

Master's Program Biomedical Engineering (120 ECTS credits)

Course Structure as of fall semester 2022

Elective Preparation Courses (max. 11 ECTS)

Basic Modules (36 ECTS)

"Applied Mathematics"
(8 ECTS)

"Basics in Human Medicine"
(10 ECTS)

"Biomedical Engineering"
(18 ECTS)

Major Module (31-46 ECTS)
"Biomechanics"

Mandatory Courses (18 ECTS)

Electives (max. 28 ECTS)

Recom. Electives (max. 20 ECTS)

Major Module (31-46 ECTS)
"Electronic Implants"

Mandatory Courses (18 ECTS)

Electives (max. 28 ECTS)

Recom. Electives (max. 20 ECTS)

Major Module (31-46 ECTS)
"Image-Guided Therapy"

Mandatory Courses (18 ECTS)

Electives (max. 28 ECTS)

Recom. Electives (max. 21 ECTS)

General Elective Courses (max. 28 ECTS)

Module "Complementary Skills" (8-12 ECTS)

Mandatory Courses (6 ECTS)

Elective Courses (2-6 ECTS)

Master's Thesis (30 ECTS)



Courses in the first semester (fall)

Preparation Courses (Electives)

	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

Basic Modules (mandatory courses)

	ECTS
Applied Mathematics	
Numerical Methods	5
Basics in Human Medicine	
Basics in Physiology for Biomedical Engineering	3
Biological Principles of Human Medicine	4
Introductory Anatomy and Histology for Biomedical Engineers	3
Biomedical Engineering	
Biomedical Instrumentation	3
Introduction to Biomechanics	3
Introduction to Digital Signal Processing	3
Medical Informatics	3
Principles of Medical Imaging	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
Applied Mathematics	
Introduction to Medical Statistics	3
Biomedical Engineering	
(Bio)Materials	3

Complementary Skills

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

Major Modules

	ECTS
Biomechanics – Mandatory Courses	
BME Laboratory	6
Finite Element Analysis I	3
Fluid Mechanics	3
Solid Mechanics	3

	ECTS
Electronic Implants – Mandatory Courses	
Biomedical Signal Processing and Analysis	3
BME Laboratory	6
Low Power Microelectronics	3
Wireless Communication for Medical Devices	3
Electronic Implants – Recommended Elective Courses**	
Biomedical Sensors	3
Microsystems Engineering	3

	ECTS
Image-Guided Therapy – Mandatory Courses	
BME Laboratory	6
Computer-Assisted Surgery	3
Introduction to Image Analysis	3
Medical Robotics	3
Image-Guided Therapy – Recommended Elective Courses**	
Rehabilitation Technology	3

	ECTS
General Elective Courses**	
Advanced Medical Imaging	2
C++ Programming I	3
Deep Learning. This course is recommended for the 4th semester.	5
Dynamical Models: Analysis, Conception and Simulation	3
Introduction to Digital Logic (2-week block course between fall and spring semester)	3
Orthopaedic Surgery – Practical Course (1-week block course)	2
Regenerative Dentistry for Biomedical Engineering	2
Tissue Engineering Practical Course (2-week block course after the fall semester): 4 th semester	2

**In addition to the Recommended and General 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

Mandatory Courses		ECTS
Ethics in Biomedical Engineering		2
Elective Courses		
Innovation Management		2
Scientific Writing in Biomedical Engineering		2

Major Modules

Biomechanics – Mandatory Courses		ECTS
BioMicrofluidics		3
Biomechanics – Elective Courses (Recommended)**		
Applied Biomaterials		3
Cardiovascular Technology		3
Design of Biomechanical Systems		2
Functional Anatomy of the Locomotor Apparatus		3
Movement Biomechanics		3
Tissue Biomechanics Lab		3
Tissue Engineering		3

Electronic Implants – Mandatory Courses		
Intelligent Implants and Surgical Instruments		3
Electronic Implants – Elective Courses (Recommended)**		
Biomedical Acoustics and Audiology		3
Cardiovascular Technology		3
Neurotechnology		3
Programming of Microcontrollers		5

Image-Guided Therapy – Mandatory Courses		
Medical Image Analysis		3
Image-Guided Therapy – Elective Courses (Recommended)**		
Computer Vision		5
Medical Image Analysis Lab		4
Neurotechnology		3
Ophthalmic Technologies		3
Technology and Diabetes Management		3

General Elective Courses**		ECTS
Applied Optimization		5
Biomedical Laser Applications		4
C++ Programming II		3
Computer Graphics (German)		5
Finite Element Analysis II		3
Image-Guided Therapy Project (2-week block course between spring and fall semester)		3
Introduction to Artificial Intelligence		3
Lecture Series in Advanced Microscopy		3
Machine Learning		5
Osteology		3

**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.