

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, part-time**
 Kind of subject: **obligatory**
 Subject code: **ELR053364**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	10		20		
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 peripherals.
- 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.	1
Lec 4	The operating principle of the processor's internal circuits: I/O, A/C converters, timer/counter systems, interrupt system.	4
Lec 5	Assessment.	1
Total hours:		10

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.	1
Lab 2	Microcontroller programming using basic arithmetic and logic operations.	2
Lab 3	Programming of I/O ports of the microcontroller.	2
Lab 4	Programming the LCD.	2
Lab 5	Programming of the time-counter module of microcontroller, PWM signal generation.	4
Lab 6	Programming of the microcontroller A/C converter.	2
Lab 7	Stepper motor control.	2
Lab 8	Control of a DC motor using PWM.	2
Lab 9	Miniature Servo Control.	2
Lab 10	Assessment.	1
Total hours:		20

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 <i>F – forming (during semester) P – concluding (at semester end)</i>	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	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)	$P=0,2 \cdot F1 + 0,6 \cdot F2 + 0,2 \cdot F3$	

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] Dyrz, Czesław T. Kowalski, Zdzisław Zarczyński, 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 to microprocessor technology.

SUBJECT SUPERVISOR
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