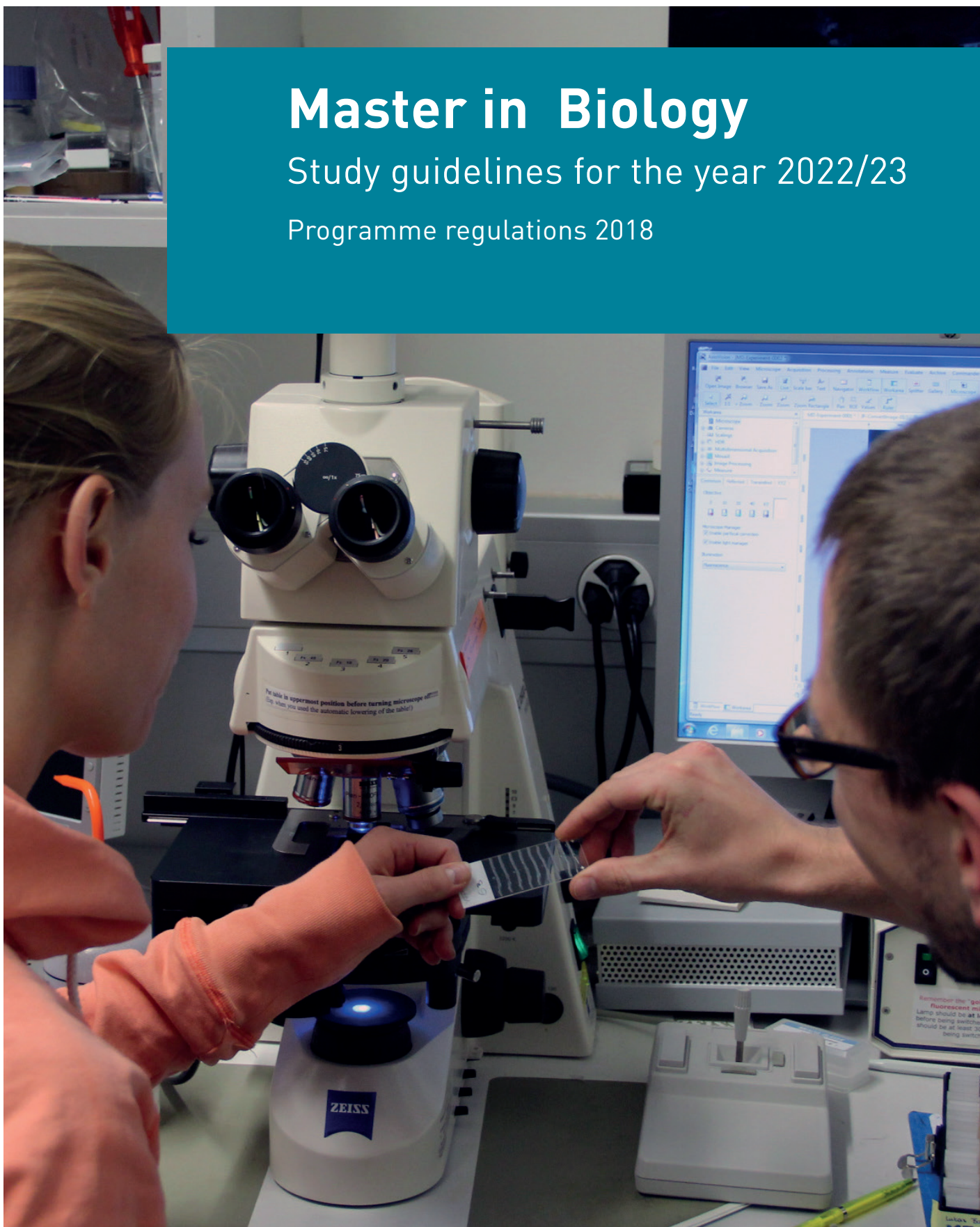


Master in Biology

Study guidelines for the year 2022/23

Programme regulations 2018



Master Programme in Biology

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1. Introduction

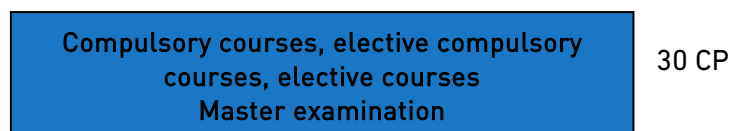
The Biology Master programme was designed for a study period of one and a half years and is focused on experimental approaches, including two research projects and a thesis. Depending on the candidate's previous training, additional 3rd year courses from the Bachelor programme may have to be taken. Otherwise, there is a choice from a list of specific Master courses in each of the elective Master majors. Successful completion of the Master programme will allow graduates to pursue doctoral studies in national and international research institutions, or to apply for positions in industry or the public service sector.

The legal basis for this study guide is the ETH document entitled "Studienreglement 2018 für den Master-Studiengang Biologie" (only available in German). Please see <https://www.biol.ethz.ch/en/studies/master/guidelines-and-regulations.html>.

