



Faculty of Electrical Engineering and Information Technology

Catalog of Elective Modules

for the Master program

Medical System Engineering

March 6, 2019

updated April 1, 2021

Guidelines for elective modules

- (1) Compulsory elective modules must be chosen according to the scope specified in the current study regulations. Overall, the required number of credit points (CP) must be reached or exceeded
- (2) The elective modules are arranged in deepenings. The deepenings have to be selected according to the following rules:
 - Either: choice of three deepenings. Per deepening choice of modules with a total of 15 CP.
 - Or: choice of two deepenings. A deepening with the choice of modules with a total of 30 CP and a second deepening with the choice of a total of 15 CP.



Explanation about general curriculum:

S = semester hours (SWS)

A = Types of Courses

V = Lecture

S = Seminar

Ü = Tutorial

K = Colloquium

LP = Lab Project

PRO = Research Project

E = Field Trip

* = Dependent on the chosen modules or not applicable

CP = Credit Points



Explanation about examination schedule:

LN = Types of course-related examination achievements

* = Dependent on the chosen modules

PL = Types of course-related examination achievements

K = written examination

M = oral examination

SA = seminar paper

HA = thesis

EA = experimental work

PRO = research project

R = oral presentation

* = Dependent on the chosen modules

CP = Credit Points



Legende zum Regelstudienplan:

S = Semesterwochenstunden (SWS)

A = Art der Lehrveranstaltung

V = Vorlesung

S = Seminar

Ü = Übung

K = Kolloquium

LP = Laborpraktikum

PRO = Wissenschaftliches Projekt

E = Exkursion

* = Abhängig von der Modulwahl oder nichtzutreffend

CP = Credit Points = Leistungspunkte



Legende zum Prüfungsplan:

LN = erforderliche Leistungsnachweise (Prüfungsvorleistung)

* = Abhängig von der Modulwahl

PL = Art der Prüfungsleistung

K = Klausur

M = Mündliche Prüfung

SA = Seminararbeit

HA = Hausarbeit

EA = Experimentelle Arbeit

PRO = Wissenschaftliches Projekt

R = Referat

* = Abhängig von der Modulwahl

CP = Credit Points = Leistungspunkte



Timing of the exam performance:

During the examination period of the semester in which the course was attended.



Zeitpunkt der Prüfungsleistung:

Im Prüfungszeitraum am Ende des Semesters, in dem das Modul belegt wurde.

Elective Modules

Enrolment: Choice of three deepening. Choice of modules with a total number of 15 CP per deepening. Alternative: Choice of two deepening. Choice of modules with a total number of 30 CP for one deepening and choice of modules with a total number of 15 for a second deepening.

Remarks: * new modules, * changes in module/submodule, * modules which are no longer offered (CP will be considered if you completed the course prior to the summer term 2021)

Deepening 'Medical Imaging Fundamentals'	2. Semester			3. Semester			Total			LN	PL
	CP	S	A	CP	S	A	CP	S	A		
Computed Tomography submodule: Methods on CT submodule: <i>Advances in CT</i> submodule: Lab Course CT				10		V/Ü/LP	10		V/Ü/LP	Lab certificate	K60
				3		V/Ü	3		V/Ü		
				1		S	1		S		
				2		LP	2		LP		
<i>Hybrid Imaging</i>	5	3	V/S				5	3	V/S		R
Positron Emission Tomography (PET)				5	3	V/Ü	5	3	V/Ü		K90
Methods of MRI	5	3	V/Ü				5	3	V/Ü	Tutorial certificate	K90
<i>MRI Pulse Sequence Design</i>				5	4	S	5	4	S		SA
<i>MR System Engineering</i>				5	4	V/Ü	5	4	V/Ü	Lab Certificate	EA
<i>Planar Medical Imaging Techniques</i>	5	3	V/Ü				5	3	V/Ü	Tutorial certificate	K90
	15 CP			25 CP			40 CP				

Deepening 'Radiation and Medical Physics'	2. Semester			3. Semester			Total			LN	PL
	CP	S	A	CP	S	A	CP	S	A		
Advances in Radiation and Medical Physics	3	3	V/Ü	2	2	LP	5	5	V/Ü/LP	Lab Certificate	K120
Nuclear Medicine				5	3	V/Ü	5	3	V/Ü		K90
<i>Hybrid Imaging</i>	5	3	V/S				5	3	V/S		R
Positron Emission Tomography (PET)				5	3	V/Ü	5	3	V/Ü		K90
	8 CP			12 CP			20 CP				

