

Guidelines for the Study Program Master of Science in Physics of Life at the Faculty of Science of the University of Basel

April 30, 2024

This is a non-official translation from the original document in German language. Only the German original document “*Wegleitung für das Masterstudium Physics of Life an der Philosophisch-Naturwissenschaftlichen Fakultät der Universität Basel*” (30.04.2024) is legally valid.

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1. General

The admission requirements and the descriptions of the degree programs at the University of Basel are set out in regulations, study programs, and guidelines and are available on the Internet. (www.unibas.ch/en/Documents.html) For the Study Program MSc Physics of Life these are the following documents:

- The Student Regulations of the University of Basel (in German: ***Studierenden-Ordnung der Universität Basel***) regulates, amongst other things, the degree programs and grades, obtaining and recognition of credit points, change of personal data, email account, admission, matriculation,

application and registration and general rights and obligations of students. Detailed information of the procedure for admission is available on the Internet (www.unibas.ch/en/Documents.html).

- The Regulation of the Faculty of Science for Master studies (in German: *Ordnung der Philosophisch-Naturwissenschaftlichen Fakultät der Universität Basel für das Masterstudium*; short title in German: *Rahmenordnung Master*) defines the regulations for master studies (available on www.unibas.ch/en/Documents.html or www.philnat.unibas.ch).
- The Study Plan Master of Science in Physics of Life (in German: *Studienplan für das Masterstudium Physics of Life*, short title in German: *Studienplan Physics of Life*) from 19th of September 2023 regulates the Master degree in Physics of Life (available on www.unibas.ch/de/Dokumente.html or www.philnat.unibas.ch). The Study Plan Master of Science in Physics of Life is supplemented and explained by the present guidelines.

The Physics of Life Teaching Committee is responsible for the Master Program in Physics of Life. Its composition and duties are described in the Regulation of the Faculty of Science for the Master studies and in the study program “Master of Science in Physics of Life”, respectively.

After a student has successfully passed the study program, the Faculty of Science awards the degree “Master of Science in Physics of Life”.

The Master's degree program in Physics of Life is offered by the Biozentrum of the University of Basel.

2. Admission to the Study Program

- 2.1 The admission to the MSc Physics of Life requires a Bachelor of Science (BSc) with at least 180 credit points (CP) that was obtained at a Swiss university or Swiss federal institute of technology, with the following accomplishments:
- a. Either the BSc comprises at least 150 CP in one of the following “fields of study”*: Physics, mathematics, computer science, computational science and engineering, chemistry, biochemistry, life sciences and technologies, mechanical engineering, civil engineering, electrical engineering, micro engineering, material science, chemical engineering.
 - b. Or the BSc comprises at least 150 CP from more than one of the following “fields of study”*: Physics, mathematics, computer science, chemistry, biochemistry, and biology, but at least 60 CP of these 150 CP must be from the “fields of study”* physics, mathematics, computer science, and chemistry.
- 2.2 For BSc degrees from a recognized university that do not fall under point 1 above, the teaching committee will evaluate the equivalence with the degrees listed in point 1, using the corresponding Bachelor degree programs of the University of Basel as a reference. If the University of Basel does not offer this degree program, a degree program of another Swiss university will be used as a reference. In the case of engineering degrees, a degree program from the Swiss federal institute of technology will be used as a reference.
- 2.3 Admission obligations and conditions may not exceed 30 CP. If they would exceed 30 CP, admission is not possible.

English skills are a precondition.

* Note added during translation regarding the term “fields of study” in the Admission section: The list of all “fields of study” at universities in Switzerland is published by swissuniversities.ch. For university degree programs in Switzerland, the “field of study” that is formally associated with a degree program is listed on the entry of this degree at studyprogrammes.ch.

3. Study Objectives

With the master's degree program in Physics of Life, the Biozentrum Basel offers a research-oriented course of study at the interface of physics, mathematics, engineering, and life sciences.

The program focuses on independent research projects (two smaller research projects and one longer research project as a master's thesis), which are carried out at various departments of the Faculty of Science of the University of Basel, at associated institutes of the Faculty of Science, or at the Department of Biomedicine or the Department of Biomedical Engineering.

