

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: **ELR043364**  
 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):	27		54		
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 EDUCATIONAL EFFECTS***relating to knowledge:*

- PEK\_W01 Student knows the basic principle of operation and the internal systems of microprocessors.
- PEK\_W02 Student knows the fundamental numeric codes used in microprocessor-based systems.
- PEK\_W03 Student knows the principle of operations of different internal systems (A / D converters, timers, interrupts systems).

*relating to skills:*

- PEK\_U01 Student can choose the proper software for different kinds of processors.
- PEK\_U02 Student can program processor internal systems to work with different types of peripherals.
- PEK\_U03 Student can run the programs, tests them using the appropriate software and hardware 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	Organizational matters. The basic elements of microprocessors. Instruction cycle processor, pipelining.	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	The principle of operation of systems of internal CPU A / D converters, timers, interrupts systems.	2
Lec 5	Design and programming displays. Assessment.	2
Total hours:		<b>10</b>

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	Arithmetic and logical operations, working with memory microcontroller.	1
Lab 3	Programming of I/O ports of the microcontroller, control LED ruler.	2
Lab 4	Programming the AC converter.	2
Lab 5	Programming of the time-counter module of microcontroller, PWM signal generation.	4
Lab 6	Programming the LCD.	2
Lab 7	Control of a DC motor using PWM.	2
Lab 8	Stepper motor control.	2
Lab 9	Miniature Servo Control.	3
Lab 10	Assessment.	1
Total hours:		<b>20</b>

TEACHING TOOLS USED
<p>N1. Traditional lectures using multimedia techniques.</p> <p>N2. Consultation.</p> <p>N3. Own work.</p> <p>N4. Lecture - credit.</p> <p>N5. Verification of knowledge with a short quiz.</p> <p>N6. Laboratory - credit.</p>

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation <i>F - forming (during semester)</i> <i>P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(W)	PEK_W01 PEK_W02 PEK_W03	Final test.
P(W)	P=F1	
F1(L)	PEK_U01 PEK_U02 PEK_U03	Active participation.
F2(L)	PEK_U01 PEK_U02 PEK_U03	Written tests.
F3(L)	PEK_U01 PEK_U02 PEK_U03	Rate of programs.
P(L)	P=0,2*F1+0,3*F2+0,5*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] Dyrzcz, 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] www.atmel.com

## SUBJECT SUPERVISOR

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### MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT ELR043364 - Fundamentals of microprocessors AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY Electrical Engineering

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	K1ETK_W26	C.1	Lec1 Lec2 Lec3 Lec4 Lec5	N.1 N.2 N.3 N.4
PEK_W02	K1ETK_W26	C.1	Lec1 Lec2 Lec3 Lec4 Lec5	N.1 N.2 N.3 N.4
PEK_W03	K1ETK_W26	C.1	Lec1 Lec2 Lec3 Lec4 Lec5	N.1 N.2 N.3 N.4
PEK_U01	K1ETK_U23	C.2	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10	N.3 N.5 N.6
PEK_U02	K1ETK_U23	C.2	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10	N.3 N.5 N.6
PEK_U03	K1ETK_U23	C.2	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10	N.3 N.5 N.6
PEK_K01	K1ETK_K05	C.3	Lec1 Lec2 Lec3 Lec4 Lec5 Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10	N.1 N.2 N.3 N.4 N.5 N.6