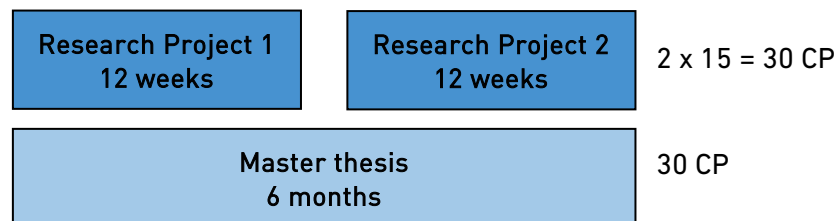
Programme overview

90 ECTS credit points (CP) in 1.5 years

Theoretical part



Practical part



2. Admission

As a rule, admission to the programme requires a Bachelor degree (ideally in Biology) from a recognized university. A formal application is required for everyone without a Bachelor degree in Biology from ETH Zurich (see below).

ETH students enrolled in the Bachelor programme in Biology

Students must have earned all CP of the first two years of the Bachelor programme before enrolling for the Master programme.

Students of the University of Zurich

Applicants holding the Bachelor degree in Biology ("Monofach", 180 CP) of the University of Zurich are admitted to the ETH Master programme in Biology without additional requirements, except for a necessary documentation of a good knowledge of the English language. CPCP

Students from all Swiss universities

Applicants holding the Bachelor degree in Biology ("Hauptfachstudium", at least 150 CP from Biology curriculum) from a Swiss University (other than ETH and University of Zurich) are admitted to the ETH Master programme in Biology. Documentation of a good knowledge of the English language is an essential requirement for their admission. Final admission might also be subject to the fulfilment of additional requirements during the Master programme (e.g. courses from the ETH Bachelor programme in Biology).

Students from other universities

Students from other universities must hold a Bachelor or equivalent degree in a field of biology, biochemistry or related areas from a recognized university. Documentation of a good knowledge of the English language is also required. Final admission may be subject to the fulfilment of additional requirements during the Master programme (e.g. courses from the ETH Bachelor programme in Biology).

Application procedure

ETH students in the Bachelor programme in Biology

Students who have earned the required amount of credit points may register for the Master programme online at www.mystudies.ethz.ch/en.

Other students

Information about admission and application for Master programmes for other students can be found at <https://ethz.ch/en/studies/master/application.html>. It is essential that applicants indicate which of the Master majors they intend to apply for (see section 7 "study programme").

3. Credit points system

Credit points are awarded according to the European Credit Transfer System (ECTS). Credit points (CP) are a measure of the total time and effort required by a student to reach a given educational goal. The calculation is based on a total of 1500 to 1800 working hours per year, for 60 credit points (1 CP corresponds to 25 to 30 hours of work).

4. Course catalogue

The current list of courses, including schedules, short descriptions, information about contents and goals, lecturers, credit points, and performance assessment procedures is published in the electronic course catalogue at <http://www.course-catalogue.ethz.ch/>.

5. Performance assessments

Credit points are awarded only for successfully completed performance assessments. An assessment that has not been passed may be repeated only once. Assessments are in the form of examinations, presentations, reports, etc.

There are three types of examinations at ETHZ: Session examinations, End-of-semester examinations and semester performances (graded/ungraded). For each course, the examination type is defined in the electronic course catalogue (see section 4 “Course Catalogue”). For further information see:

<https://ethz.ch/students/en/studies/performance-assessments/examination-types.html>

For session examinations and end-of-semester examinations additionally to a course enrolment in myStudies, a registration is mandatory. This registration is binding and an absence without excuse will result in failing the assessment. The time schedule for registration and de-registration is communicated by the Examinations Office of ETH.

Grading scale: 6 is the highest, 1 is the lowest grade; the passing grade is 4.

6. Learning Agreement (LA)

After admission to the Master programme, students define their individual study programme (= LA) together with the advisor of the chosen major. In the case of any disagreement, the director of studies will make the final decision regarding the study programme. The LA has to be filled in on myStudies (www.mystudies.ethz.ch/en). **All additions and changes must be approved by your major advisor.**

Some instructions:

- **Initial steps:** The first time you edit your Master enrolment go to "Functions" -> "Specialisation" and choose your major. The LA is under "Functions" -> "LA".
- **Compulsory courses:** Compulsory courses that were done in the ETH Biology Bachelor programme have to be marked with "Bachelor". If you have already done the necessary concept courses in the Bachelor, you are required to do additional "Elective Compulsory Courses" instead.
- **Elective Compulsory Courses:** The website of the Department of Biology provides information on the "Elective Compulsory Courses" in each major of this degree programme. However, please refer to the course catalogue entries for the definitive information. (See chapter 4. Course categorizations can sometimes change.) Courses that are not listed in this category for your major may not be chosen as "Elective Compulsory Courses", only as "Elective Courses".
- **Elective Courses:** Elective courses usually are Master level courses from other majors or other Masters' degree programmes at ETH Zurich.
- **Research Projects, Master thesis, Master examination and "Science in Perspective" course(s):** These should not be included in the LA.
- **ECTS requirements for the Master degree:** The section "ECTS credits" in the LA shows the planned, the needed minimum and the missing CP in the categories "Compulsory and Elective Compulsory Courses" and "Elective Courses". 24 CP must be acquired in total from the categories "Compulsory Subjects and Compulsory Electives" and "Electives", whereof at least 18 CP have to be from the category "Compulsory Subjects and Compulsory Electives".
- **Submission of the LA:** After the first discussion with your major advisor at the beginning of your Master programme, please submit your entries on myStudies for approval. **The LA does not have to be complete at the beginning and can be submitted multiple times during your studies.** Ideally it should be submitted as soon as possible after changes are made. The major advisor can only see the changes if the LA has been submitted.
- **Course registration:** The LA is not an automatic course registration. All Courses listed in the LA must be registered in myStudies under "Course registration" (no automatic transfer or examination registration!).

