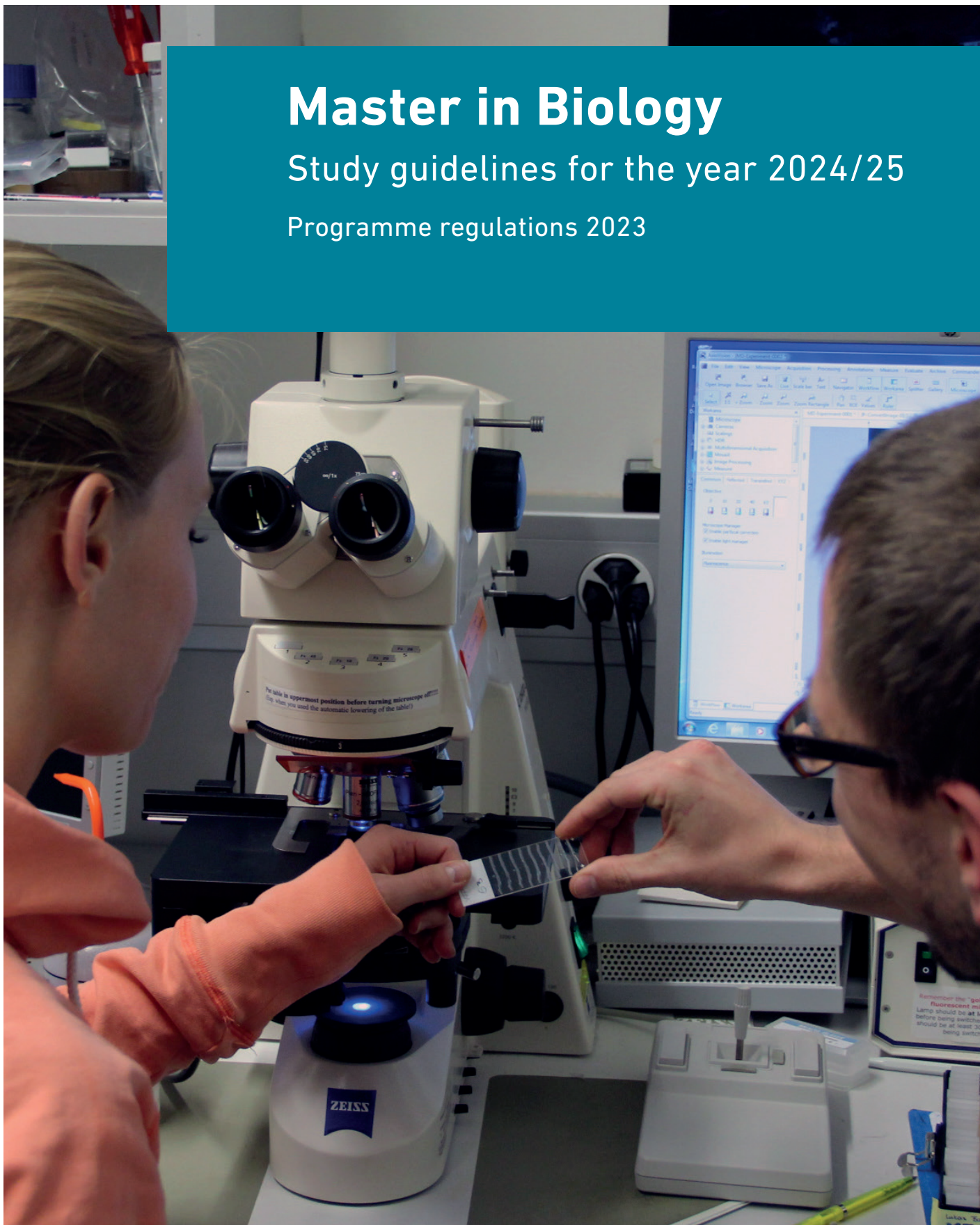


# Master in Biology

Study guidelines for the year 2024/25

Programme regulations 2023



# 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 3<sup>rd</sup> 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.