The practical part of the degree program is supplemented by attending courses in Physics of Life, as well as a selection of courses with a theoretical or experimental focus in the fields of chemistry, mathematics, physics, biochemistry, biophysics, computational biology, developmental biology, genetics, immunology, infection biology, microbiology, neurobiology, pharmacology, structural biology and cell biology.

By combining courses and research projects as part of the Physics of Life master's degree programme, students will be able to answer important biological research questions and identify and apply appropriate physical, mathematical, or biological methods. Upon completion of the programme, students will have the practical experience to conduct a research project and the ability to communicate their findings. The course usually lasts three semesters.

The Master of Science in Physics of Life opens up a wide range of career prospects. These include a research career at a university or in industry, working in a laboratory or at a school, in a patent law firm or in consulting, in biocomputing, or in science journalism. With their knowledge of biological processes and their training in quantitative methods, many doors are open to the graduates in biomedicine, biotechnology, the pharmaceutical and food industries, at universities, or in public organizations.

4. Study Program

The study program Master of Science in Physics of Life (90 credit points, CP) comprises two research projects (2x 10 CP), the master's thesis (30 CP), the master's exam (10 CP), the module "Foundations in Physics of Life" (18 CP) and an electives area (12 CP within the master's courses of the Faculty of Science, of which at least 6 CP must be from courses of the master program Molecular Biology).

The master's degree program usually lasts 18 months (3 semesters). In the case of part-time study, the duration of study is extended accordingly. The course can be started in both fall and spring semesters.

The selection of courses and research projects enables each student to develop individual specializations, e.g. in biophysics, cell physics, multicellular dynamics, neuroscience, systems biology, or evolutionary biology.

4.1. Advice for the Selection of Courses

At the beginning of the degree program, each student is assigned an advisor from among the members of the teaching committee in order to jointly select suitable courses. The individual planning of the courses to be taken is documented with the advisor using the "*Beratung zur Modulgestaltung* / Advice on module design" form. The studies secretariat Physics of Life must receive a copy of the form from the student.

4.2. Credit Point (CP) System

The review of student performance is accomplished by course-accompanying examinations, through performance reviews according to a study contract, the master's thesis, and the final master examination. Credit points are granted only for adequate performance. This performance is considered sufficient when a minimum grade 4 or a "Pass" is given. A failed performance may be repeated. Master's examination and master's thesis can be repeated only once, see section 4.5 and 4.6. The number of granted credit points for the

particular area itself depends on the time of completion as given in the current course catalogue of the University of Basel.

4.3. Module “Foundations in Physics of Life”

The module “Foundations in Physics of Life” covers the biological and physical foundations for Physics of Life. Courses in this module include theoretical, computational, and experimental methods for research on the topic of Physics of Life. At least 18 CP must be earned from this module. Courses are offered in both the fall and spring semesters. The range of courses offered may vary; the course catalogue shows which courses are offered for this module in the current semester. (Course directory: Program structure → Faculty of Science → MSc Physics of Life → Modul Foundations in Physics of Life).

The module contains these obligatory courses:

- Current Topics in Biophysics (6 CP), fall semester.
- From Data to Physical Models in Biology (4 CP), spring semester.

In addition, further courses are offered which students can choose in order to acquire the minimum 18 CP for this module. The courses for this module are selected in consultation with the advisor from the teaching committee (see section 4.1).

The module grade of the module Foundations in Physics of Life is calculated from the average of the graded assessments of the module weighted by credit points. In addition to the graded courses, there may also be courses in this module that are assessed without a grade but with a pass/fail. These ungraded courses are not included in the module grade, even if the CP of these courses are fully credited.

4.4. Module “Research Projects”

During the course of study, students carry out two research projects, each worth 10 CP, under the responsibility of a member of the teaching staff of the Faculty of Science or the teaching staff of the Department of Biomedicine, the Department of Biomedical Engineering, the Friedrich Miescher Institute for Biomedical Research or the Swiss Tropical and Public Health Institute. Each of the two projects usually lasts three months. The project work can be carried out 2/3 part-time, so that courses can be attended during the project in the remaining 1/3 of the student's working time. The topic of the project work needs to be in the subject area Physics of Life. The two research projects and the master's thesis can be carried out in the same research group or in different research groups. Each research project is completed with a final written report and a presentation to the research group.

