GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Chemical apparatus, PG_00060845		
Field of study	Chemical Technology		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	first-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	2	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		

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	5.0	50.0	100

Subject objectives

This course teaches students about the classification of industrial processes, including mechanical, thermal, and diffusion processes, as well as the construction and operation of the corresponding apparatus. The course covers equations that describe fluid dynamics, such as Bernoulli's equation and the calculation of flow resistance, as well as the construction and function of machines and apparatus, such as pumps, pipelines, tanks, conveyors, grinding, separation and mixing equipment, heat exchangers, drying equipment, distillation, rectification, and mass exchange equipment.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K01] understands the need for continuing education, and is aware of the opportunities to improve professional, personal and social competences	The student understands the role of an engineer, taking into account social, economic, and ethical aspects. They also recognize the importance of improving their professional competencies.	[SK2] Assessment of progress of work
[K6_W04] understands processes occurring in the life cycle of equipment and facilities and has knowledge of mechanical engineering, chemical apparatus, technical thermodynamics and chemical engineering and chemical reactor engineering necessary to analyse technological processes and correctly design installations and systems in the chemical industry	The students are familiar with the construction and operation of fundamental equipment used in chemical technology. Based on calculations, they are able to design an industrial installation and select suitable equipment for it.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K6_U04] performs basic design calculations of selected processes and unit operations, is able to calculate and select the basic apparatus of chemical industry in a process line	Students have knowledge of technological and industrial processes and installations. They are capable of selecting appropriate equipment and construction materials for various chemical substances based on calculations and assumptions.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject

<table>
<tr><td>Subject contents</td><td>- Fluid dynamics - equations describing fluid dynamics, resistance to flow in pipelines.
- Pipelines and auxiliary fittings for chemical processes
- Pumps - standard and special pumps, their construction and use, pump seals
- Compressors and fans
- Bulk material handling - conveyors
- Storage tanks - materials and construction elements of tanks depending on the type of substance stored
- Mixing processes in the chemical industry, construction of mixers, types of mixers, mixing efficiency mixing efficiency and ways of eliminating whirls
- Grinding processes - construction of equipment and energy consumption of processes depending on the required
degree of comminution
- Separation of heterogeneous systems
- Heat transfer - coefficients of heat penetration, conduction and transfer, heat exchangers, evaporators, crystallisers
evaporators, crystallisers, dryers.
- Mass transfer - adsorption and absorption columns
- Distillation and rectification</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of mathematics, physics, chemistry, technical drawing, mechanical engineering, computer skills.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Lectures</td><td>60.0%</td><td>60.0%</td></tr>
<tr><td>Project</td><td>60.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>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</td></tr>
<tr><td>Supplementary literature</td><td>1. Goździecki M., Świątkiewicz H., Przenośniki. WNT, Warszawa 1979,
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</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Sample questions:
List and describe the differences between positive displacement pumps and centrifugal pumps.
Why are pumps connected in series/parallel?
How can the capacity of a centrifugal/piston pump be adjusted?
Give examples of special purpose fittings in pipelines.
List the methods of cleaning pipelines.
How do you reduce/eliminate circular motion in mixers?
State the device(s) best suited for separating a liquid-liquid-solid three-phase system.
solid.
Why are heat exchangers combined in a series/parallel system?
Why are evaporative apparatuses combined into batteries?
What is the role of the overflow on the shelf of the rectification column?</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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