



## Subject card

Subject name and code	Mechatronics devices in medicine, PG_00007835						
Field of study	Mechatronics, Mechatronics						
Date of commencement of studies	October 2020		Academic year of realisation of subject		2022/2023		
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	6		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Zakład Hydrauliki i Pneumatyki -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Ryszard Jasiński				
	Teachers		dr hab. inż. Ryszard Jasiński  dr hab. inż. Paweł Śliwiński  dr inż. Józef Niegoda, doc. PG				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	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		0.0		0.0	30
Subject objectives	Familiarizing students with the construction and principle of operation of mechatronic devices in medicine						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K6_U05	Student uses properly selected tools to compare the design solutions of mechatronic components and systems used in medicine, due to the given utility and economic criteria.	[SU1] Assessment of task fulfilment
	K6_U05	Student uses properly selected tools to compare the design solutions of mechatronic components and systems used in medicine, due to the given utility and economic criteria.	[SU1] Assessment of task fulfilment
	K6_U06	Student is able to identify and formulate a specification of simple engineering tasks of a practical nature, characteristic of mechatronic devices used in medicine.	[SU3] Assessment of ability to use knowledge gained from the subject
	K6_U06	Student is able to identify and formulate a specification of simple engineering tasks of a practical nature, characteristic of mechatronic devices used in medicine.	[SU3] Assessment of ability to use knowledge gained from the subject
	K6_W08	Student understands the processes of designing and manufacturing elements and simple mechatronic devices used in medicine.	[SW2] Assessment of knowledge contained in presentation
	K6_W11	Student has basic knowledge about the life cycle of mechatronic devices.	[SW2] Assessment of knowledge contained in presentation
	K6_W08	Student understands the processes of designing and manufacturing elements and simple mechatronic devices used in medicine.	[SW2] Assessment of knowledge contained in presentation
	K6_W11	Student has basic knowledge about the life cycle of mechatronic devices.	[SW2] Assessment of knowledge contained in presentation
Subject contents	Construction and principle of operation of ventilators. Transport devices (transport trolleys, stairclimbers, transport vehicles). Braces for upper, lower and trunk limbs. Finger prostheses, upper and lower limbs. Designing a bionic arm (pneumatic muscles, equation of motion, kinematic diagram). Unity (elements and equipment, pneumatic diagrams). Dental compressors. Devices for supporting blood circulation (human heart, supporting the circulatory system, methods of counterpulsation, peristaltic pumps, artificial hearts). Renal dialysis devices (kidney functions, hemodialysis, artificial kidney functional system, semi-permeable membrane, peritoneal dialysis). Construction and principle of operation of endoscopes. X-ray machine (radiology, X-rays, X-ray machine construction, power supply system, X-ray tube construction, X-ray machines). Medical robots (classification of medical robots, assistant robots, accurate positioning and movement systems, manipulators and diagnostic cameras). Surgical robots (telem manipulators, ZEUS and Robin Heart surgical robots, surgical materials and tools). Urological robot (construction of the MrBot robot, construction and control of the PneuStep motor).		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		56.0%	100.0%
Recommended reading	Basic literature	Basics of automationBasics of hydraulics and pneumaticsElements of mechatronic systems	

	Supplementary literature	<p>Heiman B., Gerth W., Popp K.: Mechatronika, metody, przykłady, tł. Gawrysiak M., Wydawnictwo Naukowe PWN, Warszawa, 2001</p> <p>Gawrysiak M.: Mechatronika i projektowanie mechatroniczne, Rozprawy Naukowe Nr 44, Polit. Białostocka, Białystok, 1997</p> <p>Schmid D. i inni: Mechatronika, ISBN 83-7141-425-0, Warszawa 2002</p> <p>Praca zbiorowa: Urządzenia i systemy mechatroniczne. Cz.2, Wydawnictwo REA, 2009</p> <p>Dindorf R., Wołkow J.: Systemy płynowe w inżynierii medycznej. Zakład Narodowy im Ossolińskich. Wrocław Warszawa Kraków. 1999.</p> <p>Pawlicki G.: Podstawy inżynierii medycznej. Oficyna Wydawnicza Politechniki Warszawskiej. Warszawa 1997.</p> <p>Podsędkowski L.: Roboty medyczne. Budowa i zastosowanie. WNT Warszawa 2010.</p>
	eResources addresses	<p>Adresy na platformie eNauczanie:</p> <p>Mechatroniczne urządzenia w medycynie 2023 - Moodle ID: 29328  <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29328">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29328</a></p>
Example issues/ example questions/ tasks being completed	Sample questions: Blood pressure monitors. Devices to support blood circulation. Medical robots.	
Work placement	Not applicable	