Important: When requesting the Mast degree certificate at the end of the Master programme, the student administration office will match your request with your LA. Certificates will only be issued when request and LA match. If you have completed additional courses which are **not** in your LA, these will need to be moved to the addendum on your diploma request and cannot count towards your overall mark.

7. Study programme

The programme is designed to be completed by full-time students in 1.5 years. To obtain the Master degree, a minimum of 90 credit points must be acquired in different categories according to the following list, within a maximum of three years.

Please note that all courses in the section “Compulsory courses, elective compulsory courses and elective courses” (see table below) must be approved by the major advisor.

Minimum number of credit points required per category

Category	Credit points
Theoretical part	
Compulsory courses, elective compulsory courses and elective courses	24
<i>Compulsory and elective compulsory courses</i>	<i>At least 18</i>
<i>Elective courses</i>	<i>0-6</i>
Elective courses in humanities, social and political sciences (Science in Perspective)	2
Master examination	4
Practical part	
Two research projects	30
Master thesis	30
Total	90

Compulsory Courses and Elective Compulsory Courses

Concept courses

A maximum of two concept courses can be applied towards the Master degree (i.e. 12 CP). Any additional concept course will not be credited for the Master degree but listed in the Master certificate under “Further achievements in the Master Programme Biology”. This means that they will be in the addendum of your final academic record. **Note:** Any concept courses required for admission (prerequisite course) do not earn credit points towards the degree.

As a rule, two concept courses (6 CP each) are compulsory for all majors. The assignment of concept courses to the different majors is defined in the table below. If credit points for the required concept courses have already been obtained in the Bachelor programme, then the students should replace the 6 or 12 CP using Master courses of the category “elective compulsory Master courses”. Concept courses not belonging to elective compulsory concept courses of your major (see table below) may be listed as elective courses.

Compulsory and elective compulsory concept courses in the individual Master majors

(Bold letters: compulsory concept courses; plain letters: elective compulsory concept courses)

Master major	1st concept course	2nd concept course
Biochemistry	Cellular Biochemistry (AS + SS)	Cell Biology (SS) <i>or</i> Molecular and Structural Biology (AS + SS) <i>or</i> Concepts in Modern Genetics (AS)
Biological Chemistry	Nucleic Acids and Carbohydrates (AS) <i>or</i> Proteins and Lipids (SS)	Second concept course upon agreement with major advisor
Cell Biology*	Cell Biology (SS)	Bioinformatics, (AS) <i>or</i> Concepts in Modern Genetics (AS) <i>or</i> Cellular Biochemistry (AS + SS) <i>or</i> Immunology (AS + SS) <i>or</i> Systems Biology (SS)
Ecology and Evolution	Evolutionary Genetics (AS)	Second concept course upon agreement with major advisor
Microbiology and Immunology	Microbiology (AS + SS)	Immunology (AS + SS)
Molecular and Structural Biology	Molecular and Structural Biology (AS + SS)	Cellular Biochemistry (AS + SS) <i>or</i> Bioinformatics, (AS) <i>or</i> Proteins and Lipids (SS) <i>or</i> Nucleic Acids and Carbohydrates (AS) <i>or</i> Microbiology (AS + SS) <i>or</i> Concepts in Modern Genetics (AS) <i>or</i> Systems Biology (SS)
Molecular Health Sciences*	Cell Biology** (SS)	Concepts in Modern Genetics (AS) <i>or</i> Bioinformatics (AS), <i>or</i> Immunology (AS+SS) <i>or</i> Cellular Biochemistry (AS + SS) <i>or</i> Systems Biology (SS)
Molecular Plant Biology	Molecular Life of Plants (AS)	One additional concept course except Immunology
Systems Biology	Systems Biology (SS)	Concepts in Modern Genetics (AS) <i>or</i> Cellular Biochemistry (AS + SS) <i>or</i> Bioinformatics, (AS) <i>or</i> Microbiology (AS + SS)

AS: autumn semester, SS: spring semester

*: Molecular Health Sciences and Cell Biology will no longer be offered starting from AS 2023. Instead, there will be a new specialization "Molecular Mechanisms of Disease".

** : Please refer to the transitional regulations under <https://biol.ethz.ch/en/studies/master/master-degree-majors/molecular-health-sciences.html>

Elective compulsory courses

These Master courses may be chosen from the list published in the course catalogue (www.mystudies.ethz.ch/en). The courses in this category are specific to each major. If students would like to take an elective compulsory course that is only offered in majors other than their own, these courses can only be counted as elective courses (see next paragraph).

Elective courses

These courses allow students to expand their knowledge in areas related to their elective major. They may be chosen from other majors or other Master programmes from ETH. As a rule,

only courses from the Master level may be chosen. In the case a concept course is selected, only fully completed concept courses (6 CP) will be accepted in this category.

Science in Perspective (SiP)

Science in Perspective (SiP) courses are humanities, social sciences and law courses that reflect on the STEM subjects (science, technology, engineering and mathematics) that form the core of ETH's mission. It also includes courses that are aimed at expanding the students' cultural horizons (language courses and a few other special courses). They are meant to help students think critically about contemporary techno-scientific knowledge from various social, historical and cultural perspectives.

