Master in Biology

Study guidelines for the year 2016/17

Programme regulations 2006
Master’s Programme in Biology

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1. Introduction

The biology Master’s programme is of one and a half years duration 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’s programme may have to be taken. Otherwise there is a choice from a list of specific Master’s courses in each of the elective Master’s majors. Successful completion of the Master’s 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 2006 für den Master Studiengang Biologie” (available only in German). Please see https://www.biol.ethz.ch/en/studies/master/guidelines-and-regulations.html.

Programme overview
[90 ECTS credit points in 1.5 years]

Theoretical part

| Compulsory courses, elective compulsory courses, elective courses | 30 ECTS CPs |
| Master examination |

Practical part

| Research Project 1 | Research Project 2 |
| 12 weeks | 12 weeks |
| 2 x 15 = 30 ECTS CPs |

| Master thesis |
| 6 months |
| 30 ECTS CPs |

2. Admission

As a rule, admission to the programme requires a Bachelor’s degree in biology or biochemistry from a recognized university.

ETH students enrolled in the Bachelor’s programme in Biology
Students must have earned all CPs of the first two years of the Bachelor’s programme before enrolling for the Master’s programme.
Credit points system

**Students of the University of Zurich**
Students holding the Bachelor’s degree in Biology or Biochemistry of the University of Zurich are admitted to the ETH Master’s programme in biology without additional requirements, except for documentation of a good knowledge of the English language is also required.

**Students from other universities**
Students from other universities must hold a Bachelor’s 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 (e.g. courses from the ETH Bachelor’s programme in biology).

Application procedure

**ETH students in the Bachelor’s programme in Biology**
Students who have earned the required amount of credit points may register for the Master’s programme online at [https://www.lehrbetrieb.ethz.ch/myStudies/](https://www.lehrbetrieb.ethz.ch/myStudies/)

**Other students**
Information about admission for other students can be found at [https://www.ethz.ch/en/studies/registration-application/Master’s.html](https://www.ethz.ch/en/studies/registration-application/Master’s.html)

**Note**: It is essential that applicants indicate which of the Master’s majors [see below] they intend to apply for.

Online application for Master’s programmes:
[https://www.lehrbetrieb.ethz.ch/eApply/ealogin.view?lang=en](https://www.lehrbetrieb.ethz.ch/eApply/ealogin.view?lang=en)

3. **Credit points system**

Credit points are awarded according to the European Credit Transfer System (ECTS). Credit points (CPs) 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 www.vvz.ethz.ch (for the English version, click on the “en” button on the right upper corner of this webpage).

5. Performance assessments

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

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

An assessment may take place during the semester, at the end of a semester, or during the ETH examination session. For each course, the assessment method is indicated in the electronic course catalogue.

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 deregistration is communicated by the examinations office of the rectorate.

6. Learning agreement

After admission to the Master’s programme, students define their individual study programme (= Learning Agreement) 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. Any changes to the study programme must be approved by the major advisor. The Learning Agreement has to be filled in here: https://www.lehrbetrieb.ethz.ch/myStudies/loginPre.do?lang=en

Instructions:

- The first time you edit your Master’s enrolment go to “Functions” -> “Specialisation” and choose your major.
- Go to “Functions” -> “Learning agreement”. The compulsory courses are already listed now. The compulsory electives and the elective courses can be entered according to the discussion with your major advisor. In the end submit your entries to your major advisor for approval.
The learning agreement does not have to be complete in the beginning and it can be changed during the course of the study time. All additions and changes have to be approved by your major advisor.

All compulsory courses are marked with “Yes” in the section “Completion of mandatory courses”.

Compulsory courses that were done in the ETH Biology Bachelor’s programme have to be marked with “Other programme”.

In the rare case a compulsory course does not have to be taken with agreement of your major advisor it can be marked with “No”.

The section “ECTS credits” shows the planned, the needed minimum and the missing CPs in the categories “Compulsory Subjects and Compulsory Electives”, “Electives” and “Research Projects” (not shown are Master’s thesis, Master’s exam and GESS course). For the Master’s degree 24 CPs must be acquired in the categories “Compulsory Subjects and Compulsory Electives” and “Electives” whereof at least 18 CPs have to come from the category “Compulsory Subjects and Compulsory Electives”.

