

DESCRIPTION OF THE COURSES

- Course code: ARR3209
- Course title: **DIGITAL SIGNAL PROCESSORS**
- Language of the lecturer: POLISH

<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>	2		2		
<i>Number of hours/semester*</i>	30		30		
<i>Form of the course completion</i>	<i>credit</i>		<i>Credit</i>		
ECTS credits	2		2		
Total Student's Workload	60		60		

- Level of the course (basic/advanced): advanced
- Prerequisites: Informatics, Basic of microprocessor technique
- Name, first name and degree of the lecturer/supervisor: KRZYSZTOF P. DYRCZ, Ph.D.
- Names, first names and degrees of the team's members: CZESŁAW KOWALSKI, Ph.D., D.Sc., MARCIN PAWLAK, Ph. D.
- Year:.....1..... Semester:.....1.....
- Type of the course (obligatory/optional): obligatory
- Aims of the course (effects of the course): training programming of fixed point and floating point DSP
- Form of the teaching (traditional/e-learning): traditional
- Course description:

Lecture deals with basic information about structure, programming and application of digital signal processors. Examples of practical solutions based on Texas Instruments applications are demonstrated and discussed: for fixed point processor TMS 320C243, floating point processor TMS 320C31 and DSP controllers based on DS1102 from dSPACE. Fixed and floating point arithmetic, structure of different DSP solutions, programming. Realization of digital filters using signal processors. Application of digital signal processors for realization of DFT and FFT transformations. DSP application for real time motion control (speed and position), state estimation, complex control algorithms (nonlinear, adaptive etc.). Application of DS1102 for realization of developing system. Examples of DSP application in industrial automation.

- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. Basic information about digital signal processors – hardware and software.	2
2. Fixed and floating point digital signal processors.	2
3. Fixed and floating point arithmetic. Format Q15.	2
4. Basics of DSP programming using C.	3
5. Structure of fixed point DSP of TMS 320C2000 series.	2
6. Programming of fixed point DSP of TMS 320C2000 series.	2
7. Realization of digital filters using signal processors.	2
8. Design of digital filters using DSP Blockset and Signal Processing Toolbox of MATLAB.	2

9. Application of digital signal processors for realization of DFT and FFT transformations.	2
10. Structure and programming of floating point DSP of TMS 320C31series.	2
11. Structure of DSP from dSPACE and their programming using MATLAB-SIMULINK	3
12. DSP application for real time motion control(speed and position), state estimation, complex control algorithms (nonlinear, adaptive etc.).	2
13. Interfaces for communication used in DSP technique and JTAG standard.	2
14. Examples of DSP application in industrial automation and FPGA technique.	2

- Classes – the contents:

- Seminars – the contents:

- Laboratory – the contents:

1. Digital signal processors TMS320 C240 – usage of hardware and software
2. Basics of Code Composer Studio i VisSim environment.
3. Fixed point arithmetic operations in TMS 320C240
4. Interrupts in TMS 320C240
5. Programming of A/D i D/A converters in TMS 320C240
6. Design of digital filters using MATLAB.
7. Realization of digital filters in TMS 320C240
8. Floating point digital signal processors TMS320C31 – usage of hardware and software
9. Realization of digital filters using TMS320C31
10. PWM wave generation using TMS320C31
11. DSP card DS1102 – usage of hardware and software
12. Realization of PWM generator using DSP card DS1102
13. Application of DSP (DS1102 of dSpace) for DC drive control
14. Application of DSP (DS1102 of dSpace) for control of the induction motor drive

- Project – the contents:

- Basic literature:

1. C. Marven, G. Ewers, Zarys cyfrowego przetwarzania sygnałów, Wyd. Komunikacji i Łączności, Warszawa 1999.
2. Dąbrowski A., (red.), Przetwarzanie sygnałów przy użyciu procesorów sygnałowych, Wyd. Politechniki Poznańskiej, Poznań 2000
3. Owen R., (red.), TMS320C3X Digital Signal Processing, Teaching Kit (DTK), Texas Instruments, SPRP038, 1998

- Additional literature:

1. Signal Processing Toolbox for use with MATLAB. User's Guide. The MathWorks, Inc. 1998
2. DSP Blockset Toolbox. User's Guide The MathWorks, Inc. 2000

- Conditions of the course acceptance/creditation: lecture and laboratory - credit

* - depending on a system of studies