As a rule students must take 4 ECTS of SiP courses during the BSc Biology and 2 ECTS during the MSc Biology studies. These may include no more than 3 ECTS of language courses for bachelor and master studies combined. Language courses in English, French, Italian and Spanish only count as SiP courses from level B2 and above. German as foreign language is only recognized from level C1.

The courses can be found in the course catalogue under "GESS – Science in Perspective". The full list of SiP courses appears under Type A. Type B courses are a selection of Typ A courses and are especially relevant for selected courses of study, but students can take any courses from the SiP catalogue, subject to the course's entry requirements. All SiP courses must be graded (no pass/fail courses).

Only courses explicitly marked as SiP courses in the ETH course catalogue will count as such. Other courses taught at ETH or other institutions will not be recognized, even if they appear to be similar to SiP courses. The only exception is up to 3 ECTS taken in the context of student exchange with another university. However, these courses have to be approved in advance – before the beginning of studies, or as soon as the host university's course information is available. Requests for SiP recognition of exchange courses submitted after the beginning of the course will not be accepted. More information is available at: <https://gess.ethz.ch/en/studies/science-in-perspective.html>

Research projects

General

In the Master programme two research projects have to be performed. Students acquire the projects by themselves. If necessary, the major advisor can give guidance. The individual research projects provide insights into the research processes in the area of the chosen major and should prime the students for the Master thesis.

The duration of a research project is 12 weeks (based on a 40 hour week). Projects are not bound to the academic calendar. If lectures are attended in parallel, the research project can be extended by the respective time.

Performing research projects outside ETH Zurich

Under certain conditions, research projects can be performed outside ETH Zurich, see below. Since a maximum of 30 credit points from the Master degree may be done externally, in these cases the Master thesis must be performed at ETH Zurich.

Note:

1. Students holding a non-ETH Bachelor degree must perform both research projects at ETH.
2. Only students with a good academic record will be allowed to do a mobility stay, in agreement with the study advisor
3. Whether a project is considered external or internal is defined by where it is performed, even if the supervisor is also a lecturer at ETH Zurich.
4. If students perform a research project outside ETH and their external supervisor is not a lecturer at ETH Zurich, then they will require an official supervisor from ETH Zurich as well.

Acceptance, registration and approval of research projects

1. Each research project must be registered in myStudies under „Theses/Projects“. It is highly recommended to do so before starting the project. The deadline for registration in myStudies is one month after that.
2. The registration requires a provisional title - or if not yet available, keywords. Additionally, start and end dates have to be entered. Both dates are binding.
3. Research projects performed outside ETH must be registered as such, by ticking the appropriate box and filling in the contact details for the external supervisor.
4. Before starting a research project, it must be **accepted by the major advisor**.
5. Registered research projects need to be electronically **approved by the project supervisor and the student administration office finally**.

Research projects that are neither accepted nor registered nor approved, will not be credited.

Note:

- Research project I can only be registered if students are enrolled in the Master degree programme. For students in the Bachelor's degree programme in Biology at ETH Zurich, this requires that at least 120 CP of the Bachelor programme in biology (incl. all mandatory courses from the first two years) have been obtained.
- Research project II can only be registered if research project I has been turned in.
- The Master thesis can only be registered if CP of both research projects and most of the Master lectures have been obtained.

Report

Each research project has to be completed with a written report, at the date arranged with the project supervisor and entered in myStudies. The report must be in paper format (title, summary, introduction, results, discussion, materials and methods, references). As a rule, the report should comprise five to ten pages.

Assessment

The supervisor evaluates the written report and grades it as passed or not passed. For a passed research project 15 CP are granted. The supervisor is bound to have a final discussion with the student about the research project.

Master thesis

General

For the Master thesis, a student should demonstrate the ability to conduct independent research and to provide a written scientific report of that work and its results.

The duration of the Master thesis is strictly limited to six months. The starting date is independent of the academic calendar. For a successfully completed thesis 30 CP are granted.

Master theses can be performed outside ETH only if no other mobility stays have been done during the Master studies.

Note: Only students with a good academic record will be allowed to do a mobility stay.

Thesis supervision and starting date

The Master thesis is performed under the supervision of an entitled lecturer (= referee). Additionally, a co-referee has to be specified. Referee and co-referee grade the thesis. Referee, co-referee and the intended starting date for the thesis must be approved by the major advisor.

Lecturers entitled to supervise and evaluate Master theses are listed under

<https://ethz.ch/content/dam/ethz/special-interest/biol/departement/MasterThesisSupervisors.pdf>

Formal requirements

1. The student must have been awarded the Bachelor's degree.
2. Any additional requirements for admission to the Master programme must have been fulfilled.
3. Both research projects must have been passed (i.e. CP granted).

Acceptance, registration and approval of Master thesis

1. A Master thesis must be **registered in myStudies** under „Theses/Projects“. It is highly recommended to do so before starting the project. The deadline for registration in myStudies is one month after that.
2. The starting date automatically defines the end date of a project. Both dates are binding. Additionally, the registration requires a provisional title - or if not yet available, keywords.
3. Before starting the Master thesis, it must be **accepted by the major advisor**.
4. A registered Master thesis has to be electronically **approved by the thesis supervisor (= referee), the major advisor and the student administration office**.

A Master thesis that is neither accepted nor registered nor approved, will not be credited.