Courses listed in the learning agreement must be registered in myStudies under “Course registration” (no automatic transfer!). If a course is registered, the dot in front of the course’s name in the learning agreement turns green. Without registration it turns red.

**Note:** When requesting the Master’s degree certificate at the end of the Master’s program the student administration office will match your request with your Learning Agreement. Certificates will only be issued when request and Learning Agreement match.
7. Study programme

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

Minimum number of credit points required per category

<table>
<thead>
<tr>
<th>Category</th>
<th>Credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical part</td>
<td></td>
</tr>
<tr>
<td>Compulsory, elective compulsory* and elective courses</td>
<td>24</td>
</tr>
<tr>
<td>Elective courses in humanities, social and political sciences (GESS - Science in Perspective)</td>
<td>2</td>
</tr>
<tr>
<td>Master’s examination</td>
<td>4</td>
</tr>
<tr>
<td>Practical part</td>
<td></td>
</tr>
<tr>
<td>Two research projects</td>
<td>30</td>
</tr>
<tr>
<td>Master’s thesis</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>90</strong></td>
</tr>
</tbody>
</table>

*A minimum of 18 credit points must be obtained from compulsory and elective compulsory courses.

Compulsory Courses and Elective Compulsory Courses

Concept courses
As a rule, two concept courses (6 CP each) are compulsory for all majors. Some majors require two courses, and others only one. For the latter case, the second concept course has to be chosen as indicated in the table below. If the credit points for the required concept courses have already been obtained in the Bachelor’s programme, then the students should replace the 6 or 12 CP using Master’s courses of the category “elective compulsory Master’s courses”. Concept courses may be listed as elective “free choice” courses if they are not part of the list of elective compulsory concept courses (see below). Please note that all courses must be approved by the major advisor.

A maximum of 12 CP of concept courses can be applied toward the degree. Note that any concept courses required for admission (prerequisite course) do not earn credit points towards the degree.
Compulsory and elective compulsory concept courses in the individual Master’s majors

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

<table>
<thead>
<tr>
<th>Master’s major</th>
<th>1st concept course</th>
<th>2nd concept course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecology and Evolution</td>
<td>Evolutionary Genetics (AS)</td>
<td>Pflanzenökologie/Advanced Ecological Processes (AS and SS)</td>
</tr>
<tr>
<td>Neurosciences</td>
<td>Neurobiology (AS)</td>
<td>Cell Biology (SS) or Concepts in Modern Genetics (AS) or Cellular Biochemistry (AS + SS) or Immunology (AS + SS)</td>
</tr>
<tr>
<td>Microbiology and Immunology</td>
<td>Microbiology (AS + SS)</td>
<td>Immunology (AS + SS)</td>
</tr>
<tr>
<td>Cell Biology</td>
<td>Cell Biology (SS)</td>
<td>Concepts in Modern Genetics (AS) or Cellular Biochemistry (AS + SS) or Neurobiology (AS) or Introduction to Bioinformatics: Concepts and Application (AS) or Immunology (AS + SS) or Systems Biology (SS) or Molecular Disease Mechanisms (SS)</td>
</tr>
<tr>
<td>Molecular Health Sciences</td>
<td>Molecular Disease Mechanisms (SS)</td>
<td>Cell Biology (SS) or Concepts in Modern Genetics (AS)</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>Cellular Biochemistry (AS + SS)</td>
<td>Cell Biology (SS) or Molecular and Structural Biology (AS + SS) or Concepts in Modern Genetics (AS)</td>
</tr>
<tr>
<td>Plant Biology</td>
<td>Molecular Life of Plants (AS)</td>
<td>One additional concept course except Neurobiology, and Immunology and Molecular Disease Mechanisms</td>
</tr>
<tr>
<td>Systems Biology</td>
<td>Systems Biology (SS)</td>
<td>Concepts in Modern Genetics (AS) or Cellular Biochemistry (AS + SS) or Microbiology (AS + SS) or Introduction to Bioinformatics: Concepts and Application (AS)</td>
</tr>
<tr>
<td>Structural Biology and Biophysics</td>
<td>Molecular and Structural Biology (AS + SS)</td>
<td>Cellular Biochemistry (AS + SS) or Proteins and Lipids (SS) or Nucleic Acids and Carbohydrates (AS) or Microbiology (AS + SS) or Introduction to Bioinformatics (AS) or Concepts in Modern Genetics (AS) or Systems Biology (SS)</td>
</tr>
<tr>
<td>Biological Chemistry</td>
<td>Nucleic Acids and Carbohydrates (AS) or Proteins and Lipids (SS)</td>
<td>Second concept course upon agreement with study advisor</td>
</tr>
</tbody>
</table>