Deepening 'Medial Visualizations & Interventions'	2. Semester			3. Semester			Total			LN	PL
	CP	S	A	CP	S	A	CP	S	A		
Visual Analytics in Healthcare	3	2	S				3	2	S		R
Computer Assisted Surgery	6	4	V/S				6	4	V/S	Seminar certificate	M
Human Computer Interfaces in Medicine				4	2	S	4	2	S		R
Medical Visualization				5	4	V/Ü	5	4	V/Ü	Tutorial certificate	K120
Three Dimensional and Advanced Interaction	6	4	V/S				6	4	V/S		K120
Computer Aided and Image Guided Interventions —submodule: Computer Assisted Surgery —submodule: Medical Imaging in Interventional Endovascular Therapy	8	3 1	V/S S				8	V/S V/S S			
	15 CP			9 CP			24 CP				

Deepening 'Biomedical Signal Acquisition and Processing'	2. Semester			3. Semester			Total			LN	PL
	CP	S	A	CP	S	A	CP	S	A		
Introduction to Deep Learning	10	6	V/Ü				10	6	V/Ü		K120
Machine Learning for Medical Systems	5	4	V/S				5	4	V/S	Seminar certificate	M
Image Coding	5	3	V/Ü				5	3	V/Ü		M
Digital Information Processing Lab				5	2	S	5	2	S		EA
Electromagnetic Compatibility (EMC)	5	3	V/Ü				5	3	V/Ü		M
Functional Safety for Medical and Technical Systems	5	3	V/Ü				5	3	V/Ü		
Computer Vision and Deep Learning				6	4	V/PRO	5	3	V/PRO		
	25 CP			5 CP			30 CP				

Deepening 'Physiological and Biological Systems & Modelling'	2. Semester			3. Semester			Total			LN	PL
	CP	S	A	CP	S	A	CP	S	A		
Introduction in Tissue Engineering	5	4	V/Ü				5	4	V/Ü		K90
Tissue Engineering Lab				5	3	LP/Ü	5	3	LP/Ü		EA
Mathematical Modeling of Physiological Systems	5	3	V/Ü				5	3	V/Ü	Tutorial certificate	M
Theoretical Neuroscience I	5	5	V/Ü				5	5	V/Ü	Tutorial certificate	K120

Theoretical Neuroscience II				5	5	V/Ü	5	5	V/Ü	Tutorial certificate	K120
Experimental Neuroscience – from study design in motor research to brain-computer-interfaces				5	3	LP/S	5	3	LP/S		EA
Pharmacokinetic and Pharmacodynamic Modeling				5	3	V/S	5	3	V/S		K120
			15 CP	20 CP			35 CP				

Deepening ‘Mechanical- and Flow-Simulation in Medical Engineering’	2. Semester			3. Semester			Total			LN	PL
	CP	S	A	CP	S	A	CP	S	A		
Finite Element Method	5	4	V/Ü				5	4	V/Ü		M
Computational Biomechanics	5	3	V/Ü				5	3	V/Ü	Tutorial certificate	M
Rheologie und Rheometrie	4	3	V/Ü				4	3	V/Ü		K90
Computational Fluid Dynamics				5	3	V/PRO	5	3	V/PRO		PRO
Microfluidics: Theory & Applications				5	3	V/Ü	5	3	V/Ü	Tutorial certificate	K120
Soft Matter and Microfluidics Lab				5	3	V/S/LP	5	3	V/S/LP		R
			14 CP	15 CP			29 CP				

Deepening ‘Medical Regulatory Affairs’	2. Semester			3. Semester			Total			LN	PL
	CP	S	A	CP	S	A	CP	S	A		
Introduction to the approval process of medical devices	5	3	V/S				5	3	V/S	Tutorial certificate	K90
Introduction to the pre- market phase in the approval process of medical devices				5	3	V/S	5	3	V/S	Tutorial certificate	K90
Principles in clinical trials as well as market introduction and market surveillance of medical devices	5	3	V/S				5	3	V/S	Tutorial certificate	K90
Advanced Security Issues in Medical Systems	5						5				
			15 CP	5 CP			20 CP				

Deepening ‘Research Track’	2. Semester			3. Semester			Total			LN	PL
	CP	S	A	CP	S	A	CP	S	A		
Research Project	5			10			15				PRO
			5 CP	10 CP			15 CP				