

Department	VII – Electronics – Mechatronics - Optometry / <i>Elektrotechnik - Mechatronik – Optometrie</i>
Degree level	Master's
Degree program	Information and Communications Engineering / <i>Information and Communications Engineering</i>
Type of instruction	Seminar plus laboratory training
Credits	5
Availability	Every semester
Hours/week	4

Module Number	WP02
English/German Title	<b>Model-Based Digital Communication Systems Design / <i>Modellbasierter Entwurf digitaler Kommunikationssysteme</i></b>
Credit Points	5 credits
Workload	150 hours: <ul style="list-style-type: none"> <li>• Class attendance 4 h/w during the semester lecture period: 68 hours</li> <li>• Independent study: 82 hours</li> </ul>
Subject Coverage	Subject-specific specialization
Learning Objectives / Outcomes	Students know the fundamentals of fast and efficient digital signal processing in digital communication systems. They have got an overview of typical devices and architectures for implementing such signal processing and master the integration and the embedding of hardware and software in versatile prototype systems using a model based approach and automatic code generation. They can design, simulate and verify signal processing algorithms and apply their knowledge in state-of-the-art platforms for communication systems, e.g. for software defined radio (SDR).
Prerequisites	Recommendation: Basic knowledge in digital and microprocessor technology, digital communication systems and signal processing
Level	1 <sup>st</sup> /2 <sup>nd</sup> semester
Type of Module	Seminar plus laboratory training
Status	Required-elective module
Semester when Offered	Every semester
Method of Assessment / Type(s) of Examination	The method of assessment / type of examination must be defined by the lecturer within the deadline determined in §19 (2) RSPO. Should the deadline pass without determination of the form of assessment in the module, the following method of assessment / type of examination applies: Written examination 50%, Written laboratory report of the laboratory group with consultation 50%
Determination of the Grade	See study and examination regulations
Equivalent Modules	Modules with comparable contents
Contents	<ul style="list-style-type: none"> <li>• Fundamentals of fast and efficient digital signal processing (number representation, pipelining, adder trees, distributed arithmetic, CORDIC architectures, ...)</li> <li>• Devices and architectures for fast and efficient signal processing in digital communication systems (General Purpose Processors, DSP, FPGA, HW accelerators, bus architectures)</li> <li>• Platforms for communication systems, e.g. SDR (Software, RF frontends, SDR components)</li> <li>• Integration and embedding hardware and software in versatile prototype systems using a model based approach and automatic code generation</li> <li>• Design of DSP algorithms, simulation of the hardware, generation of C and HDL code and verification in model-based prototype systems</li> </ul>
Reading List	U. Meyer-Baese: Digital Signal Processing with Field Programmable Gate Arrays, Springer E. Gryver: Implementing Software Defined Radio, Springer

	S. Pollin, M. Timmers, L. van der Perre: Software Defined Radios – From Smart(er) to Cognitive, Springer
Further Information	This module is offered in English.