AS: autumn semester, SS: spring semester

Master’s courses

The Master’s courses may be chosen from the list published in the course catalogue for every major [www.vvz.ethz.ch].
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 MSc programmes from ETH. As a rule only courses from the Master’s level may be chosen. In the case a concept course is selected, only fully completed concept courses (6 CPs) will be accepted in this category. Approval of the respective major advisor is required.

Elective courses in humanities, social and political sciences (GESS - Science in Perspective)

All students must gain credit points for courses offered by the ETH Department of Humanities, Social and Political Sciences.

Research projects

General

In the Master’s 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’s thesis.

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

Research projects can be performed outside ETH Zurich or the University of Zurich. In this case the Master’s thesis must be performed at ETH Zurich or the University of Zurich.

Notes:
1. Only students with a good academic record will be allowed to do a mobility stay.
2. Students holding a non-ETH Bachelor’s degree must perform both projects at ETH or the University of Zurich.

Acceptance, registration and approval of research projects

1. A research project must be registered in myStudies under „Theses/Projects“. Registration can be done one month before starting to one month after starting. Start and end dates have to be entered. Both dates are binding.
2. Before starting a research project it must be accepted by the major advisor.
3. Registered research projects need to be approved by the project supervisor and the student administration office finally.

Research projects neither accepted nor registered nor approved will not be credited.
Note:
• Research project I can only be registered if at least 120 CPs of the Bachelor’s 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’s thesis can only be registered if CPs of both research projects and most of the Master’s lectures have been obtained.

Report
Each research project has to be completed with a written report, within 12 weeks after begin resp. at the date arranged with the project supervisor. 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 CPs 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 scientific report of that work and its results.
The duration of the Master’s thesis is strictly limited to six month and it’s independent of the academic calendar. A successfully completed thesis is granted with 30 CPs.
Master’s theses can be performed outside ETH Zurich or the University of Zurich only if no other mobility stays have been done during the Master’s studies.
Note: Only students with a good academic record will be allowed to do a mobility stay.

Referee, co-referee and starting date for the thesis
The Master’s 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’s theses are listed under http://www.biol.ethz.ch/en/studies/Master’s/Master’s-thesis.html.

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

**Acceptance, registration and approval of Master’s thesis**
1. A Master’s thesis must be registered in myStudies under „Theses/Projects“. Registration can be done one month before starting to one month after starting. The starting date automatically defines the end date of a project. Both dates are binding.
2. Before starting the Master’s thesis it must be accepted by the major advisor.
3. A registered Master’s thesis has to be approved by the thesis supervisor and the student administration office.

**A Master’s thesis neither accepted nor registered nor approved will not be credited.**

**Master’s thesis submission**
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 agreed date (cf. myStudies) in hard-copy to the referee and the co-referee and as pdf-document by email to the student administration office [studies@biol.ethz.ch]. The format should not exceed A4. The front page should enlist:

- name of the student
- title
- where the thesis was performed
- supervisor
- referee and co-referee
- date of submission


The Master’s thesis is graded according to the “Master’s Thesis Evaluation Form” ([http://www.biol.ethz.ch/en/studies/Master’s/Master’s-thesis.html](http://www.biol.ethz.ch/en/studies/Master’s/Master’s-thesis.html)). All Master’s theses are archived in the Department of Biology’s student administration office for two years.

