Subject card

Subject name and code	Intelligent sensor systems, PG_00053369
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering

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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment

Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics

Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Grzegorz Jasiński
	Teachers	dr inż. Grzegorz Jasiński

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	3.0	17.0	50

Subject objectives	The aim of the course is to familiarize students with the structure and basic properties of intelligent sensors and intelligent sensor systems.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study by:n-appropriate selection of source information and its critical analysis, synthesis, creative interpretation and presentation,n-application of appropriate methods and toolsn	Knowledge about the use of intelligent sensors to build measurement systems	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
	[K7_W02] Knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	Knowledge of the features and properties of smart sensors	[SW1] Assessment of factual knowledge
	[K7_U06] can analyse the operation of components, circuits and systems related to the field of study; measure their parameters; examine technical specifications; interpret obtained results and draw conclusions	Knowledge of the functioning of intelligent sensors and intelligent sensor systems	[SU2] Assessment of ability to analyse information
	[K7_W05] Knows and understands, to an increased extent, methods of process and function support, specific to the field of study.	Knowledge of the construction and principles of operation of intelligent sensors	[SW1] Assessment of factual knowledge
	[K7_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, making assessment and critical analysis of the prepared software as well as a synthesis and creative interpretation of information presented with it	Znajomość wyboru, wykorzystania i zastosowania	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools

Subject contents	Introduction to the subject of intelligent sensors. Smart sensor design. ADC converters. Smart sensor interfaces and data formats. Intelligent sensor systems: sensors and sensor networks. Introduction to wireless sensor networks, problems and challenges. Examples of intelligent sensors. Intelligent sensor networks: signal processing. Sensors, electronics and noise reduction techniques. Reliable and energy-saving network protocols. Smart sensor standards.

Prerequisites and co-requisites	

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Test	50.0%	70.0%
	Lab	50.0%	30.0%

Recommended reading	Basic literature	T. Sidor, Elektroniczne przetworniki pomiarowe, UWN-D, Kraków 2006
		I.Kurytnik, M. Karpiński, Bezprzewodowa transmisja informacji, Wydawnictwo PAK, 2008
		W. Nawrocki, Rozproszone systemy pomiarowe, WKŁ Warszawa 2006
		Gerard C. M. Meijer
	Supplementary literature	J. Fraden, Handbook of modern sensors, Springer 2010
		Gerard C. M. Meijer, Smart Sensor Systems, Wiley 2014

	eResources addresses	Adresy na platformie eNauczanie:
		Inteligentne systemy sensorowe [2023/24] - Moodle ID: 34421 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34421
Example issues/ example questions/ tasks being completed	Give the characteristics of quasi-digital sensors	
Work placement	Not applicable	