This study guide is available online on the [website of the Department of Biology](#).

The legal basis for this study guide is the ETH document entitled "Studienreglement 2023 für den Master-Studiengang Biologie" (only available in German, see "[Rechtssammlung der ETH Zürich](#)").

## Programme overview

90 ECTS credit points (CP) in 1.5 years

### Theoretical part

Compulsory courses, Elective Compulsory courses, Elective courses, Science in Perspective courses	26 CP
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### Practical part

Research Project I 12 weeks	Research Project II 12 weeks	2 x 16 = 32 CP
Master's Thesis 6 months		32 CP

# 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 (legal basis see annex 1 of the "Studienreglement 2023 für den Master-Studiengang Biologie").

## ETHZ students enrolled in the Bachelor programme in Biology

Enrollment is possible when a maximum of 64 CP (60 CP from the third bachelor study year and 4 KP from SIP subjects) still have to be acquired for the Bachelor diploma in total.

### 3. Credit point 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](#).

The information published in the course catalogue is legally binding.

### 5. Performance assessments

Credit points are awarded only for successfully completed performance assessments. An assessment that has not been passed may be repeated 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 an examination registration is required - in addition to the course enrolment in myStudies.** This examination registration is binding and an absence without excuse will result in failing the assessment. The time schedule for registration and deregistration is communicated via email by the Examinations Office of ETH.

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

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>

## 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](#). **The LA does not have to be definitive at the beginning and can be re-submitted multiple times during your studies. All additions and changes must be approved by your major advisor.** In myStudies you can see the current status of your LA in brackets behind the title "Learning Agreement of ...".

### Initial steps

The first time you edit your Master enrolment go to "Functions" -> "Specialisation" and choose your major. The LA can be found under "Functions" as well.

### Categories in the course catalogue

- **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 further "Elective Compulsory Courses" instead.
- **Elective Compulsory Courses:** The website of the Department of Biology provides information on the "Elective Compulsory Courses" for each major of this degree programme. However, as course categories can sometimes change, please refer to the course catalogue entries for the definitive information (see chapter 4). 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's Thesis and "Science in Perspective" course(s):** These should not be included in the LA. The LA does not account for the ECTS required in these categories.

### 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 different categories. 24 CP must be acquired in total from the categories "Compulsory Subjects and Compulsory Electives" and "Electives", whereof at least 18 CP must be from the "Compulsory Subjects and Compulsory Electives" (corresponds to the categories "Compulsory courses" and "Elective Compulsory Courses" from the course catalogue).

### Submission of the LA

After the first discussion with your major advisor at (or before) the beginning of your Master programme, please submit your entries on myStudies for approval. If you make any further changes during your studies, the LA should ideally be re-submitted as soon as possible again. The major advisor can only see the changes if the LA has been submitted.

### Course and examination registration

The LA is not an automatic course or examination registration. All courses listed in the LA require a registration in myStudies under "Course registration" (no automatic transfer) and, depending on the type of performance assessment, can also require an examination registration (see chapter 5).

### Important

When requesting the Master degree certificate at the end of the degree programme, the studies administration office will compare your request with the LA. Certificates will only be issued when both 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

To obtain the Master degree, a minimum of 90 CP 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 your major advisor.

### Minimum number of CP required per category

Category	CP
<b>Theoretical part</b>	
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
<b>Practical part</b>	
Two Research Projects	32
Master’s Thesis	32
<b>Total</b>	<b>90</b>

## Compulsory, Elective Compulsory and Elective 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 addendum of your final academic record, under “Further achievements in the Master Programme Biology” in your Master certificate.

**Note:** Any concept courses required for admission (category “Additional Requirements” in the transcript of records) 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 the 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)

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

**Elective Compulsory courses**

These Master courses may be chosen from the list published in the course catalogue (see chapter 4). The courses in this category are specific to each major. Elective Compulsory courses that are only offered in other majors can only be counted as an elective course (see next paragraph).

