

Module description: Digital Signal Processing 1			
Module Code	t.BA.XWV.DSV1.22HS		
ECTS Credits	4		
Language of Instruction/Examination	German		
Organizational Unit	ISC Signal & WCOM		
Module Coordinator	Sigisbert Wyrsh		
Legal Framework	The module description is part of the legal basis in addition to the general academic regulations. It is binding. During the first week of the semester a written and communicated supplement can specify the module description in more detail.		
Module Characteristic	Type 3a 2 lecture lessons per semester week and class+ 2 lab bi-weekly lessons per semester and half-class		
Module Description	The DSV1 module covers the basics of digital signal processing and teaches students the most important algorithms. The algorithms are designed and analysed in MATLAB and are implemented and measured on a microcontroller/DSP (e.g. STM32F769).		
Module Content	<ul style="list-style-type: none"> - AD-DA conversion (sampling, reconstruction, quantization, undersampling, aperture and clock sampling jitter (phase noise), DDS technology) - DFT and FFT (DFT and properties, FFT algorithm, FFT of real signals, leakage, windowing, zero padding, frequency inversion, spectrograms) - Digital systems (difference equation, z-UTF, convolution, correlation, realization structures, fixed-point realization) - FIR and IIR filter design (Filter specification, FIR filter design with windowing, with frequency sampling and in the z-domain, IIR filter design with analog prototype filters with bilinear transformation and in the z-domain) - Implementation of the algorithms in C on MCU (STM32F769 MCU) or on fixed-point DSP TMS320VC5510 from TI - DSV Tips & Tricks (Filter-Sharpener, Cordic-Algorithm, Amount (Abs) -Approximation, Spectral-Peak-Location Estimation (FFT-Peak Interpolation, Zero-Phase Filtering, Time-Domain Windowing in the Frequency Domain, Efficient Multiplication of Two Complex Numbers, DC Removal Filter) - Overview of special FIR filters (IFIR filter, overlaps-save algorithm) 		
Prerequisite Knowledge	Fourier series and Fourier transform, basic knowledge of programming and the use of MATLAB/Python		
Learning Objectives (Competences)	Students...	Competencies	Taxonomies
	The students understand the basics of Digital Signal Processing (DSV).	M, F	K2, K3, K4
	You can use Matlab/Python to analyze and implement DSV algorithms and design filters.	F, M	K3, K4, K5
	You understand simple DSV applications.	F	K2
	You can program small real-time applications on a digital signal processor (MCU or DSP) in C.	F	K3, K4, K5

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Performance Assessment	End-of-module exam	Assessment	Length (min.)	Weighting	Form	
	written exam	Grade	90	80	acc. to module agreement	
	Performance assessment during the semester		Assessment	Length (min.)	Weighting	Form
	written exam		Grade	45	20	acc. to module agreement
Classroom Attendance Requirement	None					
Learning material	<ul style="list-style-type: none"> Book from ZHAW library (pdf): "Applied Digital Signal Processing" by Dimitris Manolakis and Vinay Ingle 					
Comments						