



Life Sciences and  
Facility Management



## Bachelor's degree in Biotechnology

### Specialisations

Bioprocess Development & Bioengineering  
Molecular, Micro-, and Cell Biology | page 3

### Overview

6 semesters to a Bachelor's degree | page 5

### Prospects

Broad range of career opportunities | page 7

Important information | page 9

At a glance | page 11

# Biotechnology

## Interdisciplinary science

Biotechnology is one of the key technologies of the future. It is the interdisciplinary combination of biological, medical and technical sciences. The aim is to produce or analyse useful compounds derived from beneficial micro-organisms, animal and plant cells, or their components. Biotechnological methods allow the production of substances that are difficult or impossible to produce by purely chemical methods. Today more and more analytical methods are based on biological principles.

## Study programme

Are you interested in natural sciences such as biology, biochemistry and molecular biology? Do you enjoy performing experiments and would you like to develop new products? Are you also fascinated by industrial processes and systems? Then the Bachelor's degree programme in Biotechnology is just the thing for you.

In addition to subject-specific and general educational content, the emphasis in this study programme is placed on independent work, creativity, teamwork, communication, and holistic thinking. These skills are actively encouraged by participation in projects and research assignments from industry.

Within the study program, you can choose between two specializations: **Bioprocess Development & Bioengineering, and Molecular, Micro-, and Cell Biology.** This allows you to focus on your future career orientation – whether in the field of biotechnological processes or the production of drugs.

## Structure

The study programme is designed to be taken full-time and lasts six semesters. In the third year you can choose from a variety of modules to put together your own individual study plan. In this way you can adapt part of your studies to suit your previous experience, interests and career goals. The study programme can also be completed on a part-time basis. Furthermore, the modular structure enables you to spend a semester studying abroad and take part in student exchanges with our partner universities.

After foundation studies in the first year, you expand your scientific and technical knowledge and skills in the second year. With your specialisation in the third year you can focus on your own particular interests. Through many practical sessions in small groups, you acquire methodological and social competence. In the fourth semester, as part of your literature review, you also learn how to write scientific publications. In addition, the subsequent semester assignment and Bachelor's thesis promote your ability to work independently on projects with a high degree of self-confidence.

# Specialisations

## Bioprocess Development and Bioengineering

Biotechnology has become an indispensable tool in the research and development of new drugs. It brings biological processes into technical procedures and industrial production. As a graduate who has specialised in Biotechnology, you are equipped to work on the development of analytical processes and new products. You often act as a link between management, university graduates, technical staff and skilled workers, and may take on technical and managerial responsibilities. Companies in the areas of biotechnology and pharmaceuticals, food and beverages, biomedicine and the chemical, cosmetic and environmental sectors are typical employers.

### Educational objectives

- Develop and implement cultivation processes for microorganisms as well as for plant, animal, and human cells (including stem cells).
- Manufacture biopharmaceuticals, cell-based therapeutics, vaccines, as well as traditional and modern products for the food industry.
- Utilize microorganisms, as well as animal and human cells, for diagnostics.
- Conduct projects in the development of bioprocesses and in biotechnological equipment and facility engineering.
- Transfer biotechnological processes from laboratory scale to the production environment.

### Areas of activity

- Development of bioprocesses
- Molecular and cell biology research
- Bioanalysis
- Engineering, systems engineering
- Production planning and coordination
- Biosafety
- Quality management, certification
- Environmental protection (analyses, risk management)
- Bioenergy
- Research, education and training

## Molecular, Micro-, and Cell Biology.

Understanding the molecular, microbiological, and cell biological foundations is of great importance for the advancement of applied biotechnological research. As a graduate of this specialization, you can apply your expertise in academic and industrial research. You will work in laboratories of pharmaceutical companies, biotech startups, hospitals, or universities. In collaboration with subject experts, you may develop pharmacological or toxicological tests, establish new molecular or microbiological methods, or conduct research in the field of tissue engineering and stem cell biology. Typical employers include companies in the pharmaceutical, food, biomedicine, and diagnostics sectors, as well as the cosmetics and environmental industries.

### Educational objectives

- Analyze galenic and molecular, microbiological and cellular mechanisms of biotechnological processes and apply them in the context of biotechnological processes.
- Develop cell lines and strains for biotechnological production processes.
- Establish new diagnostic procedures.
- Apply tissue engineering methods for drug development and therapy of diseases (e.g., orthopedics, autoimmune diseases, cancer).

### Areas of activity

- Development of pharmaceutical production processes
- Development of laboratory procedures to ensure product quality
- Validation and qualification of pharmaceutical developments, processes and systems
- Pharmaceutical production and packing
- Biomedical research institutions
- Quality management, validation
- Preparation and writing of registration documents
- Education and training

# Minors

Through six interdisciplinary minors, you can give your studies an individual profile in the fifth semester. One minor is mandatory, and if desired, a second minor can be chosen. Each minor corresponds to 12 ECTS credits, half of which are completed through an internship.