**Elective courses**

These courses allow students to expand their knowledge in areas related to their major. They may be chosen from other Biology Master majors or other Master programmes from ETH. As a rule, only courses from the Master level may be chosen. If 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 CP of SiP courses during the BSc Biology and 2 CP during the MSc Biology studies. These may include no more than 3 CP 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 Type 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 CP 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

Two research projects must be performed in this Master programme. The projects must be carried out in independent research groups. Students acquire the projects by themselves. If necessary, your major advisor can give guidance. The individual research projects provide insights into the research processes in the area of your major and should prime you for the Master's thesis.

### Duration

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. For a possible extension of the hand-in date, see below.

### Formal requirements

- Research project I can only be registered if students are enrolled in the Master degree programme.
- For Biology Bachelor students of ETH Zurich this enrolment is only possible, once they are enrolled in the Master as well (for this, a maximum of 60 CP from the third bachelor study year and 4 CP from SIP subjects may be missing from the Bachelor, see chapter 2).
- Research project II should only be started and registered if research project I has been handed in.

### Supervision of research projects

Research projects are generally performed under the direction of professors of the Department of Biology. The department may designate other persons who are authorized to lead research projects. As a rule, professors and "Privatdozierende" (holders of the title PD) of ETHZ are accepted as supervisors of research projects. Any other potential supervisors must be discussed and agreed upon with your major advisor.

### Registration, acceptance and approval of research projects

1. Each research project must be registered in myStudies under „Projects/papers/theses“. Registration should be done before starting the research project (Latest registration possibility: one month after effective start).
2. The registration requires a provisional title - or if not yet available, keywords.
3. Start and end dates must be entered. Both dates are binding. If you require an extension, please contact your supervisor and the studies administration office on time (see below).
4. 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.
5. Before starting a research project, it must be **discussed with and accepted by your major advisor**.
6. Registered and accepted research projects need to be electronically **approved by the research project supervisor, major advisor and the studies administration office finally**.

### Extending the hand-in deadline for the report

If a project needs to be extended past the original end date, this must be discussed with the supervisor. If the extension is > 1 week, please forward a written confirmation from your supervisor via email to the study administration (studies@biol.ethz.ch).

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

### **Format of the report**

Each research project must be completed with a written report. The report must be in paper format (title, summary, introduction, results, discussion, materials and methods, references, extent approximately 5 to 10 pages). Each report must comprise a filled out and signed declaration of originality (<https://ethz.ch/content/dam/ethz/main/education/rechtliches-abschluesse/leistungskontrol-len/declaration-originality.pdf>).

### **Submission of the report**

Each report is handed in at the date arranged with the project supervisor and entered in myStudies. It must be submitted to the official supervisor and uploaded to [Polybox](#) as a pdf file for the studies administration office. The version uploaded to Polybox should be the one that the student initially considers final and hands in for evaluation – i.e. not containing any potential corrections afterwards. The file naming convention for the upload is: **Family name\_First name\_research project I or II**.

All reports are archived in the Biology studies administration office for two years.

### **Assessment**

The supervisor evaluates the written report and grades it as passed or not passed. For a passed research project 16 CP are granted. The supervisor is bound to have a final discussion with the student about the research project.

## **Master's thesis**

### **General**

For the Master's thesis, a student should demonstrate the ability to conduct independent research and to provide a written and oral scientific report of that work and its results. The duration of the Master's thesis is strictly limited to six months. The starting date is independent of the academic calendar.

### **Formal requirements**

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

### **Supervision of thesis**

Master's theses are generally performed under the supervision of professors of the Department of Biology (supervisor = referee). The department may designate other persons who are authorized to supervise Master's theses. As a rule, professors and "Privatdozierende" (holders of the title PD) of ETHZ are accepted as supervisors too. Any other potential supervisors must be discussed and agreed upon with your major advisor.

