



## Subject card

Subject name and code	Mobile Robots, PG_00049082						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2026/2027		
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			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Automatic Control -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Fiertek					
	Teachers	dr inż. Piotr Fiertek					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	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	3.0		27.0	75	
Subject objectives	Understanding theoretical and practical aspects of modern mobile robotics.						
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	Students will be familiar with basic methods of design, construction and programming of mobile robots mobile robots, i.e. machines that autonomously plan and performing the movements necessary for the execution of assigned tasks.			[SW1] Assessment of factual knowledge		
	[K6_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	They independently carry out several selected practical tasks requiring the construction and/or use of mobile robots.			[SU1] Assessment of task fulfilment		
Subject contents	1. Design principles of mobile robots (MR) and autonomous guided vehicles (AGV). 2. Overview of applications - performing tasks in hostile environments. 3. Overview of applications service and inspection tasks. 4. Locomotion systems wheeled systems. 5. Locomotion systems tracking systems. 6. Locomotion systems legged mechanisms. 7. Overview of legged mechanisms. 8. Ultrasonic sensors. 9. Ultrasonic range finders and their characteristics. 10. Optical sensors. 11. Infrared sensors. 12. Tactile and scent sensors 13. Machine vision systems. 14. Passive localization methods. 15. Active localization methods. 16. Global positioning systems (GPS). 17. Radionavigation systems 18. Sensor fusion. 19. Databases and models of the world used in mobile robotics. 20. Maps (grid, geometric, topological). 21. From measurements to maps. 22. Map-based robot localization procedures. 23. Formulation of the path-planning problem. 24. Path planning the visibility graph approach. 25. Path planning the Voronoi diagram approach. 26. Path planning the cell decomposition approach. 27. Path planning - the artificial potential field approach. 28. Path planning - the diffusion field approach. 29. Trajectory smoothing. 30. Multi-level robot control architectures. 31. Robot effectors. Selected problems of kinematics and dynamics of control. 32. Structure of the control system, on-board computer and communication systems. 33. Operating systems used in mobile robotics. 34. Robot simulators and their role in the design process. 35. Man-machine interface.						
Prerequisites and co-requisites							

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical exercise	50.0%	60.0%
	Midterm colloquium	50.0%	40.0%
Recommended reading	Basic literature	Tchoń K. i inni, "Manipulatory i roboty mobilne", Akademicka Oficyna Wydawnicza PLJ, 2000.	
	Supplementary literature	"Podstawy robotyki", praca zbiorowa pod redakcją A. Moreckiego i J. Knapczyka, WNT, 1993.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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