GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Digital Signal Processors and Programmable Logic, PG_00068309						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2028/2029			
Education level	first-cycle studies		Subject group	Optional subject group Subject group related to scientific research in the field of study			
Mode of study	Full-time studies		Mode of delivery	at the university			
Year of study	4		Language of instruction	Polish			
Semester of study	7		ECTS credits	2.0			
Learning profile	general academic profile		Assessment form	exam			
Conducting unit	Department of Automatic Control -> Faculty of Electronics Telecommunications and Informatics -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Krzysztof Cisowski				
	Teachers		dr inż. Krzysztof Cisowski				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours	Self-study		SUM
	Number of study hours	30		2.0	18.0		50
Subject objectives	The aim of the course is to familiarize the student with the construction, programming and practical application of digital signal processors.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U12] can analyze the operation of components, circuits and systems related to the field of study, as well as measure their parameters and examine technical specifications, and plan and conduct experiments related to the field of study, including computer simulations and measurements, and interpret obtained results and draw conclusions	The student describes and is able to use in practice the elements of DSP processor architecture. The student describes and is able to use in practice the elementary principles of DSP processor programming.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
[K6_W03] knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	The student describes the elements of DSP processor architecture. The student describes the basic principles of DSP programming. The student describes and is able to use basic signal processing algorithms in practice.	[SW1] Assessment of factual knowledge
[K6_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study	Student describes and put to use in practice elements of DSP processor. The student describes and knows how to use in practice elementary principles of DSP programming. The student describes and knows how to use in practice DSP processor input and output system. The student describes and knows how to use the DSP processor interrupt system in practice. The student describes and knows how to use DSP processors in practice	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment

Subject contents

Definition and characteristics distinguishing digital signal processors (DSPs) from general-purpose microprocessors. Methods for classifying and comparing the performance of DSPs. A brief historical overview of the development of these processors. DSP manufacturers. Architecture of the TMX320C55XX series fixed-point processors, the TMS320C67XX single-core floating-point processors, and the OmapL138 and Sitara AM572X multi-core processors. The TMS320C6713 DSK and TMX320C5515 eZDSP v2 USB Stick development system. Code Composer Studio (CCS) development environment - compilation and execution of sample programs. Fixed-point arithmetic. Selected digital signal processing algorithms: DFT transform using FFT (software and hardware versions), FIR (time- and frequency-domain) and IIR digital filtering, selected FIR and IIR filter design methods, methods for generating sinusoidal signals, DTMF tone synthesis and detection, acoustic effects, and guitar effects. Example implementations of the discussed algorithms using the TMS320C6713 and TMS320C5515 processors. Definition and general characteristics of FPGA circuits.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Projects and examination	50.0%	100.0%

Recommended reading

Basic literature	1. R. Chassaing, D. Reay, Digital signal processing and Applications with the C6713 and C6416 DSK, Wiley-Interscience 2008. 2. Sophocles J. Orfanidis, Introduction to Signal Processing, Copyright c 2010 by Sophocles J. Orfanidis, 3. S.M. Kuo, B.H. Lee, W.Tian, Real-Time Digital Signal Processing, Fundamentals, Implementations and Applications, Third Edition, J. Wiley & Sons, Ltd. 2013, 4. Tomasz P. Zieliński, "Cyfrowe przetwarzanie sygnałów Od teorii do zastosowań Wydanie 2 poprawione" Wydawnictwo WKiŁ, 2009. 5. Borodziewicz W., Jaszczak K., Cyfrowe Przetwarzanie sygnałów, Wydawnictwo Naukowo-Techniczne W-wa 1987. 6. Wojtkiewicz A. Elementy syntezy filtrów cyfrowych, Wydawnictwo Naukowo-Techniczne W-wa 1984. 7. DSP56000, 24-BIT DIGITAL SIGNAL PROCESSOR FAMILY MANUAL, Motorola, Inc. Semiconductor Products Sector DSP Division 6501 William Cannon Drive, West Austin, Texas 78735-8598, 1995. 8. Steven W. Smith, "Cyfrowe przetwarzanie sygnałów DSP Praktyczny poradnik dla inżynierów i naukowców", Wydawnictwo BTC, 2007. 9. Mark Owen, "Przetwarzanie sygnałów w praktyce" Wydawnictwo WKiŁ, 2009. 10. P. Zbysiński, J. Majewski, "Układy FPGA w przykładach" Wydawnictwo BTC 2007.
Supplementary literature	_
eResources addresses	

Example issues/ example questions/ tasks being completed

Work placement

Not applicable

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