Master thesis submission

The Master thesis (i.e. the **uncorrected thesis document that is considered by the student to be the final version**) has to be submitted by the agreed date (stated in myStudies) in hardcopy to the referee and the co-referee and as pdf-document by email to the student administration office (studies@biol.ethz.ch). It can be discussed with the referee and co-referee, whether a pdf-document is sufficient for them as well.

The format should not exceed A4. The front page should enlist:

- name of the student
- title
- where the thesis was performed
- referee and co-referee
- in case of a thesis outside ETH: external supervisor
- name of mentoring person if other than referee/supervisor
- date of submission

The Master thesis must comprise a declaration of originality (<https://www.ethz.ch/content/dam/ethz/main/education/rechtliches-abschliesse/leistungskontrollen/declaration-originality.pdf>).

The Master thesis is graded according to the “Master thesis and Master examination form” (https://ethz.ch/content/dam/ethz/special-interest/biol/departement/D-BIOL%20Master%20thesis%20and%20examination_grading%20form.pdf). All Master theses are archived in the Department of Biology’s student administration office for two years.

Master examination

In the Master examination a student must provide proof of general knowledge in the elective major field. Starting with a discussion based on the Master thesis, further experiments and experimental strategies should be discussed to test the general understanding. As a rule, the discussion of the Master thesis must not exceed 50% of the examination time. The exam is taken as an oral examination with a duration of 60 minutes. The exam must be taken within 3 months after submission of the Master thesis. The examiners are the referee and the co-referee of the thesis. If necessary, a third, approved examiner may be called. This person must also be eligible to supervise and evaluate Master theses, based on the conditions mentioned in the section “Master thesis”.

8. Elective majors

The Department of Biology offers nine different Master majors, ranging from Ecology and Evolution to Biological Chemistry and thus covering the important fields of modern biology.

Biochemistry

The Master programme in Biochemistry aims at the development of advanced, research-oriented theoretical and practical skills in cellular biochemistry, and communicative, interdisciplinary attitude. The training focuses on the molecular mechanisms and concepts underlying the biochemistry of cellular physiology, and associated pathologies such as cancer. We put particular emphasis on the question of how these processes are integrated to carry out complex, highly coordinated cellular functions. The investigation and understanding of processes such as intracellular transport, cytoskeletal regulation, cell polarity, cell motility, cell division and cell growth requires a combination of approaches like classical biochemistry and molecular biology, but also cell biology, genetics, live cell imaging and quantitative data analysis.

The successful completion of the Master programme in Biochemistry prepares the student for a professional career in scientific research areas concerned with biological questions on the molecular and cellular level. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides the Master graduates with a scientific profile desired for competitive positions in biotechnology, clinical chemistry, and the chemical, biomedical and pharmaceutical industry.

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Biological Chemistry

Drawing a clear boundary between chemistry and biology is nearly impossible today given the explosive growth of technologies for synthesizing large organic molecules such as proteins, nucleic acids, and complex carbohydrates. In the future, scientists investigating the foundation and processes of life will increasingly have to master chemical methods, including organic synthesis, mass spectrometry, NMR and other spectroscopic tools, as well as modern separation methods. Equally important is a solid foundation in biological techniques such as culturing bacteria, gene cloning and mutagenesis, DNA/RNA analysis, protein purification and functional and structural characterization, and a thorough enzymological examination of biocatalysts. Today, biological chemists also employ computational and evolutionary approaches to study - and even design - complex biomacromolecules. These may serve as powerful tools for testing specific biochemical hypotheses or for performing tasks not yet seen in nature.

A specialization in Biological Chemistry offers a biologically oriented alternative to the Master curricula "Biochemistry - Chemical Biology" (programme starts autumn 2023) and "Interdisciplinary Sciences" offered in the Department of Chemistry and Applied Biosciences (D-CHAB). Its chief aims are to understand the chemical reactivity of biological molecules in living organisms and to learn to recognize and solve current problems in biomolecular design, engineering, and analysis. Students will often perform research projects both in D-BIOL and D-CHAB groups to acquire experimental skills toward synthesis, purification, and characterization of molecules ranging in nature and size from the very small (medicines and enzyme inhibitors) to the extremely large (genes and proteins and their complexes).

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Cell Biology

The Master programme in Cell Biology focuses on the understanding of fundamental life processes in higher organisms, including growth, division, migration and differentiation of cells as well as cell-cell communication via hormones, cytokines, and growth factors. These processes are studied in the context of cells, tissues and complex organisms, thereby expanding the horizons of cell biology to molecular physiology. Emphasis is also put on understanding the function of key cellular processes in embryonic development, tissue repair, and in inflammatory, metabolic and neuronal diseases and cancer.

The experimental and conceptual approaches include modern cell biological, biochemical and genetic methods, cell culture technologies (2D and 3D, including organoids), innovative molecular imaging techniques, and morphological and physiological technologies.

Students of this Master programme will obtain a broad education in cellular and molecular biology, cellular biochemistry, genetics and genomics, immunology, neurobiology and molecular medicine. They can select among a large variety of courses, allowing them to shape the curriculum based on individual interests.

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Ecology and Evolution

Ecology and Evolution aim to understand the amazing diversity of life and how organisms interact with biotic and abiotic environments at all levels of biological organization from genes to ecosystems.

