



Subject card

Subject name and code	Methods of medical construction design, PG_00057489						
Field of study	Mechanical and Medical Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2022/2023		
Education level	second-cycle studies	Subject group			Obligatory subject group in the field of study 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	1	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Grzegorz Rotta				
	Teachers		dr inż. Grzegorz Rotta dr inż. Leszek Dąbrowski				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	30.0	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		10.0		45.0	100
Subject objectives	Repetition and consolidation of knowledge on the design of mechanical machines and devices, with particular emphasis on factors typical for medical and rehabilitation equipment. The lecture includes a review of the most important information on the basics of designing and calculating mechanical structures, joints and the selection of typical elements of catalog machine parts. In addition, design aspects that affect the specificity of medical devices will be discussed in an extended way. Design projects of medical devices made by students will help in deeper understanding of new problems						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_K03] He/she can analyze and realize given tasks proposing entrepreneur and creative activities		In the design process, the student identifies and formulates practical engineering tasks aimed at solving a technical problem and makes a critical analysis of the existing solutions.		[SK2] Assessment of progress of work [SK5] Assessment of ability to solve problems that arise in practice		
	[K7_U07] He/she can see systematic and outer technique aspects while stating and solving the tasks		In the design process, the student takes into account non-technical aspects, such as ergonomics and aesthetics of devices as well as system aspects		[SU1] Assessment of task fulfilment		
	[K7_U11] He/she can design and modify tools, objects and systems related to the mechanical-medical engineering by using outer technique aspects. He/she is able to choose the engineering material that can be used to apply devices. He/she is able to make a preliminary economic analysis		In the design process, the student takes into account non-technical aspects, such as ergonomics and aesthetics of devices with the use of appropriate materials. The student is able to estimate which manufacturing technology will be the best for the proposed structure.		[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment		
	[K7_U06] He/she uses analytical engineering, numerical and experimental methods to state and solve the tasks		In the design process, the student uses analytical and computer methods to formulate and solve engineering tasks.		[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment		

Subject contents	<p><b>Definitions and classifications of medical devices, equipment and tools (3h) Repetition of Fundamentals of Machine Design (4h)</b></p> <ul style="list-style-type: none"> <li>• Strength nomenclature, general strength, fatigue strength</li> <li>• Welds</li> <li>• Bolted connections</li> <li>• Shafts and axles</li> <li>• Rolling bearings</li> </ul> <p><b>Materials Science and Production Technologies (2h)</b></p> <ul style="list-style-type: none"> <li>• Features and applications of various groups of materials with an emphasis on medical applications</li> <li>• Traditional technologies: turning, milling, drilling, grinding, casting, welding, soldering, welding</li> <li>• Additive technologies</li> <li>• Electric gouging</li> <li>• Injection molding machines (syringe manufacturing, mass production, expensive molds)</li> </ul> <p><b>Drives (2h)</b></p> <ul style="list-style-type: none"> <li>• Types, classification and application (including in the Medical University) of electric motors</li> <li>• Inverters, inverters</li> <li>• Electric actuators</li> <li>• Electric battery drives (motors, actuators)</li> </ul> <p><b>Design - methodology (4h)</b></p>											
Prerequisites and co-requisites	<p>Basic knowledge in:</p> <ul style="list-style-type: none"> <li>- fundamentals of machine design</li> <li>- technical drawing</li> <li>- mechanics and strength of materials</li> <li>- materials science</li> <li>- ability to use the CAD program</li> </ul>											
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Subject passing criteria</th> <th style="width: 33%;">Passing threshold</th> <th style="width: 33%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Lecture test</td> <td>50.0%</td> <td>25.0%</td> </tr> <tr> <td>Design project</td> <td>50.0%</td> <td>75.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Lecture test	50.0%	25.0%	Design project	50.0%	75.0%
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Design project	50.0%	75.0%										
Recommended reading	Basic literature	<p>Niezdziński: "Wzory, wykresy i tablice wytrzymałościowe", WNT, Warszawa (dowolne wydanie, sugerowane najnowsze)</p> <p>Skrypty PG z serii "Wykład z PKM z ćwiczeniami rachunkowymi"</p> <p>Dobrzański T. : " Rysunek techniczny maszynowy", WNT, Warszawa (dowolne wydanie, sugerowane najnowsze)</p>										

	Supplementary literature	Leonid W. Kurmaz, Oleg L. Kurmaz: "Podstawy konstruowania węzłów i części maszyn. Podręcznik konstruowania", Kielce, 2011  Leonid W. Kurmaz, Oleg L. Kurmaz: " Podstawy konstrukcji maszyn - projektowanie", PWN, Warszawa
	eResources addresses	Adresy na platformie eNauczenie: Metodyka projektowania urządzeń medycznych - Moodle ID: 29804 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=29804">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=29804</a>
Example issues/ example questions/ tasks being completed	<p>Design projects</p> <ul style="list-style-type: none"> <li>- wheelchair modernization (ergonomics, drive, etc.)</li> <li>- design of a medical / rehabilitation device carrying out a specific activity</li> <li>- a project of living / living facilities in an apartment / house of a person with a specific disability</li> </ul> <p>Test:</p> <ul style="list-style-type: none"> <li>- metals (other materials) used in medical devices</li> <li>- safety factor in the calculation of medical / rehabilitation devices</li> <li>- electric drives used in medical / rehabilitation devices</li> </ul>	
Work placement	Not applicable	