The internships are designed as semester projects in groups of two, and mixed groups from different fields of study are highly encouraged. In the "Pharmaceutical Technology" minor, a structured internship is undertaken, where relevant technologies are taught practically.

## Bioanalytics and Diagnostics

The minor covers three thematic areas:

- Protein analytics deals with pure preparations outside the cell matrix, focusing on biopharmaceuticals within the regulatory environment.
- Cell-based bioanalytics involves the analysis of macromolecules, cell structures, metabolism, as well as tissues/organs.
- Biomedical analytics addresses the most common pathophysiologicals in Europe and their diagnostic methods (including artificial intelligence).

## Biotechnology and Food Chemistry

The minor covers emerging fields in food science, comprising three courses:

- Key Ingredients in Food and their Analysis
- Innovative Product Developments (e.g., Single Cell Protein, Starter Cultures, Clean Meat)
- The Science of Coffee Along the Value Chain (in English)

Graduates can apply their knowledge in chemistry and biotechnology to the realm of food and confidently address important everyday topics.

## Digital Methods in Life Sciences

Digital, computer-assisted methods are at the forefront of the life sciences. Utilizing informatics, models for chemical or biotechnological inquiries are developed and numerically processed. Programming skills in a simple, object-oriented language are imparted and employed for this purpose. To extract scientific insights from large datasets, you will learn to apply statistical methods and the latest approaches such as "Machine Learning".

## Pharmaceutical Technology

In order for a pharmaceutical compound to exert its effects, it must be formulated into a suitable form with the aid of excipients. The minor covers the technical manufacturing and development of various dosage forms, provides an introduction to nanotechnology-based drug delivery systems, imparts the basics of cleanroom technology, offers an overview of quality assurance, and provides in-depth knowledge in the field of pharmaceutical microbiology.

## Environmental Chemistry and Biotechnology

Chemistry and biotechnology make a significant contribution to addressing pressing environmental issues such as climate change and resource scarcity. In the minor, you will learn about the biochemical processes and ecological principles of nature and how we can harness them for societal needs through innovative approaches. Three goals are emphasized: the use of new biobased products, the production of renewable energy, and the closing of loops to produce and consume resources and energy efficiently.

## Cell and Tissue Therapy

Cell and tissue therapies are a rapidly expanding segment of regenerative medicine. The minor provides expertise on therapeutic indications, market-approved products including their manufacturing and approval processes, as well as economic and ethical aspects. This prepares students for roles within developers and producers of cell and tissue therapeutics.

# Overview

	1 <sup>st</sup> and 2 <sup>nd</sup> semesters <b>Foundation studies</b>	3 <sup>rd</sup> and 4 <sup>th</sup> semesters <b>Major studies</b>	5 <sup>th</sup> and 6 <sup>th</sup> semesters <b>Specialised courses</b>
<b>Natural sciences</b>	Biology Microbiology with laboratory practical Molecular biology	Molecular Biology with laboratory practical Pharmacology Toxicology and Ecotoxicology Cell Biology and Cell Culture Techniques with laboratory practical Immunology	
	Chemistry with laboratory practical Organic Chemistry and Biochemistry with laboratory practical	Analytical and Bioanalytical Chemistry with laboratory practical Biochemistry with laboratory practical	
<b>Technology</b>	Introduction to Biotechnology Industrial Operations Physics with laboratory practical	Bioprocess Technology with laboratory practical Biostatistics Biochemical Engineering with laboratory practical Measurement and Control Engineering with laboratory practical Environmental Biotechnology	
<b>Mathematics (with tutorials)</b>	Informatics Mathematics		
<b>Language and Critique</b>	English Social Context and Language Digital Literacy	English	
<b>Specializations</b>		Bioprocess Development & Bioengineering or Molecular, Microbial, and Cell Biology	
<b>Minors</b>			At least one elective course can be chosen from the following options: <a href="http://www.zhaw.ch/icbt/minors">www.zhaw.ch/icbt/minors</a>
<b>Management and communication</b>			Personnel Leadership & Project Management Quality Management Science Communication
<b>Profiling Modules</b>			Single-Use Technology Bioinformatics Biotechnological Production Processes Bioprocess Technology Environmental Biotechnology
<b>Independent Projects</b>			Minor Thesis Bachelor's Thesis (Preliminary Project and Main Project)



### Biotechnology Student

“As a physics laboratory assistant, I have the privilege of combining my technical knowledge with biological insights in my studies. On a scientific level, thanks to the curriculum, I gain a deeper understanding of the mechanisms and processes involved in the production of extracts and creams from natural substances.”