Evolution is key to understanding life on Earth. Evolutionary processes shaped diverse lifeforms, with a bewildering variety of morphologies, life histories, physiologies and behaviours. Beyond explaining historical patterns, evolutionary analysis identifies forces driving evolutionary change and how populations adapt to different or changing conditions. Adaptations can be studied via experimental evolution, while theoretical models or computer simulations can generate predictions of future change. Evaluating how environmental changes affect ongoing evolution is critical considering the multiple current pressures due to climate change, diseases, invasive species or pests.

Ecology studies how microbial, fungal, plant and animal species interact with their environments and each other, and how interactions drive diversity. Beyond individual species, ecologists focus on interspecific interactions and how natural communities and ecosystems function. Deeper knowledge of ecology and evolution and how they interact is key to assess the impact of human society on natural systems, and how such systems can be managed sustainably.

This major allows students to become familiar with core themes of evolution, ecology, conservation and infectious diseases. Students are also exposed to cutting edge research in these fields and have opportunities to apply theoretical or empirical approaches in the field, laboratory, experimental gardens or greenhouses. Molecular methods providing insights into the genetic basis of evolutionary change and ecological interactions synergize with experiments at organismal, population or community levels.

Those interested in this major can also consult details of the equivalent major in Environmental Sciences: <https://www.usys.ethz.ch/en/studies/environmental-sciences/master/majors/ecology-evolution.html> and information on the interdisciplinary Institute of Integrative Biology where many lecturers and research groups involved in this major are based: <https://ibz.ethz.ch>.

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Microbiology and Immunology

Microbiology and Immunology explore the interactions between different cells and how they shape communities in the environment or affect the health of animals or plants.

Microbiology focuses on microorganisms, a large and heterogeneous group of mostly microscopically small prokaryotic and eukaryotic organisms, i.e. bacteria and archaea, protozoa, algae and fungi, but also viruses. Microbes are the oldest life forms on earth and are characterized by a high metabolic diversity, which allows them to live in a wide variety of habitats. As pathogens, mutualists, and commensals, they are of central medical and ecological importance, and adapt to environmental changes or the hosts' immune defenses. Microorganisms also play a key role in a wide range of applications including food processing, drug discovery, synthetic biology, and diverse biotechnological processes, including the production of pharmaceuticals or fine chemicals.

Immunology studies how pathogenic microbes or defective cells are recognized and eliminated from a host organism - or how some non-pathogenic microbes establish a status of commensalism. Depending on the nature of the invading microbe or the cellular defect, the immune system has evolved diverse strategies to effectively recognize and eliminate or control such threats. Thus, successful immunological effector functions differ between bacterial, viral and fungal infections. In the context of mammals, the immune system has different strategies to distinguish between "self" and "foreign" and to recognize and fight "ab-normal" self-cells such as malignant cells. Immunology plays a key role in a wide range of medical applications, such as vaccination and immune-based therapies.

This elective major offers courses and research opportunities covering the entire breadth of the field, including cellular microbiology, medical microbiology, virology, immunology, medical immunology, molecular microbial ecology, plant, animal and ocean microbiomes, bioinformatics, mycology and parasitology.

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Molecular and Structural Biology

The Master programme in Molecular and Structural Biology provides a strong background in the molecular life sciences with a particular emphasis on structural and mechanistic aspects of biology. The major is anchored in the Institute of Molecular Biology and Biophysics, where research groups investigate central cellular processes such as transcription, splicing and translation as well as protein folding and degradation with a focus on the participating molecular machines. They also study membrane transport proteins and molecular assemblies involved in cell-to-cell adhesion and communication.

The Master programme direction offers many and diverse courses: In molecular biochemistry classes, the principles of relating the functions and mechanisms of biological macromolecules with their structures are discussed. A second set of courses introduces students to modern techniques used for three-dimensional structure determination of proteins and nucleic acids including X-ray crystallography, NMR spectroscopy and electron microscopy. It also organizes a course on biophysical methods that can be applied to unravel the mechanisms of biological macromolecules, including modern techniques in fluorescence and single-molecule spectroscopy. These classes can be flexibly combined with courses from other majors to provide the student with a curriculum optimally tailored to his/her individual interests.

Participants of the programme will become experts in experimental biochemistry, which includes protein production, purification, and in vitro reconstitution of their native macromolecular assemblies. They will be trained in biochemical and biophysical characterization of these assemblies in physiologically relevant states and will have an opportunity to employ biophysical techniques to study interactions between biological macromolecules and their ligands, as well as in three-dimensional structure determination and quantitative analysis of reaction mechanisms on the molecular level.

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Molecular Health Sciences

Residing at the interface of biosciences, medicine and technology, Molecular Health Sciences focuses on the study of the molecular basis of tissue and organ functions and their responses to stress, diet, environmental challenges and aging as well as the illumination of organ-organ communication principles, stem cell function and inter- and intracellular signalling networks.

The Master programme in Molecular Health Sciences gives particular emphasis to integrating the knowledge derived from these studies into the context of whole-body function to advance understanding of common complex diseases such as diabetes, obesity, heart disease, cancer, neurological and inflammatory disorders. The development of the scientific basis for rational preventive and therapeutic strategies for the successful management of human diseases is another core component of the programme.

Participants of this master programme will acquire the experimental skills to apply tools and insights from many disciplines ranging from genetics and genomics, molecular cell biology and physiology to biological chemistry, in vivo imaging, and molecular pathology to address unsolved problems in basic and translational sciences.

