

Master's Program Biomedical Engineering (120 ECTS credits)

## Course Structure before fall semester 2021

### Basic Modules (37 ECTS)

**"Applied Mathematics"**  
(8 ECTS)

**"Basics in Human Medicine"**  
(10 ECTS)

**"Biomedical Engineering"**  
(19 ECTS)

**Major Module "Biomechanical Systems"** (41-45 ECTS)

Mandatory Courses (16 ECTS)

Elective Courses (25-29 ECTS)

**Major Module "Electronic Implants"** (41-45 ECTS)

Mandatory Courses (16 ECTS)

Elective Courses (25-29 ECTS)

**Major Module "Image-Guided Therapy"** (41-45 ECTS)

Mandatory Courses (16 ECTS)

Elective Courses (25-29 ECTS)

### Module "Complementary Skills" (8-12 ECTS)

Mandatory Courses (6 ECTS)

Elective Courses (2-6 ECTS)

**Master's Thesis (30 ECTS)**



Bern University  
of Applied Sciences



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## Courses in the first semester (fall)

### Basic Modules (mandatory courses)

	ECTS
<b>Applied Mathematics</b>	
Numerical Methods	5
<b>Basics in Human Medicine</b>	
Basics in Physiology for Biomedical Engineering	3
Biological Principles of Human Medicine	4
Introductory Anatomy and Histology for Biomedical Engineers	3
<b>Biomedical Engineering</b>	
Biomedical Instrumentation	5
Introduction to Biomechanics	3
Medical Informatics	3
Principles of Medical Imaging	3

### Major Modules

Preparation Courses (elective courses in all Major Modules)*	ECTS
Introduction to Electrical Engineering	2
Introduction to Engineering Mechanics	2
Introduction to Material Science	2
Introduction to Programming	2
Selected Chapters in Mathematics	2
Short Introduction to MATLAB	1

Elective Courses**	ECTS
Introduction to Signal Processing	3

\*Preparation Courses are intended to fill gaps regarding prerequisites for basic and advanced courses in the master's program Biomedical Engineering. Technically, they belong to the elective courses in all Major Modules. Therefore, they can be selected freely.

## Courses in the second semester (spring)

### Basic Modules (mandatory courses)

	ECTS
<b>Applied Mathematics</b>	
Introduction to Medical Statistics	3
<b>Biomedical Engineering</b>	
(Bio)Materials	5

### Complementary Skills

	ECTS
<b>Mandatory Courses</b>	
Fundamentals of Quality Management and Regulatory Affairs	4
<b>Elective Courses</b>	
Clinical Epidemiology and Health Technology Assessment	2

### Major Modules

	ECTS
<b>Biomechanical Systems – Mandatory Courses</b>	
Continuum Mechanics (equivalent to Solid Mechanics as of spring semester 2022)	3
Finite Element Analysis I	3
Fluid Mechanics	4
<b>Biomechanical Systems – Recommended Elective Courses**</b>	
Dynamical Models: Analysis, Conception and Simulation	3
Microsystems Engineering	3
Orthopaedic Surgery – Practical Course (1-week block course)	2
Regenerative Dentistry for Biomedical Engineering	2
Rehabilitation Technology I	3
Tissue Engineering Practical Course (2-week block course after the Fall Semester): 4 <sup>th</sup> semester	2

	ECTS
<b>Electronic Implants – Mandatory Courses</b>	
Biomedical Signal Processing and Analysis	3
Low Power Microelectronics	4
Microsystems Engineering	3
Wireless Communication for Medical Devices	3
<b>Electronic Implants – Recommended Elective Courses**</b>	
Biomedical Sensors	3
C++ Programming I	3
Dynamical Models: Analysis, Conception and Simulation	3
Finite Element Analysis I	3
Introduction to Digital Logic (2-week block course between Fall and Spring Semester)	3
Rehabilitation Technology I	3

	ECTS
<b>Image-Guided Therapy – Mandatory Courses</b>	
Computer-Assisted Surgery	3
Introduction to Signal and Image Processing	5
Medical Robotics	3
<b>Image-Guided Therapy – Recommended Elective Courses**</b>	
Advanced Topics in Machine Learning. <b>This course is recommended for the 4<sup>th</sup> semester.</b>	5
C++ Programming I	3
Dynamical Models: Analysis, Conception and Simulation	3
Finite Element Analysis I	3
Rehabilitation Technology I	3
Microsystems Engineering	3

	ECTS
<b>Elective Courses**</b>	
Advanced Medical Imaging	2
BME Laboratories (as of spring semester 2022)	6

\*\*In addition to the Recommended Elective Courses, any course listed in this document which is not mandatory for the student can be selected. However, course overlaps in the timetable may occur when non-recommended courses are selected.

## Courses in the third semester (Fall)

### Complementary Skills

<b>Mandatory Courses</b>	<b>ECTS</b>
Ethics in Biomedical Engineering	2
<b>Elective Courses</b>	
Innovation Management	2
Scientific Writing in Biomedical Engineering	2

### Major Modules

<b>Biomechanical Systems – Mandatory Courses</b>	<b>ECTS</b>
Tissue Biomechanics	3
Tissue Engineering	3
<b>Major Module Biomechanical Systems – Elective Courses (Recommended)**</b>	
Applied Biomaterials	3
Applied Optimization	5
BioMicrofluidics	3
Cardiovascular Technology	3
Design of Biomechanical Systems	2
Finite Element Analysis II	3
Functional Anatomy of the Locomotor Apparatus	3
Intelligent Implants and Surgical Instruments	3
Lecture Series in Advanced Microscopy	3
Movement Biomechanics (as of fall semester 2022)	3
Osteology	3
Rehabilitation Technology II	3
Tissue Biomechanics Lab	3

### Electronic Implants – Mandatory Courses

Intelligent Implants and Surgical Instruments	3
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### Electronic Implants – Elective Courses (Recommended)\*\*

Applied Biomaterials	3
Applied Optimization	5
Biomedical Acoustics and Audiology	3
Biomedical Laser Applications	4
BioMicrofluidics	3
Cardiovascular Technology	3
C++ Programming II	3
Finite Element Analysis II	3
Neurotechnology (as of fall semester 2022)	3
Programming of Microcontrollers	5
Rehabilitation Technology II	3
Technology and Diabetes Management	3

### Image-Guided Therapy – Mandatory Courses

Medical Image Analysis	5
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### Image-Guided Therapy – Elective Courses (Recommended)\*\*

Computer Graphics (German)	5
Computer Vision	5
C++ Programming II	3
Finite Element Analysis II	3
Functional Anatomy of the Locomotor Apparatus	3
Image-Guided Therapy Project (2-week block course between Spring and Fall Semester)	3
Intelligent Implants and Surgical Instruments	3
Machine Learning	5
Medical Image Analysis Lab	4
Neurotechnology (as of fall semester 2022)	3
Ophthalmic Technologies	3
Programming of Microcontrollers	5
Rehabilitation Technology II	3
Technology and Diabetes Management	3

### Elective Courses\*\*

	<b>ECTS</b>
Artificial Intelligence	3

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