**Master’s examination**

In the Master’s examination a student must provide proof of general knowledge in the elective major field on the basis of the Master’s thesis. Starting with a discussion based on the Master’s thesis further experiments and experimental strategies should be discussed in order to test the general understanding in the chosen major. As a rule the discussion of the Master’s thesis must not exceed 50% of the examination time. The exam is taken as an oral examination lasting 60 minutes. The exam must be taken within 3 months after submission of the Master’s thesis. As a rule, the examiners are the referee and the co-referee of the thesis. If necessary, a third, approved examiner may be called.
8. Elective majors

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

Ecology and Evolution

The Master’s programme in Ecology and Evolution focuses on the diversity of organisms and the interactions between organisms and their environment. Evolutionary aspects - at the level of populations, communities and ecosystems - are emphasized, because species composition is determined by natural selection. Work in the field is accompanied by investigations in experimental gardens, greenhouses, and laboratories. Modern molecular research approaches provide insights into the genetic basis of natural selection, also theoretical models and computer simulations may allow predictions for future developments.

Those interested in this programme are advised to also consult the description of the Master’s major Ecology and Evolution in Environmental Sciences at www.usys.ethz.ch/env/Master’s/major/3/index_EN, which offers a module in “Applied Ecology” in addition to the modules “Principles in Ecology and Evolution” and “Species, Communities and Ecosystems”.

The successful completion of the Master’s programme in Ecology and Evolution prepares the student for a professional career in scientific research areas concerned with questions about organismal biology. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides Master’s graduates with a scientific profile suitable for competitive positions in the fields of ecological assessment and conservation biology.

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Neurosciences

Neurosciences focus on the development, anatomy, plasticity and diseases of the nervous system, the functions of simple and complex neuronal networks, processes like memory, emotions, addiction or behavior in animal models and humans. Computational neuroscience and neuroinformatics develop predictive theories based on experimental data of how neurons work, how brains build themselves, and how complex networks function in perception, cognition, action, and in disease. These models are also used to implement key principles of brain structure and function in artificial technology.

Master’s students in Neuroscience receive a broad training which makes them familiar with conceptual and methodological approaches from the cellular and molecular level to the whole organism. Within the Neuroscience Center Zurich (ZNZ, www.neuroscience.uzh.ch) scientists from both the ETH Zürich and the University of Zürich, as well as the University Hospital, cover this field on all levels, from basic molecular and cell biology to complex circuit analysis, model building, behavioral biology and human studies.

The successful completion of the Master’s programme in Neurosciences prepares the student for a professional career in scientific research areas concerned with the function of the central nervous system. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides the Master’s graduates with a scientific profile desired for competitive positions in the fields of biomedical, pharmaceutical, computer or microelectronic industry, respectively.

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Microbiology and Immunology

Microbiology deals with microorganisms, a large and very heterogeneous group of usually microscopically small prokaryotic and eukaryotic organisms, i.e. bacteria and archaea, protozoa, algae and fungi, but also viruses. Microbes are characterized by a high metabolic diversity allowing them to explore a wide variety of habitats. As pathogens and commensals, they are of central medical importance and represent the major target of our immune system.

Immunology centers on the questions how such pathogens are recognized and how they are eliminated from the organism. Microorganisms play an important role in food processing and they are used in many different biotechnological processes, being it for the production of pharmaceuticals or chemical substances. This elective major offers courses and research opportunities in the areas of microbial cell biology, medical microbiology, virology, immunology, food microbiology, microbial ecology, plant pathology, mycology, parasitology, etc.

The successful completion of the Master’s programme in Microbiology and Immunology prepares the student for a professional career in scientific research areas concerned with microorganisms and their impact on other organisms, including humans. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides the Master’s graduates with a scientific profile desired for competitive positions in the fields of biomedicine and biotechnology, as well as in health organizations.

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Cell Biology

The Master’s programme in Cell Biology focuses on an understanding of fundamental life processes in higher organisms, from cell growth, cell differentiation and cell-cell communication to hormonal, inflammatory and neuronal signaling. These processes are studied in the context of cells, individual tissues and complex organisms, thereby expanding the horizons of cell biology to molecular physiology. Emphasis is also put on understanding the function of biological macromolecules and interaction networks associated with diseases such as cancer, diabetes and brain disorders. The experimental and conceptual approaches include modern cell biological, (bio)chemical and genetic methods combined with modern molecular imaging techniques, and morphological and physiological technologies.

