



Subject card

Subject name and code	CHEMICAL AND BIOTECHNOLOGICAL APPARATUS, PG_00063449						
Field of study	Biotechnology						
Date of commencement of studies	October 2025	Academic year of realisation of subject			2025/2026		
Education level	second-cycle studies	Subject group			Obligatory subject group 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			exam		
Conducting unit	Department Of Energy Conversion And Storage -> Faculty Of Chemistry -> Wydział Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Monika Wilamowska-Zawłocka				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	15.0	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	Student learns about the classification of industrial processes (mechanical, thermal and diffusion) and construction and operation of devices for their implementation. The equations describing fluid dynamics will be discussed. The construction and function of apparatus i.e. pumps, pipelines, tanks, reactors and bioreactors, conveyors, grinding machines, apparatus for separation and mixing processes, heat exchangers, drying, distillation, rectification and mass transfer devices will be presented. The devices will be discussed in terms of their usefulness in the biotechnological industry.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_K02] is aware of the potential risks and opportunities associated with the development of science and technology for the natural environment and society	The student knows industrial processes and installations. He can select the right device and construction material for various chemical substances. He knows the environmental impact of various chemicals used in industry.			[SK3] Assessment of ability to organize work [SK5] Assessment of ability to solve problems that arise in practice		
	[K7_W05] identifies crucial developments in research, apparatus and technology in biotechnology and related fields	The student has knowledge of developments and advances in chemical and biotechnological apparatus.			[SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects		
	[K7_U05] proposes solutions to technological and scientific problems in biotechnology and related fields using experimental methods and bioinformatics, statistics and specialized databases	On the basis of available tools and databases, the student is able to solve technological and scientific problems.			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject		
Subject contents	The content of the classes includes the presentation of necessary information relating to construction and operational principles of conventional machines and apparatuses generally applied in the chemical and biotechnological industries. The lecture covers discussion of the relations between the theory of devices operation and their construction supplemented with drawings. The intention is to give sufficient theoretical matter to provide the student with a satisfactory understanding of the subjects discussed.						
Prerequisites and co-requisites	Knowledge of chemical engineering, basic mathematics, basic physical chemistry, knowledge of selected physical quantities						
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	Lectures		60.0%		60.0%		
	Project		60.0%		40.0%		

Recommended reading	Basic literature	<p>1. Błasiński H., Młodziński B., - Aparatura przemysłu chemicznego, WNT 1983,</p> <p>2. Pikoń J., - Aparatura chemiczna, PWN 1978,</p> <p>3. J. Warych, Aparatura Chemiczna i Procesowa, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1996</p> <p>4. Bieszk H., Urządzenia do realizacji procesów mechanicznych w technologii chemicznej, Wyd. PG. 2001,</p> <p>5. Bieszk H., Urządzenia do realizacji procesów cieplnych w technologii chemicznej, Wyd. PG. 2010,</p> <p>6. Pawłow K.F., Romankow P.G., Noskow A.A. - Przykłady i zadania z zakresu aparatury i inżynierii chemicznej, WNT 1981.</p>
	Supplementary literature	<p>1. Viesturs U.E., Szmitė I.A., Žilewicz A.W., - Biotechnologia, WNT 1992.</p> <p>2. Koch R., Noworyta A.: Procesy mechaniczne w inżynierii chemicznej. WNT, Warszawa 1992,</p> <p>3. Leszczyński S.: Filtracja w przemyśle chemicznym. WNT, Warszawa 1972,</p> <p>4. Stępniewski M.: Pompy. WNT, Warszawa 1985,</p> <p>5. Goździecki M., Świątkiewicz H., Przenośniki. WNT, Warszawa 1979</p>
	eResources addresses	Adresy na platformie eNauczanie:

<p>Example issues/ example questions/ tasks being completed</p>	<ul style="list-style-type: none"> <li>- Fluid dynamics - equations describing fluid dynamics, flow resistance in pipelines.</li> <li>- Pipelines and pipeline armature for chemical processes</li> <li>- Pumps - standard and special pumps, their construction and application, pump sealing</li> <li>- Compressors and fans</li> <li>- Transport of materials - conveyors</li> <li>- Storage tanks - materials and components of containers depending on the type of substance stored</li> <li>- Mixing processes in the chemical industry, construction of mixers, types of mixers, mixing efficiency and methods of vortex elimination</li> <li>- Reactors and bioreactors</li> <li>- Shredding processes - construction of equipment and energy consumption of operations depending on the required degree of fragmentation</li> <li>- Separation of heterogeneous systems</li> <li>- Heat exchange - heat transfer coefficients, heat exchangers, evaporators, crystallizers, dryers.</li> <li>- Mass exchange - adsorption and absorption columns</li> <li>- Distillation and rectification processes</li> </ul> <p>Sample questions:</p> <p>List and describe the differences between displacement and centrifugal pumps.</p> <p>Why are the pumps connected in series / parallel?</p> <p>How can the capacity of a centrifugal / piston pump be adjusted?</p> <p>Which pumps are suitable for transferring finely structured liquids and slurries (without damaging the liquid structure)?</p> <p>List a pipeline cleaning methods.</p> <p>How to reduce / eliminate circular motion in mixers?</p> <p>List the types of bioreactors.</p> <p>Specify the device (s) best suited for separating a three-phase liquid-liquid-solid system.</p> <p>Why are heat exchangers connected in series / parallel?</p> <p>Why are evaporators often combined in series?</p>
<p>Work placement</p>	<p>Not applicable</p>

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