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):	**Industrial Control Engineering**
Specialization (if applicable):	**Automation of Machines, Vehicles and Apparatus**
Level and form of studies:	**2nd level, full-time**
Kind of subject:	**obligatory**
Subject code:	**APR013237**
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 LEARNING OUTCOMES

relating to knowledge:

PEU_W01 He has knowledge in the construction of digital signal processors.

PEU_W02 He has knowledge in the field of digital signal processors applications in industrial automation.

PEU_W03 He has knowledge of the programming techniques of digital signal processors.

relating to skills:

PEU_U01 Can recognize the type of digital signal processor and apply it in an electronic system.

PEU_U02 He can choose a digital signal processor for the task, can program the selected processor type.

PEU_U03 Be able to work runtime using appropriate programming nad diagnostic tools.

relating to social competences:

PEU_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 libraries in the programming of signal processors.	2
Lec 3	Fixed point and floating point signal processors. Construction and basic properties of the selected DSP families.	2
Lec 4	Event handling and programming of GPIO ports on the example of the selected DSP.	2
Lec 5	Structure and programming of digital signal processor timer/counter structures.	2
Lec 6	Structure and programming of the A/D converter and communication modules of the digital signal processor.	2
Lec 7	Emulators and J-TAG system in the programming of digital signal processors.	2
Lec 8	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. Familiaizer 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.	3
Lab 3	Programming GPIO ports of the TMS320F2812 processor.	3
Lab 4	Programming Event Manager module and interrupt system the TMS320F2812 processor.	6
Lab 5	Programming time-counting system the TMS320F2812 processor. PWM generation using the TMS320F2812 processor.	6
Lab 6	Programming the A/D converter TMS320F2812 processor.	4
Lab 7	TMS320F2812 processor programming using graphical user interface (GUI)	4
Lab 8	Pass of the labs.	2
	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 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_W03 PEU_K01	Final test.
P(W)	P=F1	
F1(L)	PEU_U01 PEU_U02 PEU_U03	Rate written programs.
F2(L)	PEU_U01 PEU_U02 PEU_U03 PEU_K01	Activity in laboratory classes.
F3(L)	PEU_U01 PEU_U02 PEU_U03	Evaluation of the final report.
P(L)	P=0,6*F1+0,2*F2+0,2*F3	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[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

SECONDARY LITERATURE:

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

SUBJECT SUPERVISOR

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