

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Procesory sygnałowe w automatyce przemysłowej**
 Name in English: **DSP in Industrial Automation**
 Main field of study (if applicable): **Control Engineering and Robotics**
 Specialization (if applicable): **Automation of Machines, Vehicles and Apparatus**
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **obligatory**
 Subject code: **ARR043237**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	15		30		
Number of hours of total student workload (CNPS):	30		60		
Form of crediting:	crediting with grade		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	1		2		
including number of ECTS points for practical (P) classes :			2		
including number of ECTS points for direct teacher-student contact (BK) classes:	0.70		1.40		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has a basic knowledge of the structure of microprocessors and microcontrollers.
2. Has a basic knowledge of programming techniques of the microprocessors and microcontrollers.
3. He can practical and effectively use the basic knowledge of the construction of microprocessors and microcontrollers.
4. He can practically use a basic knowledge of programming techniques digital systems.

SUBJECT OBJECTIVES

- C1. To provide students with a basic knowledge of the construction and programming of digital signal processors used in industrial automation.
- C2. Familiarize students with possibilities to use digital signal processors in industrial automation systems.
- C3. Acquiring skills programming techniques of digital signal processors used in industrial automation.
- C4. The acquisition of programming skills and practical use of the internal structures of the signal processor.
- C5. The acquisition and consolidation of social competences including emotional intelligence involving the ability to work in a group of students with a view to effective problem solving. Responsibility, honesty and fairness in the procedure observance in force in academia and society.

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 He has knowledge in the construction of digital signal processors.
- PEK_W02 He has knowledge in the field of digital signal processors applications in industrial automation.
- PEK_W03 He has knowledge of the programming techniques of digital signal processors.

relating to skills:

- PEK_U01 Can recognize the type of digital signal processor and apply it in an electronic system.
- PEK_U02 He can choose a digital signal processor for the task, can program the selected processor type.
- PEK_U03 Be able to work runtime using appropriate programming nad diagnostic tools.

relating to social competences:

- PEK_K01 The acquisition and consolidation of competence in the independent and creative thinking.

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours:
Lec 1	Introductory lecture. General information about digital signal processors. Basic concepts and definitions.	2
Lec 2	Fixed-and floating-point arithmetic. The use of IQ-math library for DSP programming.	2
Lec 3	Fixed point and floating point signal processors. Construction and basic properties of the C2000 and C31 DSP families.	2
Lec 4	Structure and programming of the Event Manager module and GPIO ports of the TMS320F2812 DSP.	2
Lec 5	Structure and programming of the A/D converter of the TMS320F2812 DSP.	2
Lec 6	Structure and programming of the A/D converter and communication modules of the processor TMS320F2812.	2
Lec 7	Digital Motor Control Library in the programming TMS320F2812 processor.	1
Lec 8	Emulators and J-TAG system in the programming of digital signal processors.	1
Lec 9	Final test.	1
Total hours:		15

Form of classes - laboratory		Number of hours:
Lab 1	Introductory classes. Getting acquainted with safety rules. Discussion of laboratory stands. Familiarization with the development environment, create a sample project and its parameterization.	2
Lab 2	Programming TMS320F2812 processor using iq-math library. Arithmetic and logical operations.	2
Lab 3	Programming GPIO ports of the TMS320F2812 processor.	4
Lab 4	Programming Event Manager module and interrupt system the TMS320F2812 processor.	2
Lab 5	Programming time-counting system the TMS320F2812 processor. PWM generation using the TMS320F2812 processor.	4
Lab 6	Programming the A/D converter TMS320F2812 processor.	4
Lab 7	Programming TMS320F2812 processor for operating the display and keyboard.	2
Lab 8	TMS320F2812 processor programming using graphical programming tools (eg. Matlab / Simulink).	5
Lab 9	TMS320F2812 processor programming using graphical user interface (GUI)	4
Lab 10	Pass of the labs.	1
Total hours:		30

TEACHING TOOLS USED
N1. Multimedia presentations. N2. Consultation. N3. Traditionally carried out laboratory. N4. Rating executed programs. N5. Final test.

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 PEK_W03 PEK_K01	Final test.
P(W)	P=F1	
F1(L)	PEK_U01 PEK_U02 PEK_U03	Rate written programs.
F2(L)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	Activity in laboratory classes.
P(L)	P=0,7*F1+0,3*F2	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- | |
|---|
| <p>[1] Kowalski H. A., Procesory DSP dla praktyków, Wyd. BTC, Legionowo 2011
[2] Kowalski H. A., Procesory DSP w przykładach, Wyd. BTC, Legionowo 2012
[3] Proakis J. G., Manolakis D. G., Digital Signal Processing, Prentice Hall Int., 1996
[4] Smith S., Cyfrowe przetwarzanie sygnałów. Praktyczny poradnik dla inżynierów i naukowców, Wyd. BTC, 2003</p> |
|---|

SECONDARY LITERATURE:

- | |
|--|
| <p>[1] TMS320F2812 User Guide, Texas Instruments, 2010
[2] http://www.ti.com
[3] http://processors.wiki.ti.com/index.php/Main_Page</p> |
|--|

SUBJECT SUPERVISOR

Krzysztof Dyrzcz, krzysztof.dyrzcz@pwr.edu.pl
--

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ARR043237 - DSP in Industrial Automation
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Control Engineering and Robotics**
AND SPECIALIZATION **Automation of Machines, Vehicles and Apparatus**

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	S2AMPU_W04	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9	N.1 N.2 N.5
PEK_W02	S2AMPU_W04	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9	N.1 N.2 N.5
PEK_W03	S2AMPU_W04	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9	N.1 N.2 N.5
PEK_U01	S2AMPU_U03	C.3 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10	N.2 N.3 N.4
PEK_U02	S2AMPU_U03	C.3 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10	N.2 N.3 N.4
PEK_U03	S2AMPU_U03	C.3 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10	N.2 N.3 N.4
PEK_K01	K2AiR_K06	C.5	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10	N.1 N.2 N.3 N.4 N.5