FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Cyfrowe przetwarzanie sygnałów 1**
Name in English:	**Digital signal processing 1**
Main field of study (if applicable):	**Industrial Control Engineering**
Specialization (if applicable):	
Level and form of studies:	**1st level, full-time**
Kind of subject:	**obligatory**
Subject code:	**APR011308**
Group of courses:	**NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	15				
Number of hours of total student workload (CNPS):	30				
Form of crediting:	crediting with grade				
For group of courses mark (X) final course:					
Number of ECTS points:	1				
including number of ECTS points for practical (P) classes :					
including number of ECTS points for direct teacher-student contact (BK) classes:	0.70				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Mathematical knowledge in the field of Laplace and Fourier transform
2. The basic ability to programming in C

SUBJECT OBJECTIVES

C1. Understanding and applying issues of digital signal processing

C2. Ability to analyze digital systems in time and frequency domain.

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01 He can describe basic issues of digital signal processing

PEU_W02 He can explain issues including sampling theory, mathematical description and analysis of discrete systems in the time and frequency

relating to skills:

relating to social competences:

PEU_K01 Is able to think act and in a creative manner.

PROGRAMME CONTENT

	Form of classes - lecture	Number of hours:
Lec 1	Introduction, syllabus, bibliography, conditions for course crediting, Discrete-time systems - basic definitions.	2
Lec 2	Discrete-time systems, LTI systems properties, difference equations, convolution, impulse response, block diagrams, state space, systems classification. Analog-to-digital conversion, periodic sampling, examples, sampling theorem, sampling of band pass signals.	2
Lec 3	The z-transform, introduction, definition of the z-transform, relationship between the z-transform and the Laplace transform, basic properties. The inverse z-transform, methods and examples.	2
Lec 4	Using z-transform, transform analysis of systems, solving difference equations, system function, stability and causality, the discrete Fourier transform (DFT), introduction, definition and properties of the DFT, examples, relationship between the z-transform and the DFT. The inverse discrete Fourier transform (IDFT), overlapping effect, windows methods, and frequency resolution.	2
Lec 5	Digital filters, introduction, notations, filter specifications and classification, examples of filters, FIR filters, FIR design using windows method.	2
Lec 6	IIR filters, introduction, structures for IIR filters, IIR filters design, impulse-invariant transformation, bilinear transformation.	2
Lec 7	The Fast Fourier Transform, relationship between the FFT and the DFT, FFT algorithm, introductions, examples, radix-2 decimation-in-time FFT.	2
Lec 8	Test.	1
	Total hours:	**15**

TEACHING TOOLS USED
N1. Lecture with multimedia techniques.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation *F – forming (during semester)* *P – concluding (at semester end)*	**Educational effect number**	**Way of evaluating educational effect achievement**
F1(W)	PEU_W01 PEU_W02 PEU_K01	Computer test
P(W)	P=F1	

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE:
[1] T. P. Zieliński „Cyfrowe przetwarzanie sygnałów”, 2005 [2] A. V. Oppenheim, R. W. Schafer „Cyfrowe przetwarzanie sygnałów“ 1989 [3] R. G. Lyons „Wprowadzenie do cyfrowego przetwarzania sygnałów” 1999
SECONDARY LITERATURE:
[1] G. Marven, G. Ewers „Zarys cyfrowego przetwarzania sygnałów” 1999 [2] W. Brodziewicz, K. Jaszczak „Cyfrowe przetwarzanie sygnałów” 1987 [3] R. Gabel, R. Roberts „Sygnały i systemy liniowe” 1978 [4] K. Steiglitz „Wstęp do systemów dyskretnych” 1977

SUBJECT SUPERVISOR
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