GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Chemical and Biotechnological Apparatus, PG_00054694		
Field of study	Biotechnology		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
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		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Monika Wilamowska-Zawłocka	
	Teachers	dr hab. inż. Monika Wilamowska-Zawłocka	

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_W10] has knowledge in the field of bioprocess technology and engineering and knowledge in the field of engineering design of technical objects and processes including engineering graphics with the use of computer-aided design and databases	The student knows the construction and operation of basic equipment used in chemical and biotechnological technology. He is able to select on the basis of calculations the appropriate equipment for industrial installation. The student uses standards and catalogs of apparatus provided by manufacturers in the design of installations.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects
[K7_U10] is able to use knowledge about possibilities, aims and limitations of biotechnology to develop, design and obtain products and biotechnological processes in the area of his/her specialization	The student has knowledge of biotechnological processes and industrial installations used in the biotechnology industry.	[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
Project	60.0%	40.0%
Lectures	60.0%	60.0%

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

Example issues/ example questions/ tasks being completed	- Fluid dynamics - equations describing fluid dynamics, flow resistance in pipelines. - Pipelines and pipeline armature for chemical processes - Pumps - standard and special pumps, their construction and application, pump sealing - Compressors and fans - Transport of materials - conveyors - Storage tanks - materials and components of containers depending on the type of substance stored - Mixing processes in the chemical industry, construction of mixers, types of mixers, mixing efficiency and methods of vortex elimination - Reactors and bioreactors - Shredding processes - construction of equipment and energy consumption of operations depending on the required degree of fragmentation - Separation of heterogeneous systems - Heat exchange - heat transfer coefficients, heat exchangers, evaporators, crystallizers, dryers. - Mass exchange - adsorption and absorption columns - Distillation and rectification processes Sample questions: List and describe the differences between displacement and centrifugal pumps. Why are the pumps connected in series / parallel? How can the capacity of a centrifugal / piston pump be adjusted? Which pumps are suitable for transferring finely structured liquids and slurries (without damaging the liquid structure)? List a pipeline cleaning methods. How to reduce / eliminate circular motion in mixers? List the types of bioreactors. Specify the device (s) best suited for separating a three-phase liquid-liquid-solid system. Why are heat exchangers connected in series / parallel? Why are evaporators often combined in series?
Work placement	Not applicable