drug development.
• Based on interdisciplinary understanding is able to propose and formulate model solutions and methods of analysis to solve multidimensional problems in the areas of drug discovery, development, production and application.
• Is able to present, communicate and discuss interdisciplinary knowledge and drug-related problems with colleagues, other specialists and non-specialists.

**Competences**

A graduate with an MSc in the Pharmaceutical Sciences:

• Is able to assess complex problems in the areas of drug discovery, development, production and application, and on the basis of interdisciplinary skills is able to formulate hypotheses and model solutions, either independently or in interdisciplinary collaboration.
• Can independently take responsibility for continuing to develop within an interdisciplinary environment as well as area of specialisation: drug discovery or development, medicine and society.
• Is able to make a constructive contribution to collaboration or lead multidisciplinary project groups in certain phases of drug development or in connection with communication between the pharmaceutical industry and health authorities based on area of specialisation.
• In an interdisciplinary area can integrate complex information and think analytically, creatively, innovatively and reflectively in order to solve problems in the areas of drug discovery, industry and public authorities.
Part 2 Programme structure, instruction and maximum duration of study

§4 Programme structure and instruction

The programme consists of a number of compulsory modules, a compulsory academic study track, a number of restricted elective and elective modules and a master’s thesis.

The modules compulsory for all students are as follows:

1. Drug Discovery and Development (7.5 ECTS credits)
2. Principles of Pharmacology (7.5 ECTS credits)
3. Pharmaceutics and Drug Development (7.5 ECTS credits)
4. One of the three academic study tracks listed below:

Study track I ("Drug Discovery"):

- Medicinal and Biostructural Chemistry (7.5 ECTS credits)
- Pharmacology: From Physiology to Therapy (15 ECTS credits)
- Advances in Medicinal Chemistry Research (7.5 ECTS credits)

Study track II ("Drug Development"):

- Medicinal and Biostructural Chemistry (7.5 ECTS credits)
- Pharmaceutical Analytical Chemistry (7.5 ECTS credits)
- Research Project in Pharmaceutics and Drug Delivery (15 ECTS credits)

Study track III ("Medicines and Society"):

- Pharmacology: From Physiology to Therapy (15 ECTS credits)
- Contemporary Social Pharmacy (7.5 ECTS credits)
- Methods and Procedures in Clinical Drug Development (7.5 ECTS credits)

5. A master’s thesis worth 30, 37.5, 45, 52.5 or 60 ECTS credits within a pharmaceutically relevant field.
6. Restricted elective modules amounting to at most 37.5 ECTS credits.
7. Other elective modules amounting to at most 30 ECTS credits.

4.2. The constituent subject elements in the programme is constituted by the compulsory study and exam activities, and the Master’s thesis. These elements consist of part 1 no. 1, 2, 3, 4, 5 and 6 and must amount to at least 90 ECTS credits.

4.3. Each student’s syllabus must be drawn up in cooperation with the thesis supervisor to ensure that:

1. There is a reasonable connection and progression between the completed bachelor programme and the master’s programme.
2. The student has acquired the academic foundation necessary to complete the chosen master’s thesis.
3. The master’s programme to be followed incorporates optimal academic progression.
4. The programme comprises a balanced course of study aimed at one or more areas of employment.
4.4. If the student completes the first year of the programme at the University of Copenhagen and the second year at Vrije Universiteit in Amsterdam, the Netherlands, enrolled on the Master of Science in Drug Discovery and Safety in accordance with the pertaining set of regulations, the student will gain a “double degree” with the title of kandidat i lægemiddelvidenskab (cand.scient. i lægemiddelvidenskab) from the University of Copenhagen and the title of MSc in Drug Discovery and Safety from Vrije Universiteit.

4.5. Instruction is primarily in the form of lectures, dialog-based class teaching, experimental exercises and project work in groups of two or more students.

§5 Maximum duration of study

Students admitted to the programme 1. September 2016 or later must complete the programme within three years of commencement. Students admitted to the programme before the date must complete the programme within four years of commencement.

5.2. The study board may extend this deadline in special circumstances.
Part 3 Course modules and exams

§6

The programme contains the following course modules and exams:

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester</th>
<th>Block</th>
<th>Course modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>1st</td>
<td>1</td>
<td>Drug Discovery and Development, Principles of Pharmacology</td>
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<tr>
<td></td>
<td></td>
<td>2</td>
<td>Pharmaceutics and Drug Development, Study track I + II: Medicinal and Biostructural Chemistry, Study track III: Methods and Procedures in Clinical Drug Development</td>
</tr>
<tr>
<td>2nd</td>
<td>2nd</td>
<td>3</td>
<td>Study track I + III: Pharmacology: From Physiology to Therapy, Study track II: Pharmaceutical Analytical Chemistry, Study track II: Restrictive elective-/e Elective modules</td>
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<tr>
<td></td>
<td></td>
<td>4</td>
<td>Study track I: Advances in Medicinal Chemistry Research, Study track II: Research Project in Pharmaceutics and Drug Delivery, Study track III: Contemporary Social Pharmacy, Study track I + III: Restrictive elective-/e Elective modules</td>
</tr>
<tr>
<td>2nd</td>
<td>3rd</td>
<td>1</td>
<td>Restrictive elective-/e Elective modules, Individualized study unit and master’s thesis</td>
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<tr>
<td></td>
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<td>2</td>
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§7
The programme must include the following elements:

7.2. 7.1. Compulsory course and exam activities of 52.5 ECTS (§8) Elective course and exam modules of maximum 30 ECTS (§11)

