

## DESCRIPTION OF THE COURSES

- Course code: ARR3211
- Course title: **BASICS OF MICROPROCESSOR TECHNIQUE 1**
- Language of the lecturer: English

<i>Course form</i>	<i>Lecture</i>	<i>Classes</i>	<i>Laboratory</i>	<i>Project</i>	<i>Seminar</i>
<i>Number of hours/week*</i>	<i>1</i>		<i>1</i>		
<i>Number of hours/semester*</i>	<i>15</i>		<i>15</i>		
<i>Form of the course completion</i>	<i>credit</i>		<i>credit</i>		
<i>ECTS credits</i>	<i>2</i>		<i>1</i>		
<b>Total Student's Workload</b>	<i>30</i>		<i>30</i>		

- Level of the course (basic/advanced): basic
- Prerequisites: Basics of electronics, Informatics
- Name, first name and degree of the lecturer: Czesław T. Kowalski, dr hab. inż.
- Names, first names and degrees of the team's members: dr inż. Krzysztof Dyrz, dr inż. Marcin Pawlak, dr inż. Krzysztof Szabat, mgr inż. Zdzisław Żarczyński
- Year:.....3..... Semester:.....5.....
- Type of the course (obligatory/optional): obligatory
- Aims of the course (effects of the course): *learn of basic problems connected with structure, operation and programming microcontrollers.*
- Form of the teaching (traditional/e-learning): traditional

Course description: Basic problems of INTEL8051 type microprocessors: architecture, idea of operation, software elements (assembler), microprocessor environment, memory types and its organization, memory segmentation, input-output systems, parallel port (input, output), serial port, measurement and control interfaces. Instruction formats, basic addressing modes, addressing in microcontroller SAB 537, interrupts and exception interrupts. Elements of microprocessor arithmetic, number and code notation, fixed and float point notations. Co-operation of microprocessor with external devices (register pooling, interrupts, direct memory access). Analogue-digital 8-bit and 10-bit converter. Counter and timer (T0, T1, T2). Generation of PWM waves. Design of microprocessor systems, developing and systems, examples of microcontroller applications in measurements and drives, in real time systems. Laboratory exercises are based on SAB 537 microcontroller.

- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. Introduction. Basic definitions and information about microprocessors; architecture, idea of operation, software elements.	<i>2</i>
2. Elements of microprocessor environment, memory types and its organization, memory segmentation, input-output systems, parallel port (input, output), serial port, measurement and control interfaces	<i>2</i>
3. Instruction formats, basic addressing modes, addressing in microcontroller SAB 80C535/537, interrupts and exception interrupts	<i>2</i>
4. Elements of microprocessor arithmetic, number and code notation, fixed and float point notations	<i>2</i>

5. Co-operation of microprocessor with external devices (register pooling, interrupts, direct memory access)	2
6. Analogue-digital 8-bit and 10-bit converter. Counter and timer (T0, T1, T2). Generation of PWM waves.	2
7. Design of microprocessor systems, developing and systems, examples of microcontroller applications.	3

1. Classes – the contents:

2. Seminars – the contents:

3. Laboratory – the contents:

1. Introduction to microcontroller SAB80C535/537. Description of educational module.

2. Using of SYMULATOR and MONITOR software. Basic arithmetic and logic operations, software possibilities, basic instructions.

3. Arithmetic and logic operations of the microcontroller. Addition of multi-bit arguments, external memory operation.

4. Programming of input/output ports. Control of diode system.

5. Measurement of analogue signals using 8-bit A/D converter.

6. Measurement of analogue signals using 10-bit A/D converter.

7. Programming of T2 timer in comparator mode. Generation of PWM wave.

4. Project – the contents:

5. Basic literature:

1. Dyrz K., Kowalski Cz., Żarczyński Z., *Podstawy techniki mikroprocesorowej*, Oficyna Wyd. P.Wr., 1999

2. Janiczek J., Stępień A., *Mikrokontroler 80(C)515/535*, Wyd. Centrum Kształcenia Praktycznego, Wrocław, 1995

3. Pełka R., *Mikrokontrolery – architektura, programowanie, zastosowania*, WKŁ, Warszawa, 1999

4. Dąca W., *Mikrokontrolery, od układów 8-bitowych do 32-bitowych*, Micom, Warszawa, 2000

5. Starecki T., *Mikrokontrolery 8051 w praktyce*, Wydawnictwo BTC, Warszawa 2002

6. Additional literature:

1. Niederliński A., *Mikroprocesory, mikrokomputery, mikrosystemy*, Wyd. Szkolne i Pedagogiczne, 2. Warszawa, 1987

3. Wójciak A., *Mikroprocesory w energoelektronice*, WNT Warszawa, 1994

4. Takashi Kenjo, *Power Electronics for the Microprocessor Age*, Oxford Univ. Press, 1995

5. Brighouse B., Loveday G., *Microprocessors in engineering systems*, Pitman Publishing, London, 1987

7. Conditions of the course acceptance/creditation: Lecture – *credit* laboratory - *credit*

\* - depending on a system of studies