# Mona

# Prospects

### Educational objectives

Upon completion of the program, you will be equipped to address practical biotechnological challenges and assume both technical and leadership roles. You will have the ability to quantitatively and qualitatively determine organisms and molecules using chemical, microbiological, molecular biological, and immunological methods.

You will be capable of developing comprehensive biotechnological and pharmaceutical processes. Biotechnologists consider the respective ethical, regulatory, social, ecological, and economic contexts. You will be adept at evaluating and communicating research, development, and production outcomes. After your studies, you will possess practical knowledge and will have learned how to independently and continuously expand your expertise, as well as connect within your field.

### Career prospects

Biotechnology offers you numerous exciting fields of activity. The industry is predicted to experience continuous growth. In addition to globally active large corporations, many smaller and medium-sized enterprises (SMEs) as well as start-up companies establish themselves in the market.

#### Typical applications and industries

- Pharmaceutical industry
- Research institutions
- Bioanalytical laboratories
- Engineering companies
- Hospitals
- Cosmetic industry
- Suppliers and equipment manufacturers (laboratory and diagnostic equipment)
- Environmental agencies
- Licensing and supervisory authorities
- Planning, consulting and service companies

### Master’s degree/ Continuing education

Upon successful completion of your bachelor’s degree, you have the opportunity to pursue a research-based and practice-oriented “Master of Science in Life Sciences” at ZHAW in Wädenswil. The specialization offered is “Pharmaceutical Biotechnology.” The master’s degree qualifies you, especially with international companies, for advancement in your career.

[www.zhaw.ch/lsfm/master-lifesciences/en](http://www.zhaw.ch/lsfm/master-lifesciences/en)

### Continuing education

Upon request, the institute offers custom-tailored further education courses in the laboratories of individual research groups. Naturally, you can also attend practical-oriented further education courses or advanced studies programs (MAS, DAS, CAS) at a university or university of applied sciences. Participating in professional conferences, such as those held by the Institute of Chemistry and Biotechnology, also provides you with new knowledge and opportunities for professional networking.

[www.zhaw.ch/icbt/weiterbildung](http://www.zhaw.ch/icbt/weiterbildung)

### Conferences

Conferences are the best opportunity to stay up-to-date with the latest knowledge and technology and to advance one’s professional networking.

[www.zhaw.ch/icbt/en](http://www.zhaw.ch/icbt/en)



# Alwinder

## Biotechnology Student

“My knowledge in biotechnology also assists me in my role as an officer in the volunteer fire brigade. There, I can apply my understanding of biological and chemical substances to make efficient decisions during operations, such as ensuring the safety of my colleagues or preserving buildings.”

# Important information

## Conditions for acceptance

The program is multidisciplinary, and thus the backgrounds of incoming students can vary:

- Individuals with a vocational baccalaureate and an apprenticeship or with a professional baccalaureate degree in a field related to biotechnology can directly enroll in the program (technical, chemical, biological, medical, and pharmaceutical professions).
- Individuals with a vocational baccalaureate and a non-related apprenticeship or a non-related professional baccalaureate degree require one year of work experience in the field of study. 6 months of general work experience in the laboratory field are credited, leaving a 6-month admission internship to be completed.
- Individuals with a high school diploma or specialized baccalaureate require work experience in the field of study in the form of a one-year work experience. Recognition of professional and/or specialized experience is evaluated “sur dossier” by the program management.
- High school graduates can directly enter the new, practice-integrated study model after completing high school. This program lasts for 4 years and is coupled with an internship agreement with a company.

For information on other admission possibilities (e.g., foreign diplomas), please contact the program management.

## Dates

The study programme begins mid-September. The registration deadline is 30 April.

## Support from the ZHAW

If you lack the relevant work experience, you can complete a 2-month Laboratory Introduction Internship with us. This serves as preparation for an admission internship in the industry and as a foundation for enrollment in a university of applied sciences. The introduction internship imparts essential laboratory skills and techniques. The course begins at the end of July each year.

If you have a technical background and have never worked in a laboratory before or if your laboratory experience is several years old, our Laboratory Start-Up Course can prepare you for the program. It lasts for 3 weeks, with each week consisting of 4 days, and takes place in August. After completing this program, you can then join the study directly in September.

## International exchange

Do you wish to complete a part of your studies abroad? ZHAW offers you this opportunity. In the Bachelor's program in Biotechnology, you can undertake your 5<sup>th</sup> semester as an exchange semester with an international partner university. An international internship, participation in a summer school, study trips, or a language stay also provide numerous benefits: you'll experience a different culture and language, gain exposure to an alternative education and research system, and gather valuable experiences for your professional future.

