

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): **Control Engineering and Robotics**
 Specialization (if applicable):
 Level and form of studies: **1st level, full-time**
 Kind of subject: **obligatory**
 Subject code: **ARR041308**
 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 EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 He can describe basic issues of digital signal processing
 PEK_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:*

- PEK_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 EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation <i>F – forming (during semester)</i> <i>P – concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(w)	PEK_W01 PEK_W02 PEK_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. Schaffer „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. Jaszcak „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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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ARR041308 - Digital signal processing 1
 AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Control Engineering and Robotics**

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1AiR_W32	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1
PEK_W02	K1AiR_W32	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1
PEK_K01	K1AiR_K04	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1