FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Podstawy techniki mikroprocesorowej**
Name in English:	**Fundamentals of microprocessors**
Main field of study (if applicable):	**Electrical Engineering**
Specialization (if applicable):	
Level and form of studies:	**1st level, full-time**
Kind of subject:	**obligatory**
Subject code:	**ELR053201**
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. The student knows fundamental concepts of computer science.
2. The student knows the principles for the design of algorithms to solve engineering tasks.

SUBJECT OBJECTIVES

C1. Acquisition of basic knowledge of microprocessor system architecture, addressing modes, numerical codes, types of memory, microprocessors typical internal systems (AC converters, counters, interrupt systems).

C2. Getting microprocessor programming skills, formulation of algorithms and their software implementation.

C3. The acquisition and consolidation of social skills 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 life, following of academic and social rules.

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01	Student knows the basic principle of operation and the internal systems of microprocessors.
PEU_W02	Student knows the fundamental numeric codes used in microprocessor-based systems.
PEU_W03	Student knows the principle of operations of different internal systems (A / D converters, timers, interrupts systems).

relating to skills:

PEU_U01	Student can choose the proper software for different kinds of processors.
PEU_U02	Student can program processor internal systems to work with different types of peripheries.
PEU_U03	Student can run the programs, tests them using the appropriate software and hardware 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	Organizational matters. Basic elements of microprocessor systems, concepts and definitions.	2
Lec 2	Architecture of microprocessor systems. The types of memory used in microprocessor systems and their characteristic values.	2
Lec 3	Arithmetics of microprocessor systems. Numerical codes used in microprocessor systems.	2
Lec 4	Cooperation microcontroller with external systems. Construction and operation of I/O ports. Programming a typical LCD display.	3
Lec 5	Interrupt system microcontroller.	1
Lec 6	Construction and programming of the internal A/D converter.	2
Lec 7	Construction and programming of time-counting system microcontroller. Generating PWM.	2
Lec 8	Assessment.	1
	Total hours:	**15**

Form of classes - laboratory		**Number of hours:**
Lab 1	Organization matters. Getting to know the safety rules. Getting to know the positions of laboratory equipment hardware and software environment.	2
Lab 2	Microcontroller programming using basic arithmetic and logic operations.	2
Lab 3	Programming microcontroller's input/output ports, cooperation with the keyboard and external circuits.	4
Lab 4	Programming the LCD.	3
Lab 5	Measurement of analog signals using a microcontroller A/C converter.	4
Lab 6	Programming of the time-counter module of microcontroller, PWM signal generation.	4
Lab 7	Stepper motor control.	2
Lab 8	Control of a DC motor using PWM.	2
Lab 9	Miniature Servo Control.	2
Lab 10	Advanced programming using a microcontroller known internal structures.	4
Lab 11	Assessment.	1
	Total hours:	**30**

TEACHING TOOLS USED
N1. Traditional lectures using multimedia techniques.
N2. Consultation.
N3. Own work.
N4. Lecture - credit.
N5. Traditionally conducted laboratory.
N6. Laboratory - credit.

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	Final test.
P(W)	P=F1	
F1(L)	PEU_U01 PEU_U02 PEU_U03 PEU_K01	Active participation.
F2(L)	PEU_U01 PEU_U02 PEU_U03	Rate of programs.
F3(L)	PEU_U01 PEU_U02 PEU_U03	Evaluation of the final report.
P(L)	P=0,2*F1+0,6*F2+0,2*F3	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Baranowski R., Mikrokontrolery AVR ATmega w praktyce, Wyd. BTC, Legionowo, 2005
[2] Biernat J., Metody i układy arytmetyki komputerowej, Wyd. Politechniki Wrocławskiej, 2001
[2] Dyrcz, Czesław T. Kowalski, Zdzisław Żarczyński, Podstawy techniki mikroprocesorowej, Wyd. P.Wr., 1999
[3] Kardaś M., Mikrokontrolery AVR. Język C - podstawy programowania. Wydanie II poprawione i uzupełnione, Wyd. ATNEI, 2013

SECONDARY LITERATURE:

[1]Doliński J., Mikrokontrolery AVR w praktyce, Wyd. BTC, Warszawa 2004
[2] Francuz T., Język C dla mikrokontrolerów AVR: od podstaw do zaawansowanych aplikacji, Wyd. Helion, Gliwice, 2011
[3] Internet sources dedicated microprocessor technology.

SUBJECT SUPERVISOR

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