The assessment of student performance in the two research projects is carried out by entering a learning contract in the online services of the University of Basel (Acquisition of credit points outside the regular course offerings; <https://services.unibas.ch/>). In the learning contract, the responsible lecturer specifies the topic, content, duration, form and scope of the performance assessment, any revision and repetition options, the number of credit points that can be earned as well as the type of assessment and the allocation of the credits to a specific module. The study contract is approved by the student, the responsible lecturer, and the chairperson of the teaching committee before the project work begins. The research project is assessed as pass/fail.

4.5. Module “Master's Thesis”

The master's thesis gives students the opportunity to work independently on a research question. The work can be carried out in a team, whereby the student must be responsible for clearly defined aspects of the research project. The master's thesis can, but does not have to, take place in the same research group as the research project(s).

The master's thesis is carried out under the responsibility of one or more persons who belong to the group of lecturers of the Faculty of Science or the group of lecturers of the Department of Biomedicine or the

Department of Biomedical Engineering of the Faculty of Medicine, the Friedrich Miescher Institute for Biomedical Research or the Swiss Tropical and Public Health Institute.

If more than one person is responsible for supervising the master's thesis, the assessment and grading shall be carried out jointly by these persons. If the master's thesis is completed under the responsibility of only one person, another expert must be consulted for the assessment and grading (second assessor). At least one of the reviewing and grading persons must belong to the Faculty of Science. The second assessor should be determined at the beginning of the master's thesis.

The list of potential thesis supervisors (Master of Science in Physics of Life: List of potential thesis supervisors) can be found on the website of the degree program: www.biozentrum.unibas.ch/msc-physics-of-life.

The proposed topic for the master's thesis must be approved by the teaching committee before the start of the master's thesis.

Before commencing the master's thesis, the module "Research Projects" (in German: "*Forschungsprojekte*") must be completed. In addition, a total of at least 20 credit points must have been acquired in the modules "Foundations in Physics of Life" and "Electives" (in German: "*Wahlbereich*") before starting the master's thesis.

Before starting the master's thesis, Part I: Agreement (In German: *Teil I: Vereinbarung*) in the document "Learning Contract for Master's Thesis" (In German: *Studienvertrag für Masterarbeit*) must be completed and two copies of this document must be signed by the student, the assessor and - if available - the second assessor. (Download the document here: <https://philnat.unibas.ch/de/studium/master>). The two original copies of this document, which are completed and signed in Part I, must then be handed in to the studies secretariat Physics of Life. After the chair of the Physics of Life teaching committee has signed both originals, one copy remains in the studies secretariat Physics of Life, the second copy is returned to the student and must be taken to the oral master's examination.

The master's thesis lasts six months of full-time work (30 CP) and an additional two months of full-time work (10 CP) are set aside for the preparation of the master's examination. The time allocation between the practical part, the writing of the master's thesis and the preparation for the oral master's examination is the responsibility of the student in consultation with the master's thesis assessor(s).

The master's thesis must be documented in a written report with the following content: an introduction to the field of research and a description of the motivation for the research question, a description of the methods used, a description of the results obtained, a discussion of the results obtained in the context of the specialist literature and the specialist field, and an outlook for further research. In this written report, the completed and signed "Declaration on Scientific Integrity" ("*Erklärung zur wissenschaftlichen Redlichkeit*") must also be included. (Download: <https://philnat.unibas.ch/de/studium/master>). The report on the master's thesis must be submitted to the assessors at least four weeks before the oral examination together with the form "Expert Opinion on Master's Thesis Physics of Life" ("*Gutachten zu Masterarbeiten in Physics of Life*") (Download: Website of the degree program www.biozentrum.unibas.ch/msc-physics-of-life).

The master's thesis is jointly assessed and graded by the assessors named in Part I of the "Learning Contract for Master's Thesis" (*Studienvertrag für Masterarbeit*).

The grade achieved for the master's thesis will be communicated subsequent to the oral master's examination.

A print version and an electronic PDF version of the written master's thesis must be submitted to the studies secretariat Physics of Life.

Within the first month, students can abort the master's thesis without further consequences. A later termination is considered a failed master's thesis.

In the event of failure, a second master's thesis with a new topic can be written. Failure to pass a master's thesis a second time will result in exclusion from the master's degree program in Physics of Life.

