Subject card

Subject name and code	Data Acquisition, PG_00048387
Field of study	Electronics and Telecommunications

Date of commencement of studies	February 2023	Academic year of realisation of subject	2023/2024
Education level	second-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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	exam

Conducting unit	Department of Marine Electronic Systems -> Faculty of Electronics, Telecommunications and Informatics

Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jacek Marszal
	Teachers	dr hab. inż. Jacek Marszal

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15	2.0	33.0	50

Subject objectives	The aim of the course is to acquaint students with the methods of data acquisition including the process of signals preparing, multiplexing, analog to digital and digital to analog converters, including the power supply and methods provide a low signal-to-interference ratio.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_W03] Knows and understands, to an increased 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.	Student explains the theoretical basis of analog-to-digital conversion. Classifies and describes currently used technical methods of analog-to-digital conversion and gives the properties of analog-to-digital converters. Explains the operation of multi-channel measurement data acquisition systems and classifies and describes their interfaces. Based on knowledge of the parameters and technical characteristics of analog-to-digital converters, it selects them to the practical requirements of the systems.	[SW3] Assessment of knowledge contained in written work and projects
	[K7_W04] Knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	Student explains the theoretical basis of analog-to-digital conversion. Classifies and describes currently used technical methods of analog-to-digital conversion and gives the properties of analog-to-digital converters. Explains the operation of multi-channel measurement data acquisition systems and classifies and describes their interfaces. Based on knowledge of the parameters and technical characteristics of analog-to-digital converters, it selects them to the practical requirements of the systems.	[SW3] Assessment of knowledge contained in written work and projects

Subject contents	1. Organization issues: rules of passing, consultations, references.
	2. Introduction to data acquisition and data sharing in dedicated real-time systems.
	3. General information on Analogue to Digital and Digital to Analogue conversion.
	4. Sampling theorem.
	5. Second order, quadrature sampling.
	6. ADC and DAC codes.
	7. Digital to analogue conversion methods.
	8. Parameters of digital to analogue converters.
	9. Integrating ADC.
	10. Voltage-to-frequency converters.
	11. Sigma-delta ADC.
	12. **Direct conversion ADC** - flash ADC, successive approximation ADC.
	13. Charge-redistribution ADC.
	14. Sample and hold devices.
	15. Parameters of ADC - static parameters.
	16. Parameters of ADC - dynamic parameters.
	17. Multi-channel data acquisition systems in dedicated real-time systems.
	18. Analogue multiplexers.
	19. Process control of multi-channel data acquisition.
	20. The methodology of selecting the appropriate C/A and A/C sysems.
	21. Interference in converters C / A and A / C
	22. Digital data transfer interfaces with acquisition systems for microprocessors. Parallel interfaces; serial interfaces
	23. Converters and fiber optic couplers

Prerequisites and co-requisites	

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	60.0%	100.0%

Recommended reading	Basic literature	1. Plassche R. Scalone przetworniki analogowo-cyfrowe i cyfrowo-analogowe. WKŁ Warszawa 1997 2. Kulka Z., Libura A., Nadachowski M. Przetworniki analogowo-cyfrowe i cyfrowo-analogowe. WKŁ Warszawa 1987
	Supplementary literature	1. Gregg W.D. Podstawy telekomunikacji analogowej i cyfrowej. WNT Warszawa 1983
	eResources addresses	Adresy na platformie eNauczanie: Akwizycja danych 2024 - Moodle ID: 37969 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37969

Example issues/ example questions/ tasks being completed	
Work placement	Not applicable