

Master of Science “Biomedical Engineering”

2017 - 2019

Modules Overview:

1st Semester - winter term (Mannheim/ Heidelberg)

Module	Course Number	Course Name	ECTS	Type of course
M1 Advanced Physics and Mathematics for Medical Applications	1.1	Biophysics	1.0	Mandatory
	1.2	Engineering Mathematics + Exercises	3.0	Mandatory
M2 Medicine and Radiobiology	2.1	Basic Molecular and Cellular Biology	1.0	Mandatory
	2.2	Basic Medical Science	2.0	Mandatory
M3 Radiotherapy	3.1	Radiation Physics and Instrumentation	2.0	Mandatory
	3.2	Radiation Protection	1.0	Mandatory
	3.3	Radiotherapy Treatment Planning/Quality Assurance	2.0	Mandatory
	3.4	Treatment Planning and Quality Assurance Lab	1.0	Elective
	3.5	Image Guided Radiotherapy	1.0	Elective
M4 Medical Imaging	4.1	Physics of Imaging Systems	2.0	Mandatory
	4.2	Biomedical Optics	1.0	Mandatory
	4.3	Biomedical Engineering + Exercise	2.0	Mandatory
	4.4	Basic Optics and Laser	1.0	Elective
	4.5	MR-Radiology Lab	1.0	Elective
	4.6	Seminar: MR Methods and Technology	2.0	Elective
M5 Computational Medical Physics	5.1	Image Analysis + Exercises	4.0	Elective
	5.2	Matlab Programming	4.0	Elective



2nd Semester - summer term (Mannheim/ Heidelberg)

Module	Course Number	Course Name	ECTS	Type of course
M2 Medicine and Radiobiology	2.3	Radiobiology	2.0	Mandatory
	2.4	Basic Cellular Biology/Radiobiology Lab	1.0	Mandatory
	2.5	Seminar Radiobiology	1.0	Elective
M3 Radiotherapy	3.6	Special Radiotherapy Techniques	2.0	Elective
	3.7	Lab Medical Physics in Radiotherapy	5.0	Elective
	3.8	Seminar: Radiotherapy Techniques	2.0	Elective
M4 Medical Imaging	4.6	Seminar: MR Methods and Technology	2.0	Elective
	4.7	Nuclear Medicine + Exercises	4.0	Mandatory
	4.8	Lab Medical Physics in Imaging	5.0	Elective
	4.9	Seminar: Physics of Advanced MRI/CT Techniques	2.0	Elective
M5 Computational Medical Physics	5.3	Simulators in Games and Medicine + Exercises	8.0	Elective
	5.4	Volume Visualization + Exercises (advanced)	8.0	Elective
	5.5	Inverse Problems + Exercises (advanced)	8.0	Elective
	5.6	Computational Medical Physics Lab (advanced)	5.0	Elective
M6 Abroad Course	6.1	Shanghai Workshop	1.0	Elective



3rd Semester - winter term (Mannheim/ Heidelberg)

Module	Course Number	Course Name	ECTS	Type of course
M3 Radiotherapy	3.4	Treatment Planning and Quality Assurance Lab	1.0	Elective
	3.5	Image Guided Radiotherapy	1.0	Elective
M4 Medical Imaging	4.3	Biomedical Optics	1.0	Mandatory
	4.4	Biomedical Engineering + Exercise	2.0	Mandatory
	4.6	Seminar: MR Methods and Technology	2.0	Elective
	4.10	Advanced Imaging Techniques	2.0	Mandatory
	4.11	Medical Devices and Imaging Systems	4.0	Elective
	4.12	MRT Basics	2.0	Elective
	4.13	X-Ray Diagnostics and Sonography	2.0	Elective
M5 Computational Medical Physics	5.1	Image Analysis + Exercises	4.0	Elective
	5.2	Matlab	4.0	Elective
M7 Master Thesis Preparation	7.1	General Science Skills	3.0	Mandatory
	7.2	Specialized Lab Project	16.0	Mandatory

3rd Semester (Shanghai)

Neurosciences	Imaging/ Biomedical Optics	Computer Engineering
Elective modules (max. 30 ECTS)	Elective modules (max. 30 ECTS)	Elective modules (max. 30 ECTS)
<ul style="list-style-type: none"> Nanotechnology (3.0) BioMEMS (3.0) Biomaterials (3.0) Neurobiology (3.0) Structure & Function of Biomacromolecules (4.5) Theoretical Neurosciences (4.5) Experiments of modern lab animal science (1.5) Bioheat & Mass Transfer (4.5) Neuroinformatics (3.0) 	<ul style="list-style-type: none"> Physical therapy technology (4.5) Biomedical ultrasound (4.5) Medical imaging (3.75) New Technology in Medical Imaging (3.0) Biomedical Sensors (4.5) Laser medicine & biophotonics (3.0) Frontier problems of optics (4.5) Non-linear optics of optical fibers (4.5) Modern optics (4.5) Optoelectronics (3.0) Semiconductor devices (3.0) Processing of optical information (3.0) Principle & technology of laser (4.5) Non-linear optics (4.5) Engineering optics (4.5) 	<ul style="list-style-type: none"> Application of Computers in Life Sciences (3.0) Signal processing (4.5) Digital signal processing (3.0) Bioinformatics (3.0) 3D image processing & volume visualization (3.0) Adaptive filtration (3.0) Biomedical image processing (4.5) TMS320 digital signal processor (3.75) Random signal processing (4.5) Opt. estimation theory & system identification (4.5) Computer graphics (4.5) Wireless communication & sensor networks (3.0) Mobile & wireless networking (4.5)

4th semester - (Mannheim/ Heidelberg or Shanghai)

Module	Course Number	Course Name	ECTS	Type of Course
M8	8.1	Master Thesis	30.0	Mandatory