4.6. Module “Master's Examination”

The master's examination takes place after the six-month master's thesis and the two-month examination preparation period. The written report on the master's thesis together with the form “Expert Opinion on Master's Thesis Physics of Life” (*Gutachten zu Masterarbeiten in Physics of Life*) must be provided to the assessors at least four weeks before the master's examination. (Download: Degree Program Webseite: www.biozentrum.unibas.ch/msc-physics-of-life).

The master's examination is an oral exam lasting 60 min. It comprises the topic of the master's thesis, the specialist literature on the master's thesis and the subject area associated with the master's thesis.

Written registration with the studies secretariat Physics of Life is required for the master's examination (Download of form: degree program website: www.biozentrum.unibas.ch/msc-physics-of-life).

The “Assessment Master's Examination” form (*Bewertung Masterprüfung*) must be taken to the master's examination. (Download: <https://philnat.unibas.ch/de/studium/master>).

The examiners during the master's examination are the lecturers who supervised and graded the master's thesis. The master's examination is graded jointly by the examiners. In the event of failure, the master's examination can be repeated once.

After the oral examination, the following documents are to be handed in to the studies secretariat Physics of Life:

- Learning Contract for Master's Thesis (*Studienvertrag für Masterarbeit*), Part I und Part II filled in and signed.
- Assessment Master's Examination (*Bewertung Masterprüfung*), filled in and signed.
- Expert Opinion on Master's Thesis Physics of Life (*Gutachten zu Masterarbeiten in Physics of Life*), filled in and signed.
- Copy of the title page of the master's thesis.
- A printed and an electronic PDF version of the master's thesis.

4.7. Module “Electives”

In the module “Electives” (*Wahlbereich*) 12 CP have to be acquired in courses that are part of the Faculty of Science master degree programs. Of these 12 CP, at least 6 CP must be acquired in courses that are part of the degree program MSc in Molecular Biology. The choice of courses in the elective area is arranged in consultation with the advisor from the teaching committee (see section 4.1) and serves in particular to deepen the student's knowledge in the field of the two research projects and the master's thesis. The courses within the master's program in Molecular Biology are listed in the course catalogue of the University of Basel under “Master's Studies: Molecular Biology” (*Masterstudium: Molekularbiologie*) and consist of (i) courses of the Graduate Teaching Program of the Biozentrum, (ii) Further Courses, (iii) internal seminars of the individual research groups.

4.8. Qualification of the Master Program / Master Grade

The Master study is successfully passed when the following credit points (CP) have been obtained:

- a) 18 CP from the module “Foundations in Physics of Life”
- b) 20 CP from two research projects (*Forschungsprojektarbeiten*)
- c) 30 CP from the master's thesis
- d) 10 CP from the master's examination
- e) 12 CP from the electives, of which at least 6 CP are from successfully completed courses of the Master Program Molecular Biology.

The grade of the module “Foundations in Physics of Life” is calculated from the credit point-weighted average of the graded assessments of the module.

The master grade is calculated based on the average grade for the master's examination (weight 1/4), the grade of the master's thesis (weight 2/4) and the grade of the module “Foundations in Physics of Life” (weight: 1/4). This final grade will be rounded to one decimal place. Half a tenth will be rounded up.

5. Quality Assurance

The quality of the courses offered will be continuously evaluated according to the requirements of the Faculty of Science of the University of Basel.

6. Recognition of Studies and Examinations

The Examination Board of the Faculty of Science decides on the recognition of similar studies and course performances as well as credit points which have been or will be obtained in another degree program at the University of Basel or at another university upon application by the student. Equal or equivalent performances can only be recognized once. The extent of the recognized external course performances or credit points may not exceed half of the total required study performances. A master's thesis is not recognized.

Procedure: A written request with a detailed list of credit points and performance must be made to the Office of the Dean of Studies at the Faculty of Science, University of Basel. The application, a copy of all certificates of academic achievements together with a brief summary of the contents of the courses must be enclosed.

Applicants will be informed electronically of the recognition of their study and examination performance as well as additional credit points by the Office of the Dean of Studies of the Faculty of Science.

7. Validity

The present guidelines apply to all students who commence the study program Master of Science in Physics of Life on August 1, 2024 or later.

8. Relevant Course Facilities / Study Counselling

Study Counsellor for the Master Program Physics of Life

Prof. Dr. Knut Drescher E-Mail: knut.drescher@unibas.ch
www.biozentrum.unibas.ch

Chair of the Teaching Committee Physics of Life

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