

# BIOMEDICAL ENGINEERING

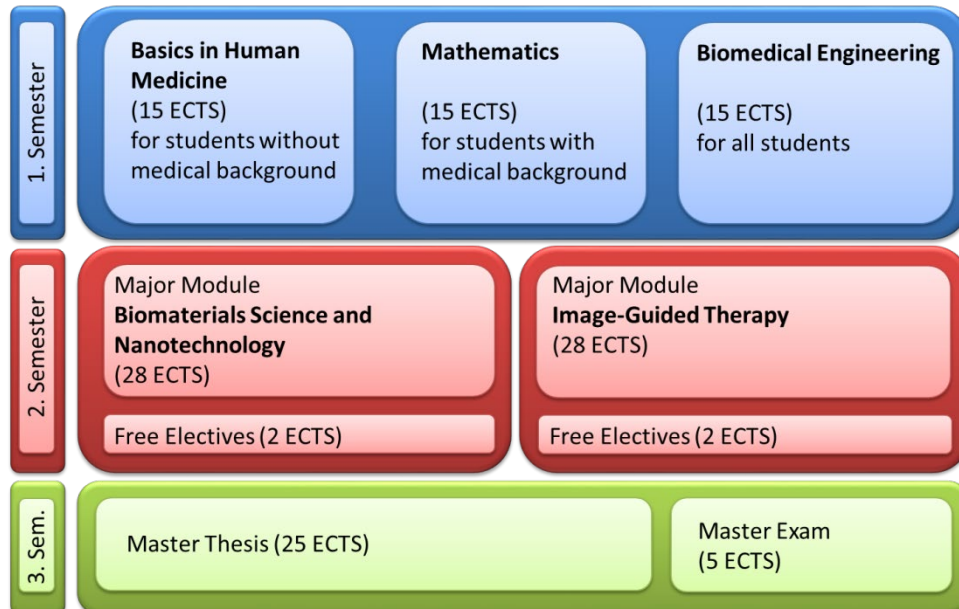
## Specialized Master's degree program

Master of Science: MSc in Biomedical Engineering

Biomedical Engineering is a rapidly emerging discipline that applies engineering tools and methods to medical diagnostics and treatment. Students can choose among courses in image-guided therapy or biomaterials & nanotechnology to learn the basics of a broad spectra of medical devices used for diagnostics, surgery and treatment. Biomedical engineers are engaging for example in digitization, automation, optimization and development of novel medical diagnostic and treatment devices in academia and industry.

### Focal area of teaching and research

In the first semester, students with a medical background attend courses in mathematics and computational techniques, whereas students with an engineering or a natural science background participate courses in human anatomy and physiology. In addition, all students will learn the principles of biomedical engineering including biomaterials science, nanotechnology, medical imaging as well as signal and image processing. In the second semester, students follow complementary courses dependent on the chosen major (Biomaterials Science and Nanotechnology or Image-Guided Therapy). The program is completed with a Master's thesis in the third semester.



The students have a choice between two majors:

**Biomaterials Science and Nanotechnology:** This module focuses on the bulk and surface properties of medical implants as well as on the characterization of tissues. Special attention is given to the tools to design and characterize materials down to the atomic level and to identify the associations between the nanostructure and function. Regenerative medicine will foster and stimulate interdisciplinary scientific discoveries and the development of advanced therapeutic strategies. Topics include: biomaterial-based control of stem cell function, engineering technologies for tissue manufacturing, and translational challenges towards industrial exploitation and clinical implementation. Courses include:

- Materials in Medicine
- Digital Dentistry
- Cells and Technologies in Regenerative Medicine

**Image-Guided Therapy:** This module is about the development and application of medical imaging techniques and image analysis. Biomedical imaging complemented with optical or magnetic stereotactic tracking devices guide surgeons during surgery. Research in this field aims to improve the treatment outcome by better diagnostics, reducing complications, morbidity, and surgery time.

Students, who major in Image-Guided Therapy, gain a comprehensive understanding of the fundamentals required to operate complex imaging techniques, such as magnetic resonance or ultrasound and methods behind the navigation system used during patient treatment, in a medical environment. In addition, students gain practical experience in developing future imaging, image analysis, and image-guided therapy solutions. Courses include:

- Computer-Assisted Surgery
- Medical Image Analysis
- Magnetic Resonance Imaging

### Master studies

The Master of Science degree is a postgraduate degree that requires a successfully completed Bachelor's program. The Specialized Master's degree program Biomedical Engineering awards 90 credit points of the European Credit Transfer System (ECTS) and is a so called «mono-course» consisting of only one core subject.

Curriculum master studies	ECTS
Basics in Human Medicine <sup>1</sup>	15
Mathematics <sup>2</sup>	15
Biomedical Engineering	15
Biomaterials Science and Nanotechnology <sup>3</sup>	28
Image-Guided Therapy <sup>3</sup>	28
Master's thesis	25
Master's examination	5
Free Electives	2
Total	90

<sup>1</sup> for students without medical background

<sup>2</sup> for students with medical background

<sup>3</sup> depends on the chosen major

One ECTS credit point corresponds to 30 working hours for an average student.