7.3. Restrictive course and exam modules of minimum 7.5 ECTS (§11)

7.4. The programme includes 30 – 60 ECTS credits for the master’s thesis (§12).

§8
The following course modules and exams are included in the programme:

1st semester

Name of module: Drug Discovery and Development
STADS code: SLVKB0392U
ECTS: 0
Title of exam: Drug Discovery and Development
STADS code: SLVKB0392E
ECTS: 7.5

Name of module: Principles of Pharmacology
STADS code: SLVKB0351U
ECTS: 0
Title of exam: Principles of Pharmacology
STADS code: SLVKB0351E
ECTS: 7.5

Name of module: Pharmaceutics and Drug Development
STADS code: SLVKA0371U
ECTS: 0
Title of exam: Pharmaceutics and Drug Development
STADS code: SLVKA0371E
ECTS: 7.5

Name of module: Medicinal and Biostructural Chemistry
STADS code: SFAK18004U
ECTS: 0
Title of exam: Medicinal and Biostructural Chemistry
STADS code: SFAK18004E
ECTS: 7.5
Name of module: Methods and Procedures in Clinical Drug Development
STADS code: SLVKB0382U
ECTS: 0
Title of exam: Methods and Procedures in Clinical Drug Development
STADS code: SLVKB0382E
ECTS: 7.5

2nd semester

Name of module: Pharmacology: From Physiology to Therapy
STADS code: SLVKB0362U
ECTS: 0
Title of exam: Pharmacology: From Physiology to Therapy
STADS code: SLVKB0362E
ECTS: 15

Name of module: Pharmaceutical Analytical Chemistry
STADS code: SLVKA0361U
ECTS: 0
Title of exam: Pharmaceutical Analytical Chemistry
STADS code: SLVKA0361E
ECTS: 7.5

Name of module: Research Project in Pharmaceutics and Drug Delivery
STADS code: SLVKA0342U
ECTS: 0
Title of exam: Research Project in Pharmaceutics and Drug Delivery
STADS code: SLVKA0342E
ECTS: 15

Name of module: Contemporary Social Pharmacy
Title of exam: Contemporary Social Pharmacy
STADS code: SLKKIF101U
ECTS: 7.5

Name of module: Advances in Medicinal Chemistry Research
STADS code: SLKKIL110U
ECTS: 0
Title of exam: Advances in Medicinal Chemistry Research
STADS code: SLKKIL110E
ECTS: 7.5

3rd and 4th semester

Elective teaching and exam activities.
§9 Group exams

Where the course description permits students to complete an assignment together, the submitted assignment must clearly identify the contribution made by each student in order to enable individual assessment.

§10 Instruction and exam language

Instructions and exams are in English.

§11 Elective element

To complete the programme students must take an elective course element worth between 7.5 and 37.5 ECTS credits (see 4.1 above). This element may be taken as a module prior to or in parallel with the master’s thesis.

The study board must ensure that the student has access to at least 18 elective courses each worth 7.5 or 15 ECTS credits offered in block 1 to 4. The elective courses are described in the course database, where they will be announced no later than May 1 for the following study year.

11.2. The elective course descriptions must be approved by the study board no later than a year before the course is held.

11.3. The study board offers the elective courses in accord with the objectives of the programme, see § 1.1 above.

11.4. An independent research paper or report or similar worth 7.5, 15, 22.5 or 30 ECTS credits may be completed in accordance with the course description for Individualised Study Units (STADS code: ITSEKABA1).

11.5. If fewer than 15 students sign up for a module it may be cancelled.

11.6. Students who are refused enrolment on an oversubscribed or cancelled module will be given a new deadline to sign up for modules with vacant places.

11.7. Restrictive elective course and exam modules:

- SFKKIF007U Advanced Manufacturing of Pharmaceuticals
- SLKKIL110U/E Advances in Medicinal Chemistry Research
- SFKK18006U Biopharmaceutics: Aspects of Drug Delivery System Design
- SLVK18001U/E Biopharmaceuticals: Design and Modification of Biomacromolecules
- SFKKIF008U Biopharmaceuticals: Formulation of Peptides and Proteins
- SFKK18007U/E Biopharmaceuticals: Protein Production and Analysis
- SFKKIF100U Characterization of Drug Substances and Drug Delivery Systems
- SLKKIF101U Contemporary Social Pharmacy
§12 Master’s thesis

The student normally prepares a master’s thesis during the third and fourth semesters.

The thesis demonstrates the student’s ability to formulate, analyse and process problems within a relevant, limited scientific subject in the pharmaceutical sciences in a qualified fashion.

12.2. The Master thesis may be prepared individually or by two students working together.

12.3. The thesis must be written in English and in accordance with the approved thesis contract. The rules are covered in detail in the course module description.
12.4. When assessing bachelor projects, master’s (candidatus) theses, master’s project and other major written assignments, emphasis must, in addition to the academic content, also be placed on the student’s spelling and writing skills.

12.5. The Master project is worth 30, 37.5, 45, 52.5 or 60 ECTS credits.

Part 4 Concluding remarks

§13 Provisions relating only to the programme concerned
In the first semester students must choose an academic study track. Until the commencement of block 2 of the first semester students may change their study track of choice.

§14 Transitional arrangements
These are determined by the study board and can be found here.

§15 Exemptions from these provisions
In exceptional circumstances, the study board may grant exemptions from any curriculum provisions within the sole remit of the study board.

§16 Date of commencement
These curriculum provisions come into force on September 1 2018 and apply to students admitted to the programme since September 1 2018.