

<b>Medizinische Messtechnik</b>						
<b>Kennnummer</b>	<b>Workload</b>	<b>Credits/LP</b>	<b>Studiensemester</b>	<b>Häufigkeit des Angebots</b>	<b>Dauer</b>	
	180 Std.	6	2	Nur Sommersemester	1 Semester	
<b>1</b>	<b>Lehrveranstaltungen</b>		<b>Sprache</b>	<b>Kontaktzeit</b>	<b>Selbststudium</b>	<b>Geplante Gruppengröße</b>
	a) Mikrooptik		a) Deutsch	a) 22,5 Std.	a) 67,5 Std.	a) 24
	b) Sensorik		b) Deutsch	b) 22,5 Std.	b) 67,5 Std.	b) 24
<b>2</b>	<b>Lernergebnisse/Kompetenzen</b>					
	After successful participation in the module the students...					
	<b>Verständnis (2)</b>					
	... Explain and paraphrase basic knowledge in the fields of technical optics, electrical engineering and electronics as well as in anatomy and electrophysiology.					
	<b>Anwendung (3)</b>					
	... design biomedical measurement systems					
	... define the optical components in advanced medical diagnostic: micromirrors, refractive microlenses or waveguide optics					
	... calculate the transfer functions of various sensor interfaces					
	... develop methods of signal processing of biomedical signals					
	... design the lighting source and photodetector for clinical instrumentation and intra-corporal imaging					
	<b>Analyse (4)</b>					
	... appraise the best micro-optical fabrication method for the specific application					
	... examine the advantages of using active micro optical components					
	... analyse the transfer functions of sensor interfaces					
	... examine biomedical measurement systems					
<b>3</b>	<b>Inhalte</b>					
	<ul style="list-style-type: none"> <li>a) - Introductions to optical materials and optical interfaces</li> <li>- Reflective micro-optics (reflection, planar and nonplanar mirrors, micro-mirrors, adaptive micro-optics)</li> <li>- Refractive micro-optics (lens fundamentals, imaging, primary and chromatic aberrations)</li> <li>- Diffractive micro-optics(diffraction, gratings, diffractive microlenses)</li> <li>- Guided-wave micro-optics (waveguides-ray optics models, waveguide characterization and components, optical fibers)</li> <li>- micro optical fabrication (Replication, Lithography)</li> <li>- Active micro-optics (Light emitting diodes, photodetectors, phase and intensity modulator)</li> <li>- Tunable micro-optics (liquid and membrane microlenses)</li> </ul>					

	<ul style="list-style-type: none"> <li>b) - Biomedical sensors</li> <li>- General biomedical signal processing - Origin and characteristics of biomedical signals - Biopotential amplifiers - Analog signal processing - Digital signal processing</li> <li>- General requirements for safety</li> <li>- Electrocardiogram</li> <li>- Electroencephalogram</li> <li>- Electromyogram</li> <li>- Invasive and noninvasive blood pressure measurement</li> <li>- Infrared temperature measurement</li> <li>- Ultrasound measurement systems</li> <li>- Magnetic resonance imaging</li> </ul>
<b>4</b>	<p><b>Lehrformen</b></p> <ul style="list-style-type: none"> <li>a) Vorlesung / Praktikum</li> <li>b) Vorlesung / Praktikum</li> </ul>
<b>5</b>	<p><b>Teilnahmevoraussetzungen</b></p> <ul style="list-style-type: none"> <li>a) Basics of technical optics</li> <li>b) Basics of electrical engineering and electronics, basics in anatomy and electrophysiology</li> </ul>
<b>6</b>	<p><b>Prüfungsformen</b></p> <ul style="list-style-type: none"> <li>a) Prüfungsleistung 1sbH (Hausarbeit) (1 LP)</li> <li>Modulprüfung Medizinische Messtechnik 1K (Klausur) (5 LP)</li> </ul>
<b>7</b>	<p><b>Verwendung des Moduls</b></p> <p>Mikromedizintechnik M.Sc. (MZT)</p>
<b>8</b>	<p><b>Modulbeauftragte/r und hauptamtlich Lehrende</b></p> <p>Prof. Dr. Bernhard Vondenbusch (Modulverantwortliche/r)</p> <p>Prof. Dr. Paola Belloni (Dozent/in)</p> <p>Katrin Skerl (Dozent/in)</p>

**9**

**Literatur**

- a) Zappe, Hans P.: Fundamentals of micro-optics, Cambridge University Press 2010  
Hans Peter Herzig: Micro-optics: elements, systems and applications; Taylor & Francis Verlag, 1998
- b) Bruce, Eugene N.: Biomedical signal processing and signal modeling, Wiley 2009  
John D. Enderle, Susan M. Blanchard, Joseph D. Bronzino: Introduction to biomedical engineering. Elsevier Academic Press, 2005