RTU Course "Analog and Digital Signal Filters"

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General data

Code	EEI357
Course title	Analog and Digital Signal Filters
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Ilja Galkins
Academic staff	Oskars Krievs
Volume of the course: parts and credits points	1 part, 4.5 credits
Language of instruction	LV, EN
Annotation	Filter classification of modern signal processing systems. Basics of filter theory. Phase amplitude and complex frequency characteristics. Basics of filter theory. Phase amplitude and complex frequency characteristics. Real-time digital signal processing input / output analog nodes. Analog active filters, and their design. Direct and inverse discrete Fourier transformation. Direct and inverse discrete signals z-transformation. Realization methods and parameters of finite and infinite impulse characteristic digital filter with programmable logic matrix and digital signal processor.
Goals and objectives of the course in terms of competences and skills	To be able to develop real-time digital signal processing I/O analogue nodes, develop digital filters, and realizē them in with programmable logic matrix and digital signal processor.
Structure and tasks of independent studies	Creation of theoretical part of documentation before practice, analysis of practical experimental results, conclusions, finalization of study work documentation.
Recommended literature	E.W. Kamen, B.S. Heck, Fundamentals of Signals and Systems Using the Web and MATLAB, Prentice Hall, 2007. E.C. Ifeachor, B.W. Jervis, Digital Signal Processing: A Practical Approach. Prentice Hall, Pearson Education Limited, 2002.
Course prerequisites	Basics of Signal theory, electronical devices and microprocessor technics.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Introduction of the themes, used literature and requirements.	1	0	0	0
Filter classification of modern signal processing systems.	2	0	0	0
Basics of filter theory. Phase amplitude and complex frequency characteristics.	2	0	0	0
Real-time digital signal processing input / output analog nodes. Analogue signal quantization. ADC and DAC.	2	0	0	0
Analogous active filters, and their design on the base of operational amplifiers.	4	0	0	0
Direct and inverse discrete Fourier transformation. Direct and inverse discrete signals z-transformation.	3	0	0	0
Realization methods and parameters of finite impulse characteristic digital filter.	3	0	0	0
Realization methods and parameters of infinite impulse characteristic digital filter.	3	0	0	0
Introduction to Texas Instruments digital signal processor programming.	3	0	0	0
Introduction to Altera Cyclone FPGA programming matrix.	3	0	0	0
Design of Finite impulse characteristic digital filter.	3	0	0	0
Design of Infinite impulse characteristic digital filter.	3	0	0	0
Practice Nr.1. Active filter designs and modelling in Matlab/Simulink and SPICE software.	2	0	0	0
Practice Nr.2. Active filter study on operational amplifier basis.	2	0	0	0
Practice Nr.3. Realization of finite impulse characteristic digital filter in programmable logic matrix.	4	0	0	0
Practice Nr.4. Realization of finite impulse characteristic digital filter in digital signal processor.	2	0	0	0
Practice Nr.5. Realization of infinite impulse characteristic digital filter in programmable logic matrix.	4	0	0	0
Practice Nr.6. Realization of infinite impulse characteristic digital filter in digital signal processor.	2	0	0	0
Total:	48	0	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
To be able to recognize, design and practically develop filters for real-time digital signal processing for I/O analog nodes.	Realization and presentation of Practice 1-2. Passed an exam
To be able to develop and realize finite impulse characteristic digital filter in digital signal processor and programmable logic matrix.	Realization and presentation of Practice 3-4. Passed an exam

To be able to develop and realize infinite impulse characteristic digital filter in digital signal processor and programmable logic matrix.	Realization and presentation of Practice 5-6. Passed an exam

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	4.5	2.0	1.0	0.0		*	