Additionally, a co-referee has to be specified. Referee and co-referee must be independent. Same as with the referee, co-referees are generally professors of the Department of Biology, professors of other ETH departments or "Privatdozierende". Any other potential supervisors must be discussed and agreed upon with your major advisor.

### Registration, acceptance, and approval of Master's thesis

1. A Master's thesis must be **registered in myStudies** under „Projects/papers/theses“. Registration should be done before starting the thesis (Latest registration possibility: one month after effective start).
2. The starting date automatically defines the end date of a project. Both dates are binding.
3. The registration requires a provisional title - or if not yet available, keywords.
4. Before starting the Master's thesis, its constellation (referee, co-referee, topic and starting date) must be **discussed with and accepted by your major advisor**.
5. A registered Master's thesis must be electronically **approved by the thesis supervisor (= referee), your major advisor and the studies administration office**.

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

### Format of the thesis

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

- name of the student
- title of thesis
- place where the thesis was performed
- names of 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's thesis must contain a filled out and signed [declaration of originality](#). The name of the student and the title of the thesis must be identical to the details on the front page of the thesis itself.

### Submission of the Master's thesis

The Master's thesis (i.e. the **uncorrected thesis document that is considered by the student to be the final version**) has to be submitted by the date stated in myStudies in hardcopy to the referee and the co-referee (unless the PDF version is sufficient for them) and electronically as a PDF file to the studies administration office (upload to [Polybox](#)).

The file naming convention for the upload is: **Family name\_First name\_Master's thesis**.

All Master's theses are archived at the Biology studies administration office for two years.

### Assessment

The Master's thesis is graded according to the "[Master's thesis form](#)".

## Research Projects or Master's theses outside ETH Zurich

1. Research projects and the Master's thesis may be carried out outside ETH Zurich.
2. At least one of the research projects or the Master's thesis must be completed at ETH Zurich.
3. A research project or thesis that is done in a research group outside of ETH Zurich, must be marked as "external" when it is being registered on myStudies.
4. If a research project is carried out outside ETH Zurich, the supervision must be taken over by a professor of D-BIOL. D-BIOL may designate further ETH Zurich-internal persons who are authorized to supervise research projects.
5. If the Master's thesis is carried out outside ETH Zurich, the supervision must be taken over by a professor of D-BIOL (as referee). The D-BIOL may designate further ETH Zurich-internal persons who are authorized to supervise Master's theses.
6. The co-referee of the Master thesis must be determined in consultation with the major advisor and the ETH internal referee.

## 8. Elective majors

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

### Biochemistry

The major 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 major 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 doctoral degree program 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" 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).

### Advisor

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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 inter-specific 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 those majors 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 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.

### Advisor

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## Molecular and Structural Biology

The major 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 major 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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information:



## Molecular Mechanisms of Disease

The major in Molecular Mechanisms of Disease focuses on the study of fundamental molecular mechanisms underlying cellular, tissue and organ functions in higher organisms in the context of health and disease.

The program exposes students to a variety of research subjects and different experimental approaches bridging basic biological research and translational biomedical sciences, with particular emphasis on the identification of novel preventive and therapeutic opportunities for complex human diseases. Participants will acquire hands-on skills and obtain a broad education in molecular cell biology and physiology, genetics and genomics, immunology, developmental biology, neurobiology, cancer biology, and molecular medicine. They will have the opportunity to select among a large variety of courses to shape their curriculum based on individual interests.

The successful completion of the major in Molecular Mechanisms of Disease prepares the students for a professional career in biomedical research areas with emphasis on scientific research concerned with biological questions on the cellular and organismal level. It provides a solid scientific background for further academic education, but also provides the Master graduates with a scientific profile qualified for competitive positions in biomedical and pharmaceutical industry, bio- and health technology, clinical research laboratories, and health organizations.