This programme is offered as part of a collaboration in teaching between D-BIOL and D-HEST in the context of the MSc in Biology and MSc in Health Sciences and Technology curricula.

<https://www.biol.ethz.ch/en/studies/master/master-degree-majors/molecular-health-sciences.html>

<http://www.hest.ethz.ch/en/studies/health-sciences-and-technology.html>

Advisor

Dr. Isabella Zanini
ETH Zurich
Institute of Molecular Health Sciences
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More
information:



Molecular Plant Biology

The Master programme in Molecular Plant Biology provides students with a deep understanding of plants, from the molecular genetic to the organismal level, and illustrates how plants can be used as a powerful model system to study fundamental biological processes.

The students will discover, both in theory and in their experimental work, how genetic and epigenetic networks steer processes in plants, such as developmental programs, photosynthesis and metabolic fluxes, cellular and systemic responses to external cues such as attacks by pathogens. They will gain insight into how plants evolve and adapt to their environment in an ecological context. Students will also learn how knowledge in plant biology can be applied through plant biotechnology (e.g. genome editing) to contribute to crop improvement and sustainable agriculture.

In a regular colloquium, internal speakers give the Master students insight into the cutting-edge research in our institute, allowing them to see the types of projects in which they themselves can engage. These internal speakers alternate with internationally renowned guests, whose talks expose the students to a breadth of contemporary topics in the plant sciences.

The students of this major are actively encouraged to take complementary courses that will broaden their knowledge in fundamental areas such as biochemistry and metabolism, cell biology, genetics, microbiology and plant protection, structural biology and systems biology. As the members of the Institute of Molecular Plant Biology participate in the Zurich-Basel Plant Science Center (PSC, <https://www.plantsciences.ethz.ch>) and the World Food System Centre (WFSC, <https://worldfoodsystem.ethz.ch/>), students also benefit from access to specialized courses, including those given at the Universities of Basel and Zurich.

Advisor

Prof. Sam Zeeman
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E-mail: szeeman@ethz.ch

More
information:



Systems Biology

Systems biology investigates how cells, communities, organs and complete organisms function as a whole. This holistic approach allows studying system properties and behaviors that emerge from networks of molecular interactions, which are not observable when focusing on isolated single parts. Because of the inherent complexity of cells, systems biology integrates molecular data with computational and theoretical approaches. It thus combines concepts from different scientific disciplines to obtain a quantitative understanding of complex biological systems in terms of their components and interactions.

Experimentally, the focus is on development and application of novel quantitative methods for global analysis of cellular components (e. g. proteome, metabolomics), their dynamic response to internal and external perturbations, and charting interactions within and across layers (e.g. between proteins and metabolites). This is a particular strength of ETH Zurich, whose exceptional infrastructure allows researchers to work with the latest technology and pioneer disruptive techniques.

Computationally, the focus is on developing bioinformatics methods for data analysis and mathematical models for in silico experiments. Such methods include statistics, machine learning, or deterministic models that use differential equations to accurately describe mechanisms and kinetics. Model-based integration of large and heterogeneous data sets opens new perspectives for deeper insights into human disease as well as development of new therapies and novel biotechnological processes. This interdisciplinary major is designed for biologists, bioinformaticians and computer scientists and promotes interdisciplinary communication skills.

The systems approach holds for virtually all biological systems. Hence, the fields of application span from basic to applied research and from microbes to plants, animals, and humans (e.g. personalized health). Depending on interests and capabilities, a focus on theoretical or experimental aspects will be encouraged.

Advisor

Prof. Nicola Zamboni
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More
information:



9. Exchange programme

Students with a good academic performance may spend one or more semesters during their Master programme at another university. Students with a non-ETH Bachelor degree can only perform their Master thesis abroad (good academic record required). A study programme for the external university must be confirmed by the advisor for the given major. Additionally, the contact details of the departmental exchange coordinator are listed in chapter 13. A maximum of 30 ECTS CP may be acquired at another university.

Further information concerning the university exchange programmes is available at <https://www.ethz.ch/en/the-eth-zurich/organisation/infrastructure-divisions/rectorate/student-exchange-office.html>.

10. Request for degree conferral

Students may apply for the Master degree after having obtained the minimal number of credit points allocated to each category described in chapter 7. The request for the degree certificate needs to be made via www.mystudies.ethz.ch/en - then printed, signed and submitted to the D-BIOL student administration office or sent as a signed pdf-document by email. The LA has to be completely filled in and approved. Certificates will only be issued when request and LA match.

The degree certificates are issued approximately once a month and sent directly to the alumni. The language for the degree certificate should be chosen by the student on the degree request (French, German or Italian). The additional graduation documents are: the final academic record in German and an English translation, a diploma supplement describing the content of the programme (including a list of all courses) and a ranking.

The overall mark for the Master degree comprises:

Courses and Master examination, weighted according to ECTS points	50%
Master thesis	50%

The official academic title awarded is

In German: "**Master of Science ETH in Biologie**", abbr. MSc ETH Biologie

In English: "**Master of Science ETH in Biology**", abbr. MSc ETH Biology

11. „Lehrdiplom in Biologie“

Details concerning the programmes in educational sciences (held in German) are found at <https://biol.ethz.ch/studium/lehrdiplom-biologie.html>.

