



## Subject card

Subject name and code	Sensors and Actuators, PG_00048150						
Field of study	Electronics and Telecommunications						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2023/2024		
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			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Marine Electronic Systems -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Jan Schmidt					
	Teachers	dr inż. Jan Schmidt mgr inż. Aleksander Schmidt					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	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	45	4.0		51.0		100
Subject objectives	The aim is the education of an engineer with knowledge and skills of basic and directional range of sensors and actuators in marine electronics devices. The aim is also to prepare to take up studies on the second stage.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[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 knows the operating principles of the actuators.			[SW1] Assessment of factual knowledge		
	[K6_U06] can analyse the operation of components, circuits and systems related to the field of study, measure their parameters and examine technical specifications	Student measures parameters of switching systems with electromechanical and semiconductor relays, discrete drive systems with a stepper motor, and control systems with a hydraulic adjuster and electric actuators.			[SU1] Assessment of task fulfilment		

Subject contents	<ol style="list-style-type: none"> <li>1. Place and functions of measurement and actuator systems in industrial real time systems</li> <li>2. Classification of sensors and technologies of manufacturing. Intelligent sensors</li> <li>3. Sensors of fundamental mechanical quantities and environmental parameters</li> <li>4. Chemical sensors - atmosphere and water monitoring, measurement of fumes concentration and explosion proof protection</li> <li>5. Magnetic field sensors</li> <li>6. Applications of magnetic field sensors</li> <li>7. Optical and fiber-optic sensors</li> <li>8. Sensors used in control of moving objects and robotics: gyro sensors and compasses, tilt angle sensors</li> <li>9. Sensors used in control of moving objects and robotics, ultrasonic sensors of object velocity, echo sounder and sonar sensors</li> <li>10. Types of actuators: notions of controller, actuator and power amplifier</li> <li>11. Types of controllers and examples of construction</li> <li>12. Classification of actuators related to the kind of energy used. Examples of construction solutions of hydraulic and pneumatic actuators</li> <li>13. Direct current (DC) motors</li> <li>14. Three-phase alternative current (AC) motors</li> <li>15. Single-phase induction AC motors</li> <li>16. Stepping motors – basics of operation</li> <li>17. Types and features of stepping motors</li> <li>18. Controllers for DC and AC motors</li> <li>19. Control of stepping motors. Microstepping drive</li> </ol>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Colloquium at the time of the semester	60.0%	50.0%
	Reports of laboratory exercises	60.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Turkowski M. Przemysłowe sensory i przetworniki pomiarowe, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2000 (Czytelnia na Wydziale Mechanicznym PG)</li> <li>2. Nawrocki W. Sensory i systemy pomiarowe. Wydaw. Politechniki Poznańskiej, 2001(Czytelnia na Wydziale Elektrotechniki i Automatyki, Magazyn Biblioteki Głównej)</li> <li>3. Zajda Z., Żebrowski L. Urządzenia i układy automatyki. Wyd. Pol. Wrocł., Wrocław 1993 (Czytelnia na Wydziale ETI)</li> </ol>	
	Supplementary literature	1. Kostro J. Elementy, urządzenia i układy automatyki. Wydawnictwa Szkolne i Pedagogiczne Warszawa 1983.(Czytelnia na Wydziale ETI)	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		