The Department of Life Sciences and Facility Management at ZHAW is currently connected to over 70 partner universities in 15 European countries through the Swiss-European Mobility Programme (SEMP; the transitional solution established by the Swiss Federal Council for the EU education program Erasmus+). The Biotechnology program encourages students to write their bachelor's thesis at one of their foreign partner institutes. Additionally, international summer schools are organized annually. In addition to the information available online, the Biotechnology program's study advisory service and the International Relations Office (IO) are available to provide further details and assist with any questions you may have.

For more information about international mobility, online registration for an exchange semester, and student testimonials, please visit: [www.zhaw.ch/lsfm/international/en](http://www.zhaw.ch/lsfm/international/en)

# At a glance

After completing the program, you will be capable of tackling complex biotechnological challenges and assuming leadership responsibilities.

<b>Degree programme Specialisations</b>	Biotechnology Biotechnology, Pharmaceutical Technology
<b>Title</b>	Bachelor of Science ZHAW in Biotechnology
<b>Duration</b>	Full-time (six semesters), part-time (individually planned). Part-time studies are integrated into full-time studies and last 4 to 6 years depending on individual workloads. For more information visit: <a href="http://www.zhaw.ch/icbt/bachelor-biotechnologie">www.zhaw.ch/icbt/bachelor-biotechnologie</a> (See Study Programme)
<b>Start of studies</b>	Mid-September (week 38); one week earlier for all new 1 <sup>st</sup> semester students (week 37)
<b>Workload</b>	180 ECTS credits (1 credit represents 25 to 30 hours of work).
<b>Preparation</b>	Preliminary courses in mathematics, chemistry, physics, biology and plant knowledge. Details at: <a href="http://www.zhaw.ch/lsfm/bachelor">www.zhaw.ch/lsfm/bachelor</a> (Information in German)
<b>Support services</b>	Laboratory Start-up course and Laboratory Introduction internship. Details at: <a href="http://www.zhaw.ch/lsfm/bachelor">www.zhaw.ch/lsfm/bachelor</a> (Information in German)
<b>Campus</b>	Wädenswil on Lake Zurich (25 km from Zurich)
<b>Tuition fees</b>	Semester fees: CHF 720 (subject to change) plus study materials, membership of the ASVZ sports association and individual living expenses. An additional fee of CHF 500 per semester is also applicable for all students who travel to Switzerland for study purposes and do not have permanent Swiss residence when commencing their studies.
<b>Conditions of acceptance</b>	Candidates with a vocational apprenticeship (relating to biotechnology) and a federally recognised vocational baccalaureate, a technical baccalaureate or a higher vocational education diploma can commence their studies directly. Candidates with an academic baccalaureate, a technical baccalaureate or a higher education diploma must have 12 months of work experience in a field related to biotechnology before commencing their studies. We will be happy to advise you.
<b>Important information</b>	The biotechnology programme is "paperless." Candidates with an academic baccalaureate can also enter the programme via PiBS (Practice-Integrated Bachelor's programme). Trial study days are also possible.
<b>Information events</b>	Four times per year, in March and October. Details at: <a href="http://www.zhaw.ch/lsfm/bachelor/infoveranstaltungen">www.zhaw.ch/lsfm/bachelor/infoveranstaltungen</a>
<b>Study advisor</b>	 <p>Susanne Dombrowski studienberater.bt.lsfm@zhaw.ch</p>

# Study and research in Wädenswil: practically-oriented, creative, passionate and reflectiv

The ZHAW is one of the leading Swiss universities of applied sciences. The School of Life Sciences and Facility Management currently has around 1800 students and employs more than 600 people. The educational programme comprises Bachelor's and Master's degree programmes as well as a broad range of further training and education courses.

Our expertise in life sciences and facility management in the areas of the environment, food and health enables us to make a vital contribution to solving social challenges and improving quality of life. Our success is based on dynamic institutes with extensive competence in research, development and services in the disciplines of applied computational life sciences, biotechnology, chemistry, food and beverage innovation, natural resource sciences and real estate & facility management.



**Environment | Food | Health | Society**  
Our competences in Life Sciences  
and Facility Management.

ZHAW Campus Reibbach / Einsiedlerstrasse

ZHAW Campus Reibbach / Seestrasse

Wohnhaus für Studierende

ZHAW Campus Gruental

## Contact

Zurich University of Applied Sciences  
School of Life Sciences and  
Facility Management  
Gruentalstrasse 14  
P.O. Box  
8820 Wädenswil/Switzerland  
+41 58 934 59 61  
studiensekretariat.lsfm@zhaw.ch

Student guidance:  
studienberatung-bt.lsfm@zhaw.ch  
www.zhaw.ch/icbt/bachelor-biotechnologie

Visit us



bilden und forschen  
wädenswil