

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Wprowadzenie do programowania procesorów sygnałowych**
 Name in English: **Introduction to system signal processor programming**
 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: **ELR041319**
 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. Has basic knowledge about digital signal processing
2. Has basic knowledge about ANSI C/ PASCAL/ MATLAB programming
3. Is able to recognise key hardware and software parameters of personal computers
4. Recognises the need of continuous education, developing professional, personal and social competences and it able to define opportunities to do so

SUBJECT OBJECTIVES

- C1. basic knowledge about data preparation and data processing in microsystems
 C2. acquisition of skills to program system processor dedicated for digital signal processing

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 has basic knowledge about computer communication interfaces
 PEK_W02 is able to formulate a numerical algorithm adequate for solving an engineering task

relating to skills:

- PEK_U01 is able to source information about digital signal processing and system processor programming from literature and other sources
 PEK_U02 is able to code elementary driver software for microcontroller using TMSx system processor

relating to social competences:

- PEK_K01 is able to think and action in a creative and enterprising manner

PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	Using DSP system processor in digital signal processing, data transmission and error correction. Key elements of microcontroller infrastructure using TMSx system processors. Basic principles of task algorithmization, programming and generating control codes.	2
Lec 2	Fixed-point and floating-point arithmetic of numbers with finite binary representation. Floating Point/Fixed-Point Numbers. Standardisation of floating-point numbers. Fixed-point and floating-point system processors	2
Lec 3	Introduction to integrated development environment "Code Composer Studio IDE (CCS)". C/C++ programming and compilation. Interactive configuration of system processor and its peripherals.	2
Lec 4	Basics of C/C++ programming in CCS. DSPLIB dedicated library. Predefined: data types, structures and functions, terminations and input/output ports, time functions and error handling. RTDX mechanism.	2
Lec 5	System processor visual code samples in integrated development environments MATLAB/SIMULINK and LabView. Resulting code generation.	2
Lec 6	Communication with hardware - microcontroller interfaces. Presentation of computer app developed on a software engineer level.	2
Lec 7	Operation microcontroller interfaces - programming examples for signal processing algorithms.	2
Lec 8	Final test	1
Total hours:		15

Form of classes - laboratory		Number of hours:
Lab 1	Introduction to integrated development environment "Code Composer Studio IDE (CCS)". Palettes and tools of the CCS environment. C/C++ programming, compilation and resulting code generation.	2
Lab 2	Programme structure and data types - unconditional and condition-controlled loops in C/C++/CCS.	2
Lab 3	Programme structure and data types - time function and event mechanism based programming in C/C++/CCS.	2
Lab 4	TMS320Cx microcontroller Input/output programming - analysis and modification of sample C/C++/CCS codes.	2
Lab 5	Sample visual code using MARLAB/SIMULINK and/or LabVIEW used for TMS320Cx based platforms	2
Lab 6	Project of digital signal processing app using TMS320Cx - teamwork.	2
Lab 7	Project engineering applications in the field of digital signal processing using TMS320Cx - working in groups - application testing.	2
Lab 8	Laboratory assessment	1
Total hours:		15

TEACHING TOOLS USED

- N1. introductory lecture with slideshow and elements of e-learning
 N2. students code case-based programmes both individually and in teams
 N3. self-study distance - <http://eportal.eny.pwr.edu.pl>: partial and final tests
 N4. consultation

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	Self-directed learning at a distance -test partial. Educational Platform: http://eportal.eny.pwr.edu.pl
F2(w)	PEK_W01 PEK_W02	Final test (final) in the computer lab. Educational Platform: http://eportal.eny.pwr.edu.pl
P(w)	$P=0.15 \times F1 + 0.85 \times F2$	
F1(L)	PEK_U01 PEK_U02 PEK_K01	Development of electronic educational platform partial reports: http://eportal.eny.pwr.edu.pl
P(L)	$P=F1$	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] TMS320C6000 Code Composer Studio Help, Texas Instruments (any edition)
- [2] LabVIEW w praktyce, Marcin Chruściel, BTC (any edition)
- [3] E-learning platform: <http://eportal.eny.pwr.edu.pl>
- [4] Net-literature

SECONDARY LITERATURE:

- [1] The Digital signal processing handbook. Madisetti V.K., Williams D.B, Viterbi A, IEEE Press, (any edition)
- [2] Filter Design Toolbox User's Guide, The MathWorks (any edition)

SUBJECT SUPERVISOR

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT **ELR041319 - Introduction to system signal processor programming** 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	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1 N.3 N.4
PEK_W02	S2OZE_W14	C.1	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1 N.3 N.4
PEK_U01	S2OZE_U09	C.1 C.2	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7	N.2 N.4
PEK_U02	S2OZE_U09	C.1 C.2	Lab2 Lab3 Lab4 Lab5 Lab6 Lab7	N.2 N.4
PEK_K01	K2ETK_K06	C.2	Lec8 Lab6 Lab7 Lab8	N.2 N.4