If you are enrolled in the “Lehrdiplom in Biologie” programme in parallel to the Biology MSc program a maximum of 6 credits of the following courses are eligible for the elective courses in the Biology MSc program:

- “Anatomie und Physiologie I” (376-0151-00L)
- “Anatomie und Physiologie II” (376-0152-00L)

The combination of courses that has to be taken in Anatomy and Physiology is defined in the student specific admission decree of the rectorate under additional requirements including examination modus (year course or semester course).

The specialized biology courses with an educational focus (551-0973-00L, 6 CP and 551-0974-00L, 6 CP) can be acknowledged as one of the two obligatory research projects (each 15 CP). In such a case, an additional 3 CP must be obtained in another course.

The respective study advisor’s approval is required for both of the above cases.

12. Documentation

The Master studies programme regulations for biology are available at <https://rechtssammlung.sp.ethz.ch/Dokumente/324.1.1001.11.pdf>

The general regulations on evaluation assessment procedures at ETH Zurich (German version only, entitled „Verordnung der ETH Zürich über Lerneinheiten und Leistungskontrollen an der ETH Zürich“) are available at <https://www.admin.ch/opc/de/classified-compilation/20121393/index.html>

13. Contact information

Studies administration office Biology

Stephanie Hosie, D-BIOL, HIT F 41.2

Wolfgang-Pauli-Str. 27, 8093 Zürich

Tel.: +41 44 632 59 42, E-Mail: studies@biol.ethz.ch

Open office: Wednesday, 8:30 to 10:00 (during the semester) or upon appointment

Studies Coordinator

Dr. Thomas Tschan, D-BIOL, HIT F 41.3

Wolfgang-Pauli-Str. 27, 8093 Zürich

Tel.: +41 44 632 36 67, E-Mail: tschan@biol.ethz.ch

Director of Studies

Prof. Dr. Samuel Zeeman,

Institute of Molecular Plant Biology

Tel.: +41 44 632 82 75, E-Mail: samuel.zeeman@biol.ethz.ch

Names and contact details of the advisors for each of the Master majors see chapter 8.

Departmental Exchange Coordinator

Dr. Matthias Gstaiger, Institute of Molecular Systems Biology

Tel.: +41 44 633 34 49, E-Mail: matthias.gstaiger@imsb.biol.ethz.ch

Registrar's Office

HG F 19, Rämistrasse 101, 8092 Zürich

Tel: +41 44 632 30 00, E-Mail: kanzlei@ethz.ch

Opening hours: Monday and Thursday, 11:00 to 13:00

Telephone: Monday to Friday, 9:00 to 11:00

ETH card, registration, semester fees, study confirmations, leaves, etc.

<https://ethz.ch/students/en/studies/administrative/about-the-registrars-office.html>

Prüfungsplanstelle

HG F 18, Rämistrasse 101, 8092 Zürich

Tel: +41 44 632 20 68, E-Mail: pruefungsplanstelle@ethz.ch

Opening hours: Monday and Thursday, 11:00 to 13:00

Telephone: Monday to Friday, 9:00 to 11:00 (outside of examination session)

Questions about exam registration and de-registration

<https://ethz.ch/students/en/studies/performance-assessments/examination-information.html>

Financial Aid Office

The team of the Financial Aid Office handles applications for ETH scholarships and loans as well as requests for contributions to travel costs.

Financial matters: <https://ethz.ch/students/en/studies/financial.html>

Student scholarships: <https://ethz.ch/services/en/teaching/administration-scholarships.html>

Special study situations

Studying with a disability/chronic illness: <https://ethz.ch/en/studies/special-study-situations/studying-with-a-disability.html>

Studies and top-level sports: <https://ethz.ch/en/studies/special-study-situations/top-level-sports.html>

Studying as a parent: <https://ethz.ch/en/studies/special-study-situations/studying-as-a-parent.html>

Counselling and Coaching

A team of coaches supports students in organizing daily academic life, coping with difficult situations, staying focused and motivated, etc. (<https://ethz.ch/students/en/advice/beratung-coaching.html>).

Responsible for counselling and coaching biology students:

Pascal Kogelmann

HG F 67.3, Rämistr. 101, 8092 Zürich

Tel.: +41 44 632 53 95, E-Mail: pascal.kogelmann@sts.ethz.ch

Psychological Counseling Services (for ETH and UZH)

Plattenstrasse 28, 8032 Zürich

Tel.: +41 44 634 22 80

E-Mail: pbs@ad.uzh.ch

<http://www.pbs.uzh.ch/en.html>

In charge of counseling during difficult phases in life, troubles in studies and conflicts arising during doctoral studies.

Associations

Association of Students at the ETH (VSETH)

ETH Zürich, CAB E 27, Universitätsstrasse 6, 8092 Zürich

ETH Zürich, HXE B 5, Einsteinstrasse 4, 8093 Zürich

Office hours see <https://vseth.ethz.ch/language/en/mainpage/>.

Main task: student representation. Besides this VSETH offers several services for students, such as excursions, career fairs, social activities and more.

The **Association of the Biology Students at ETH (VeBiS)**, a section of VSETH, puts forward the biology students' concerns to the Department of Biology. More information:

<https://www.vebis.ch/>.

Contact

ETH Zürich
Departement Biologie
HIT F 41
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8093 Zürich

<http://www.biol.ethz.ch>