The successful completion of the Master’s programme in Cell Biology prepares the student for a professional career in scientific research areas concerned with biological questions on the cellular and organismal level. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides the Master’s graduates with a scientific profile desired for competitive positions in the biomedical and pharmaceutical industry, clinical research laboratories, and health organizations.

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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 and the illumination of organ-organ communication principles, stem cell function and inter- and intracellular signaling networks. Particular emphasis is given 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 program. Participants of the program will acquire the experimental skills to apply tools and insights from many disciplines ranging from genetics and genomics and molecular cell biology and physiology to biological chemistry, in vivo imaging and molecular pathology to address unsolved problems in basic and translational sciences.

The successful completion of the Master’s programme in Molecular Health Sciences prepares the student for a career in biomedical research areas and pharmaceutical sciences. This education provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also a scientific profile suitable for competitive positions in the fields of biomedicine, biotechnology, health technologies and health organizations.

This program 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 [http://www.biol.ethz.ch/en/studies/Master's.html and http://www.hest.ethz.ch/en/studies/health-sciences-and-technology.html].

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Biochemistry

The Master’s 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’s 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’s graduates with a scientific profile desired for competitive positions in biotechnology, clinical chemistry, and the chemical, biomedical and pharmaceutical industry.

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Elective majors

Plant Biology

The Master’s programme in Plant Biology emphasizes the fundamental understanding of plants from the molecular genetic to the organismal level. In particular, students will experience, both in theory and in their experimental work, how the interconnected networks of genes and gene products work together in steering processes in plants, e.g. during development or under specific environmental conditions. Apart from plant biology, students are encouraged to broaden their educational skills in areas such as cell and structural biology, genetics, microbiology and plant protection, systems biology and metabolism. In plant biotechnology students learn how their knowledge can contribute to crop improvement. As members of the Zurich-Basel Plant Science Center (PSC, www.plantscience.ethz.ch), ETH Master’s students also benefit from joint PSC courses and courses given at the other two universities.

The successful completion of the Master’s programme in Plant Biology prepares the student for a professional career in scientific research areas concerned with plant-related questions on the molecular, cellular and systems level. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training, but also provides the Master’s graduates with a scientific profile desired for competitive positions in biotechnology, agriculture, and the agrochemical and biomedical industry.

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Systems Biology

Systems biology targets networks, cells, organs and complete organisms by integrating experimental 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. the proteome or metabolome] and their manipulation, for example through small interference [si] RNA screens. Computationally, the focus is on developing bioinformatics methods for data analysis and mathematical models for in silico experiments. 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. Depending on interest and capabilities, a focus on theoretical or experimental aspects will be encouraged.

The successful completion of the Master’s programme in Systems Biology prepares the student for a professional career in scientific research areas concerned with biological questions on the cellular, organismal, bioanalytical and computational level. It provides a solid scientific background for further academic studies towards a PhD followed by postdoctoral training. In addition, it provides a solid background on the modern work flows in industry, and the scientific profile desired for competitive positions in biotechnology, biomedical and pharmaceutical industry.

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Structural Biology and Biophysics

The Master’s programme in Structural Biology and Biophysics focuses on the structural, chemical and physical principles underlying the function of biological macromolecules and supramolecular assemblies. The programme includes courses on the three-dimensional structure determination of proteins and nucleic acids at atomic resolution with X-ray crystallography and nuclear magnetic resonance (NMR) spectroscopy. In addition, it offers courses on biophysical methods that can be applied to unravel the mechanisms of biological macromolecules towards a quantitative description of biomolecular reactions, including reaction kinetics, modern techniques in fluorescence and single-molecule spectroscopy, electron microscopy, and general biophysical methods such as analytical ultracentrifugation and thermodynamics.

Participants of the programme will acquire experimental skills in the production and purification of recombinant proteins, the biophysical characterization of the interactions between biological macromolecules and their ligands, three-dimensional structure determination and quantitative analysis of reaction mechanisms on the molecular level.

