

## Joint Master's program Biomedical Engineering

Module X4M 1500: Signal Processing	
Aims:	<p>The students shall acquire consolidated knowledge of physical, electrical, and mechanical principles of medical products.</p> <p>The students shall acquire consolidated knowledge of current important medical products used in diagnosis and therapy.</p> <p>The students shall be enabled to contribute to the development of medical products according to relevant standards.</p>
Workload:	<p>Lecture attendance: 60 h</p> <p>Self-study: 120 h</p>
Credit-points:	6
Person responsible for module:	Radoslaw Mazur
Courses (lecturer):	<p>Signal Processing lecture (Mazur)</p> <p>Signal Processing lab (Mazur)</p>
Language:	English
Curriculum:	Master's program Biomedical Engineering, 1st Semester
<b>Signal Processing</b>	<b>Lecture, 2 SWS</b>
Prerequisites according to examination regulations	None
Recommended prerequisites:	None
Learning outcomes:	The students know about the basic operations of digital signal processing, they can adopt these operations to selected examples, and they can use them in the field of medical-technology.
Content:	<ul style="list-style-type: none"> <li>• Basic signal processing knowledge</li> <li>• Elementary signals, LTI-systems, Dirac-puls</li> <li>• Integration/differentiation simple circuits, causal systems.</li> <li>• Fourier Trafo as transfer fct. properties of FT</li> <li>• FT of elementary signals, windowed cosine fct</li> <li>• Energy signals, AutoCorrelationFunction, CrossCF, correlation, ACF @ LT</li> <li>• Time and frequency discrete sampling, time discrete signals</li> <li>• LSI-systems, time discrete FT, ACF, CCF, sampling, decimation, down and upsampling</li> <li>• z-Transform and Polyphase Matrix</li> <li>• Fast Fourier-Transform Algorithm</li> </ul>

	<ul style="list-style-type: none"> <li>• Knowledge about lecturer's current research projects</li> </ul>
Literature:	<p>Oppenheim, A. V., Schafer, R. W.: Discrete-time signal processing. Prentice Hall Signal Processing Series, Englewood Cliffs (1989)</p> <p>Lüke, H: Signalübertragung. 6. ed. Springer, Berlin, (1995) in German</p> <p>Hand-outs</p>
Examination:	Oral examination
Teaching methods:	LCD-projector, whiteboard
<b>Signal Processing</b>	<b>Lab, 2 SWS</b>
Prerequisites according to examination regulations	None
Recommended prerequisites:	
Learning outcomes:	<p>The students get an introduction into Matlab. They can apply this program in signal processing.</p> <p>The students get to know the use of digital signal processors and apply their knowledge when solving simple filter tasks.</p>
Content:	<ul style="list-style-type: none"> <li>- Introduction into Matlab</li> <li>- Scripts and functions</li> <li>- Plotting with annotations</li> <li>- Convolution</li> <li>- Fourier Transform</li> <li>- Sampling and time discrete signals</li> <li>- FIR and IIR filter analysis</li> <li>- Filter design</li> <li>- FFT</li> <li>- Tasks from current research projects</li> </ul>
Literature:	see lecture
Examination:	graded lab reports
Teaching methods:	LCD-projector, Matlab, DSP-Hardware