## Course language

The courses are generally taught in English. The Master's thesis is to be written in English.

## Exams

Student performance is assessed with a variety of testing methods (e.g. written and oral examinations). The studies are completed by the Master's thesis and a final Master's examination.

## Language stays/Internships

No language stays or internships are required.

## Combination of subjects

There is no possibility to combine this Master with other Master programs.

## Start of program

The program begins in the fall semester.

## Duration of study

The full-time Master's program generally takes three semesters, which requires 90 ECTS credit points. There are no restrictions on the duration of study. Part-time enrollment increases the duration of the program accordingly.

## Further degrees

A Master of Science in Biomedical Engineering prepares students for a doctorate in Biomedical Engineering but this is not a prerequisite. The doctoral studies last approximately three years. The acceptance of a doctoral thesis is followed by an oral examination covering the graduate studies in the doctoral subject.

## Career opportunities

The Master of Science degree in Biomedical Engineering is an excellent preparation for a scientific career (doctoral program) in Biomedical Engineering, for example at the Medical Faculty of the University of Basel, or for other professions in the medical technology industry. Graduates are able to support medical experts in a clinical environment and in health care institutions.

## Admission

**Master studies:** The following Bachelor of Science (BSc) degrees of a Swiss University allow for direct admission to the Master's degree program Biomedical Engineering: Medicine, Dentistry, Human Movement and Sport Sciences, Computer Sciences, Electrical Engineering, Mechanical Engineering, Civil Engineering, Microengineering, Physics, Chemistry, Chemical Engineering, Mathematics, Pharmaceutical Sciences, Computational Sciences.

Students with a BSc in a different branch will be assessed individually. For students with a relevant BSc degree but partially accepted by the University of Basel, the student can alternatively pass the GRE test in the area of «Quantitative Reasoning» or «Mathematics» provided the result is in the top 20 % (GRE = Graduate Record Examinations®).

Good written and oral English language skills are needed.

Binding information under: [www.unibas.ch/admission](http://www.unibas.ch/admission)

## Application

Application under <http://www.unibas.ch/application>; the application fee amounts to CHF 100.-. Application deadline for the fall semester is April 30. Students of the University of Basel see: [www.unibas.ch/de/Studium/Im-Studium/Rueckmelden/Masterstudium.html](http://www.unibas.ch/de/Studium/Im-Studium/Rueckmelden/Masterstudium.html). Application deadline is published there.

## Enrollment

The letter of admission also informs students on the procedure of enrollment. In general, students with a Swiss educational background do not have to be present in person for enrollment.

## Tuition fees

**Tuition fees** (also for examination semesters) per semester: CHF 850.-

Individual costs of living etc. are not included. A laptop computer is required for a successful completion of the courses.

**Scholarships and student loans:** Applications have to be sent to the responsible office of the canton in which the parents are eligible to pay tax. No support is available by the course organizers.

## Mobility

Semesters abroad are possible and supported by scholarship programs. The mobility programs facilitate the stay at other Swiss or foreign universities. Further Information: Student Exchange, Petersplatz 1, 4003 Basel, T +41 61 207 30 28, [mobility@unibas.ch](mailto:mobility@unibas.ch)

## Further information

**Guidelines and regulations** see [www.msc.dbe.unibas.ch](http://www.msc.dbe.unibas.ch)

## Information about the University of Basel

- The course directory can be found under: [www.unibas.ch/en/Studies/Course-Directory.html](http://www.unibas.ch/en/Studies/Course-Directory.html)
- Basler Studienführer: [www.studienberatung.unibas.ch](http://www.studienberatung.unibas.ch)
- Website: [www.unibas.ch](http://www.unibas.ch)

## Student Advice

Questions regarding the study of Biomedical Engineering can be discussed personally at the Student Administration Office of the Department of Biomedical Engineering (registration via e-mail or phone).

## Adressen

### Department of Biomedical Engineering

Gewerbestrasse 14, 4123 Allschwil

T +41 (0)61 207 54 05

[www.dbe.unibas.ch](http://www.dbe.unibas.ch)

e-mail: [master-dbe@unibas.ch](mailto:master-dbe@unibas.ch)

### Student Administration Office of the University of Basel

Petersplatz 1, 4003 Basel

T +41 61 207 30 23

[www.unibas.ch](http://www.unibas.ch)

Enquiries: [www.unibas.ch/studseksupportEN](http://www.unibas.ch/studseksupportEN)

### Student Advice Center Basel

Steinengraben 5, 4051 Basel

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[www.studienberatung.unibas.ch](http://www.studienberatung.unibas.ch)

e-mail: [studienberatung@unibas.ch](mailto:studienberatung@unibas.ch)

## Imprint

**Editorial:** Student Advice Center Basel. Edited by Dr. Nathalie Bucher in collaboration with Dr. Gabriela Oser and Prof. Dr. Pablo Sinues, Juni 2021.

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