



Subject card

Subject name and code	Designing mobile robots, PG_00064571						
Field of study	Hydrogen Technologies and Electromobility						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2024/2025		
Education level	first-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Control Engineering -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Kowalski					
	Teachers	dr inż. Paweł Kowalski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	10.0	0.0	0.0	20.0	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	0.0		0.0	30	
Subject objectives	The aim of the course is to provide knowledge and skills in the independent design, construction, and programming of mobile robots. This includes learning tools and techniques for 3D design in FreeCAD, optimizing 3D models for printing, designing the mechanics and control electronics of robots, and programming microcontrollers responsible for their operation. This enables the realization of complete mobile robot projects from concept to finished device.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W07] knows the basics of computer programming, digital circuits, microprocessor technology, design of simple algorithms, principles of operation of computer networks	Designs the electronics of a mobile robot and programs the microcontroller that controls the mobile robot.	[SW3] Assessment of knowledge contained in written work and projects
	[K6_U05] can use analytical and simulation methods, prepare and for the formulation and solution of tasks in the field of hydrogen technologies, automation and robotics, electrical engineering, use various techniques to carry out engineering tasks related to electrical devices, hydrogen installations, control and robotics systems	Prepares and formulates engineering solutions for the design and propulsion of mobile robots, utilizing technologies from the fields of automation, robotics, and electrical engineering.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
	[K6_W08] has basic knowledge in the field of energy storage systems: mechanical, thermal, electrical and others, knows the basics of thermodynamics and fluid mechanics, as well as the construction and operation of thermal energy equipment, hydrogen installations, process equipment, including renewable energy sources	Possesses knowledge of energy storage for powering mobile robots.	[SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects
	[K6_K01] is aware of the need for continuous education and self-improvement in the field of the profession of an electrician and knows the possibilities of further education	Finds information in the literature useful for designing and building a mobile robot.	[SK1] Assessment of group work skills [SK2] Assessment of progress of work [SK3] Assessment of ability to organize work [SK5] Assessment of ability to solve problems that arise in practice
	[K6_W13] knows the properties of materials used in the field of hydrogen energy and electromobility	Selects appropriate materials for creating mechanical and electronic components of robots.	[SW3] Assessment of knowledge contained in written work and projects
[K6_U08] can design and build systems and devices related to automation systems, mechatronics and robotics in energy storage devices and in hydrogen installations	Designs and builds mobile robots.	[SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools	
Subject contents	Lecture: <ul style="list-style-type: none"> • Introduction to FreeCAD. • 3D design techniques for 3D printing. • Designing the mechanics of a mobile robot. • Preparing 3D models for 3D printing. • Designing control electronics for robots. • Introduction to microcontroller programming for controlling mobile robots. Project: <ul style="list-style-type: none"> • Designing a mobile robot. • Building a mobile robot. 		
Prerequisites and co-requisites	-		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	project	50.0%	60.0%
	lecture assignments	50.0%	40.0%
Recommended reading	Basic literature	freeCAD documentation, https://wiki.freecad.org/Main_Page	
	Supplementary literature	Ultimaker 3D Printing Academy, https://support.makerbot.com/s/topic/0TO5b000000Q4usGAC/ultimaker-3d-printing-academy	
	eResources addresses	Adresy na platformie eNauzanie:	
Example issues/ example questions/ tasks being completed	Development of a mobile robot using 3D printing technology.		
Work placement	Not applicable		

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