Valid from 2026.HS

Module description: Digital Signal Processing 1

Module Code	t.BA.YWF.DSV1.26HS
ECTS Credits	4
Language of Instruction/Examination	German
Organizational Unit	ISC Signal & WCOM
Module Coordinator	Josquin Rosset
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 weekly lab 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 analyzed in Python and are implemented and measured on a microcontroller/DSP (e.g. STM32F769).
Module Content	• - 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) • - Overview of special FIR filters (Differentiator, Hilbert, Pulse-Shaping), Correlation, Fast convolution (Overlap-Add/Save algorithm) • - Multirate Signal Processing (decimation, interpolation, resampling, CIC and polyphase filter, sigma-delta-converter, introduction in filter banks)
Prerequisite Knowledge	Fourier series and Fourier transform, basic knowledge of programming and the use of Phyton
Learning Objectives (Competencies)	

Students...	Competencies	Taxonomies
The students understand the basics of Digital Signal Processing (DSV).	F, M	K2, K3, K4
You can use Python to analyze and implement DSV algorithms and design filters.	F, M	K3, K4, K5
You can program small real-time applications on a MCU/DSP in C (with help of libraries).	F	K3, K4, K5
You understand simple DSV applications.	F	K2

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Performance Assessment

End-of-module exam	Assessment	Length (min.)	Weighting	Social Form	Scenario/Format
written exam	Grade	90	60%	acc. to module agreement	

	Assessment	Length (min.)	Weighting	Social Form	Scenario/Format
written exam	Grade	45	20%	acc. to module agreement	
Lab *The best 10 Labs will be graded.*	Grade		20%	acc. to module agreement	

Classroom Attendance Requirement

None

Learning material

- Book from ZHAW library (pdf): "Applied Digital Signal Processing" by Dimitris Manolakis and Vinay Ingle