

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Algorytmy cyfrowego przetwarzania sygnałów do oceny jakości energii**
 Name in English: **Digital Signal Processing Algorithm for power quality**
 Main field of study (if applicable): **Electrical Engineering**
 Specialization (if applicable): **Renewable Energy Sources**
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **optional**
 Subject code: **ELR041318**
 Group of courses: **NO**

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The mathematical knowledge of Laplace and Fourier transforms.
2. The basic ability to programming in C and Matlab.

SUBJECT OBJECTIVES

- C1. Understanding and applying issues of digital signal processing.
 C2. Analysis of digital systems in time and frequency domain.
 C3. The use of IT tools for design and simulation of digital signal processing systems.
 C4. Getting the ability to work in a laboratory group, the division of tasks and responsibilities.

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 He has ordered knowledge of digital signal processing.
 PEK_W02 He can describe and explain issues of sampling theory and analysis of discrete systems in the time domain and frequency.

relating to skills:

- PEK_U01 Able to be used mathematical tools in programming environments for the description and analysis of digital signal processing problems.
 PEK_U02 Able to design and implement the correct algorithms for digital signal processor.

relating to social competences:

- PEK_K01 Has a aware of the responsibility for their own work in a group, realizes the rules teamwork.

PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	Discrete-time systems, LTI systems properties, models of systems, difference equations, impulse response, systems classification signals, modeling of discrete-time signals.	2
Lec 2	Analog-to-digital conversion, periodic sampling, examples, sampling theorem, aliasing.	2
Lec 3	The z-transform, definition of the z-transform, basic properties. The inverse z-transform, using z-transform, transform analysis of systems, solving difference equations, system function.	2
Lec 4	The discrete Fourier transform (DFT), frequency spectrum. The inverse discrete Fourier transform (IDFT), Fast Fourier Transform algorithm (FFT).	2
Lec 5	FIR filters, linear phase FIR design using windows, properties, design procedures, examples.	2
Lec 6	IIR filters, introduction, structures for IIR filters, IIR filters design, impulse-invariant transformation, bilinear transformation.	2
Lec 7	Basic signal processing methods for evaluation signals parameters.	2
Lec 8	Test.	1
Total hours:		15

Form of classes - laboratory		Number of hours:
Lab 1	Discrete-time signals and systems, analog-to-digital conversion.	2
Lab 2	Convolution, aliasing.	2
Lab 3	The z-transform, notations.	2
Lab 4	Signals and systems analysis in z-transform domain, characteristics, block diagrams.	2
Lab 5	Spectral analysis.	2
Lab 6	Parameters of discrete Fourier transform.	2
Lab 7	Digital filters, introduction, filters design, filters comparison.	2
Lab 8	Evaluation of the laboratory reports.	1
Total hours:		15

TEACHING TOOLS USED

- N1. Lecture with multimedia techniques.
 N2. Laboratory using computer equipment.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation <i>F - forming (during semester) P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(W)	PEK_W01 PEK_W02	Written test
P(W)	P=F1	
F1(L)	PEK_U01 PEK_U02 PEK_K01	Evaluation of the laboratory reports.
P(L)	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
- [5] A. Papoulis „Obwody i układy” 1988

SUBJECT SUPERVISOR

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ELR041318 - Digital Signal Processing Algorithm for power quality
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Electrical Engineering**
AND SPECIALIZATION **Renewable Energy Sources**

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	S2OZE_W14	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1
PEK_W02	S2OZE_W14	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1
PEK_U01	S2OZE_U09	C.2 C.3	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7	N.2
PEK_U02	S2OZE_U09	C.2 C.3	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7	N.2
PEK_K01	K2ETK_K07	C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7	N.2