



**Faculty of Electrical Engineering and Information Technology**

# **Catalog of Elective Modules**

**for the Master program**

***Medical System Engineering***

**April 01, 2021**

## Guidelines for elective modules

(1) 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 deepening. The deepening have to be selected according to the following rules:

- Choice of two deepening, each with a total number of at least 15 CP per deepening. Remaining CP are completed by choice of any module(s) of the entire range of the catalog of elective modules.



### 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



### 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



### 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 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

Choice of **two** deepenings, each with a total number of **at least 15 CP per deepening**. Remaining CP are completed by choice of any module(s) of the entire range of the catalog of elective modules.

Deepening 'Medical Imaging'	2. Semester			3. Semester			Total			LN	PL
	CP	S	A	CP	S	A	CP	S	A		
Computed Tomography I – Methods on CT	5	3	V/Ü				5	3	V/Ü	Tutorial certificate	K60
Computed Tomography II submodule: Advanced Topics in CT submodule: Lab Course CT				5	2	V/LP V LP	5	2	V/LP V LP	Lab certificate	K60
Hybrid Imaging	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
Planar Medical Imaging Techniques	5	3	V/Ü				5	3	V/Ü	Tutorial certificate	K90
	<b>20 CP</b>			<b>10 CP</b>			<b>30 CP</b>				

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
Computed Tomography I – Methods on CT	5	3	V/Ü				5	3	V/Ü	Tutorial certificate	K60
Hybrid Imaging	5	3	V/S				5	3	V/S		R
Positron Emission Tomography (PET)				5	3	V/Ü	5	3	V/Ü		K90
	<b>13 CP</b>			<b>12 CP</b>			<b>25 CP</b>				

Deepening 'MR Theory and Engineering'	2. Semester			3. Semester			Total			LN	PL
	CP	S	A	CP	S	A	CP	S	A		
Methods of MRI	5	3	V/Ü				5	3	V/Ü	Tutorial certificate	K90
MRI Pulse Sequence Design				5	4	S	5	4	S		SA
MR System Engineering				5	4	V/Ü	5	4	V/Ü	Lab Certificate	EA

Electromagnetic Compatibility	5	3	V/Ü				5	3	V/Ü		M
	10 CP			10 CP			20 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 '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
Three Dimensional and Advanced Interaction	6	4	V/S				6	4	V/S		K120
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
	15 CP			9 CP			24 CP				

Deepening 'AI in Image and Signal 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
	20 CP			5 CP			25 CP				

<b>Deepening 'Physiological and Biological Systems &amp; Modelling'</b>	<b>2. Semester</b>			<b>3. Semester</b>			<b>Total</b>			<b>LN</b>	<b>PL</b>
	<b>CP</b>	<b>S</b>	<b>A</b>	<b>CP</b>	<b>S</b>	<b>A</b>	<b>CP</b>	<b>S</b>	<b>A</b>		
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
	<b>15 CP</b>			<b>20 CP</b>			<b>35 CP</b>				

<b>Deepening 'Medical Regulatory Affairs'</b>	<b>2. Semester</b>			<b>3. Semester</b>			<b>Total</b>			<b>LN</b>	<b>PL</b>
	<b>CP</b>	<b>S</b>	<b>A</b>	<b>CP</b>	<b>S</b>	<b>A</b>	<b>CP</b>	<b>S</b>	<b>A</b>		
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, 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	3	S				5	3	S		
	<b>15 CP</b>			<b>5 CP</b>			<b>20 CP</b>				

<b>Deepening 'Research Track'</b>	<b>2. Semester</b>			<b>3. Semester</b>			<b>Total</b>			<b>LN</b>	<b>PL</b>
	<b>CP</b>	<b>S</b>	<b>A</b>	<b>CP</b>	<b>S</b>	<b>A</b>	<b>CP</b>	<b>S</b>	<b>A</b>		
Research Project	5			10			15				PRO
	<b>5 CP</b>			<b>10 CP</b>			<b>15 CP</b>				

<b>General Elective Modules</b>	<b>2. Semester</b>			<b>3. Semester</b>			<b>Total</b>			<b>LN</b>	<b>PL</b>
	<b>CP</b>	<b>S</b>	<b>A</b>	<b>CP</b>	<b>S</b>	<b>A</b>	<b>CP</b>	<b>S</b>	<b>A</b>		
Mini Research Project	5						5				PRO
Computergestützte Diagnose und Therapie	5	4	V/S				5	4	V/S	Seminar certificate	K90
Statistical Methods	5	4	V/Ü				5	4	V/Ü		K60