



**Faculty of Electrical Engineering and Information Technology**

# **Catalog of Elective Modules**

**for the Master program**

***Medical System Engineering***

**March 6, 2019**

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## 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 deepening. The deepening have to be selected according to the following rules:
  - Either: choice of three deepening. Per deepening choice of modules with a total of 15 CP.
  - Or: choice of two deepening. 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.

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: Advances in CT 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		
Hybrid Imaging	5	3	V/S				5	3	V/S		R
Positron Emission Tomography (PET)				5	3	V/Ü	5	3	V/Ü		M
Methods of MRI	5	3	V/Ü				5	3	V/Ü	Tutorial certificate	K90
MRI Pulse Sequence Design				5	3	S	5	3	S		SA
MR System Engineering				5	4	V/Ü	5	4	V/Ü	Lab Certificate	EA
Planar Medical Imaging Techniques	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
Hybrid Imaging	5	3	V/S				5	3	V/S		R
Positron Emission Tomography (PET)				5	3	V/Ü	5	3	V/Ü		M
	8 CP			12 CP			20 CP				

<b>Deepening 'Medial Visualizations &amp; Interventions'</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>		
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
	<b>15 CP</b>			<b>9 CP</b>			<b>24 CP</b>				

<b>Deepening 'Biomedical Signal Acquisition and Processing'</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 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
	<b>25 CP</b>			<b>5 CP</b>			<b>30 CP</b>				

<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>				

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	5	3	V/Ü				5	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
	15 CP			15 CP			30 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	3	S				5	3	S		
Entwicklung von Medizinprodukten				5	3	V/Ü	5	3	V/Ü		SA
	15 CP			10 CP			25 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				