### Advisor

Dr. Isabella Zanini  
ETH Zurich  
Institute of Molecular Health Sciences  
HPL G 32.2  
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information:



## Molecular Plant Biology

The major 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://world-foodsystem.ethz.ch/>), students also benefit from access to specialized courses, including those given at the Universities of Basel and Zurich.

### Advisor

Prof. Sam Zeeman  
ETH Zurich  
Institute of Molecular Plant Biology  
LFW E 53.1  
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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  
ETH Zurich  
Institute of Molecular Systems Biology  
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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. A study programme for the external university must be confirmed by the advisor for the given major. 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.

Students with a non-ETH Bachelor degree may not participate in an ETH exchange programme. They may do individual exchange stays but no credits from these may be count towards their Masters degree. Further details are available in Art. 15 of the study regulations.

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 degree request must be made via [myStudies](#). The LA has to be complete and approved by the advisor of the respective major before the degree request is made. Certificates will only be issued when request and LA match.

Once the degree is requested in myStudies, it is sent automatically to the D-BIOL studies administration office. The requests are processed about once or twice a month – after which the degree certificates are printed and sent by registered mail to the Alumni.

The language for the degree certificate must be chosen by the student when requesting the degree (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:

Theoretical courses weighted according to ECTS points	50%
Master's 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://ethz.ch/de/studium/didaktische-ausbildung/studienangebot/lehrdiplom-fuer-maturitaets-schulen.html>

The education "Lehrdiplom Biologie" is a separate study program for which students must apply. All information about the application can be found at <https://ethz.ch/de/studium/didaktische-ausbildung.html>

Any additional requirements are defined in the student specific admission decree of the rectorate under additional requirements.

The specialized biology courses with an educational focus (551-0973-00L, 4 CP, 551-0974-00L, 4 CP and 551-0976-00L, 4 CP) can be acknowledged as one of the two compulsory research projects (each 16 CP). In such a case, an additional 4 CP must be obtained in one or more additional Elective Compulsory courses of the students major.

This is only possible if there is an active enrolment in both the teaching diploma and the Master degree programme. It also requires the respective study advisor's approval. The courses need to be included in the LA.

## 12. 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](mailto:studies@biol.ethz.ch)

Availability by telephone and email according to the website (<https://biol.ethz.ch/en/utis/contact.html>). Individual appointments upon request - in person or via telephone/Zoom/Teams.

### 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: [ttschan@ethz.ch](mailto:ttschan@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](mailto:samuel.zeeman@biol.ethz.ch)

**Names and contact details of the advisors for each of the 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](mailto: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](mailto:kanzlei@ethz.ch)

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

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

ETH card, semester enrolment, semester fees, study confirmations, leave of absence, etc.

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

### Examinations Office

HG F 18, Rämistrasse 101, 8092 Zürich

Tel: +41 44 632 20 68, E-Mail: [exams@ethz.ch](mailto:exams@ethz.ch)

Opening hours: Monday and Thursday, 11:00 to 13:00 (outside of examination session)

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

Questions about exam registrations and de-registrations

<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.

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

### **Special study situations**

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

Studies and elite sport: <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 & Coaching Centre**

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/counselling/beratung-coaching.html>).

Responsible for counselling and coaching biology students: Regula Spaar

HG F 68.1, Rämistr. 101, 8092 Zürich

Tel.: +41 44 632 40 87, E-Mail: [regula.spaar@sts.ethz.ch](mailto:regula.spaar@sts.ethz.ch)

### **Psychological Counseling Services (for ETH and UZH)**

Plattenstrasse 28, 8032 Zürich – as well as other locations, incl. at ETH Höggerberg

Tel.: +41 44 634 22 80

E-Mail: [pbs@sib.uzh.ch](mailto:pbs@sib.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

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

Besides its main task, the student representation, 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.

HXE B25, Höggerberg Campus

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



## Contact

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Departement Biologie  
HIT F 41  
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<http://www.biol.ethz.ch>