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

Advisor
Prof. Eilika Weber-Ban
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Biological Chemistry

Drawing a clear boundary between chemistry and biology is nearly impossible today given 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, NMR, and chromatography, and biological techniques such as growing bacteria, gene cloning, monoclonal antibody technology, and enzymology, to create molecules needed to test their biochemical hypotheses. A specialization in Biological Chemistry offers a biologically oriented alternative to studies 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 acquire experimental skills toward synthesis, purification, and characterization of molecules ranging in nature and size from the very small (medicines and enzyme inhibitors) to extremely large (genes and proteins).

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

Advisor
Prof. Peter Kast
ETH Zurich
Laboratory of Organic Chemistry
HCI F 333
Vladimir-Prelog-Weg 1-5/10
8093 Zürich

Tel.: +41 44 632 29 08
E-mail: kast@org.chem.ethz.ch
9. Exchange programme

Students with a good academic performance may spend one or more semesters during their Master’s programme at another university. Students with a non-ETH Bachelor’s degree can only perform their Master’s thesis abroad. A study programme for the external university has to be confirmed by the advisor for the given major. A maximum of 30 CP may be acquired at another university.


10. Request for degree conferral

Students may apply for the Master’s degree (request for the Master’s degree certificate via www.mystudies.ethz.ch) after having obtained the minimal number of credit points allocated to each category described in chapter 5. The printed and signed request for the degree certificate must be submitted to the student administration office. The learning agreement has to be completely filled in and approved. Certificates will only be issued when request and Learning Agreement match. The degree certificates are issued once a month and sent directly to the alumni. It contains an academic record in German and a certified copy in English. Furthermore it contains a diploma supplement describing the content of the programme (including a list of all courses) and a ranking.

The overall mark for the Master’s degree comprises:

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

The official academic title awarded is
In German: "Master’s of Science ETH in Biologie", abbr. MSc ETH Biologie
In English: "Master’s 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://www.ethz.ch/content/main/de/studium/didaktische-ausbildung.html/.

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

- “Anatomie I + Physiologie I” (376-0151-00L)
- “Anatomie II, Physiologie II and Histologie” (376-0150-00L; for those who started before the autumn semester 2012)
- “Anatomie II und Physiologie II” (376-0152-00L; for those who started in the autumn semester 2012 or later)

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 course with an educational focus (551-0963-00L, 12 CP) can be acknowledged as one of the two obligatory research projects (each 15 CP). In such a case, 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 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.share.ethz.ch/sites/rechtssammlung/default.aspx.
13. Contact information

**Study administration office Biology**
Muriel Büttel, D-BIOL, HIT F41.2
Wolfgang-Pauli-Str. 27, 8093 Zurich
Tel.: +41 44 632 59 42, Fax: +41 44 632 14 52, E-mail: studies@biol.ethz.ch

**Studies coordinator**
Dr. Thomas Tschan, D-BIOL, HIT F41.3
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**Director of studies**
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Names and contact details of the study advisors for each of the Master’s majors are listed in chapter 8.

**Military advisory service and coordination of civil and military education**
Prof. Dr. Markus Aebi, ETH Zürich, Institut für Mikrobiologie, HCI F 407,
Vladimir-Prelog-Weg 1-5/10, 8093 Zürich
Tel.: +41 44 632 64 13, E-Mail: aebi@micro.biol.ethz.ch

**Student Administration**
HG F 19, Rämistrasse 101, 8092 Zürich
Opening hours: Mo – Fr, 11:00 – 13:00
ETH card, registration, semester fees, study confirmations, leaves, etc.

**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.
Contact information

Student Advisory Service/Coaching
A team of coaches supports students when they start their course in planning their studies, preparing for examinations or when they are under stress. Responsible for biology students:

Daniel Köchli
HG F67.3, Rämistr. 101, 8092 Zürich
Tel.: +41 44 632 63 43, e-mail: daniel.koechli@soc.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/index.html
In charge of counseling during difficult phases in life, troubles in studies and conflicts arising during the course of doctoral study.

Associations

Association of Students at the ETH (VSETH)
ETH Zürich, CAB E 27, Universitätsstrasse 6, 8092 Zürich
ETH Zürich, HXE B5, Einsteinstrasse 4, 8093 Zürich
Office hours see http://www.vseth.ethz.ch/.

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