GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	THEORY OF MACHINES AND APPARATUS, PG_00064379						
Field of study	Chemistry						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2026/2027			
Education level	first-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	2		ECTS credits	5.0			
Learning profile	general academic profile		Assessment form	exam			
Conducting unit	Department of Energy Conversion and Storage -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Katarzyna Januszewicz				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	30.0	0.0	60
	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	60		5.0	60.0	125	
Subject objectives	Familiarizing the student with technical and engineering topics such as technical drawing, strength of materials, construction materials, and machine and apparatus components commonly used in the chemical industry. Gaining knowledge of the operating principles and design of equipment applied in industry, particularly in the chemical sector. Learning about technological installations, acquiring the ability to select an appropriate pump for a system, and performing basic engineering calculations related to stresses in a given system as well as the characteristics of fluids and flow processes.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U06] analyses the operation of equipment, apparatus and process lines used in laboratories and the chemical industry	The student identifies the five basic types of mechanical stresses used in engineering (tensile, compressive, shear, buckling, and bearing stresses). They classify, describe, and draw the fundamental joints used in the chemical industry. The student calculates the basic dimensions of vessel or installation components. They recognize the main types of valves and fittings used in chemical industry systems. The student is familiar with the classification of construction materials applied in the design of chemical process installations.	[SU1] Assessment of task fulfilment
[K6_K04] is able to identify and resolve dilemmas related to the chemical engineering profession while respecting traditions and ethical principles	The student is able to assign the appropriate types of stresses and theoretical concepts to potential failures or structural disasters of construction elements.	[SK2] Assessment of progress of work
[K6_W05] recognises methods, techniques and tools of computer aided design for solving engineering tasks in chemistry, chemical engineering and technology, mechanical engineering, in the design and analysis of technological processes	The student recognizes equipment in technical drawings and is able to describe its construction and operating principle.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
[K6_U08] applies computer-aided, common methods, chemical apparatus and tools necessary for the solution of simple engineering tasks involving for example technological processes, with a preliminary economic analysis of the engineering activities undertaken	The student is able to select an appropriate pump for a given installation. They can use standards relevant to the topics discussed and can identify the basic components of technical installations in technical drawings.	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment

Subject contents

Course content – lecture

Principles of preparing and reading technical drawings, diagrams, and technical documentation; selected topics in mechanics, statics, and strength of materials, including tension, compression, pressure, shear, and vessel strength; joints used in the construction of equipment and apparatus in the chemical industry, such as threads, welds, rivets, and others; an overview of construction materials used in the chemical industry, including metals (ferrous and non-ferrous), natural materials (wood, leather, cork, rubber), and synthetic materials (ceramics, glass, plastics); discussion of the design and operating principles of components used in chemical industry installations, including tanks, valves, liquid level indicators, sight glasses, measurement points, mixers, etc.; presentation of material-handling equipment such as mechanical, pneumatic, and hydraulic conveyors, as well as mixers; heat-exchange apparatus (non-separating heat exchangers, recuperators, and regenerators); crushing and screening equipment (crushers, jaw breakers, roller mills, mills, disintegrators); apparatus and devices for the distribution of heterogeneous mixtures, including gas dedusting and suspension separation; and pumps.

Course content – project

Calculation tasks covering various types of stresses (tensile, compressive, bearing, shear, and buckling) as well as topics related to chemical process equipment (pump selection, types of flow in pipelines). The project involves calculations associated with selecting an appropriate vessel and pump for a given system.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Exam	60.0%	30.0%
Test	60.0%	50.0%
Project	60.0%	20.0%

Recommended reading	Basic literature	Praca zbiorowa, Mały Poradnik Mechanika t.I i II, WNT, Warszawa, 1988, W.Lewandowski, Maszynoznawstwo chemiczne, Ćwiczenia projektowe, Wyd. PG., 1979, W.Lewandowski, A.Melcer, Zadania z maszynoznawstwa chemicznego, Wyd.PG, 2011. W.Lewandowski, Maszynoznawstwo chemiczne, Ćwiczenia projektowe, Wyd. PG., 1979, W.M.Lewandowski, Notatki z wykładów, W.Lewandowski, Techniczno-technologiczne i aparaturowe aspekty ochrony powietrza, Wyd.PG.Gdańsk, 2011 J.Pikoń, Podstawy konstrukcji aparatury chemicznej , cz.1, PWN, Warszawa, 1979 J.Pikoń, Aparatura chemiczna, PWN, Warszawa, 1978 J.Pikoń,Atlas konstrukcji aparatury chemicznej, PWN, Warszawa, 1987
	Supplementary literature	W.Lewandowski Materiały pomocnicze do projektowania zbiornika, Strona domowa Katedry, (http://www.pg.gda.pl/chem/Katedry/Maszyny/masz_index.html)
	eResources addresses	
Example issues/ example questions/ tasks being completed	Tasks involving vessels (wall thickness), the diameter of a screw conveyor, flange connections, and internal pressure in a tank. Calculations related to the practical application of the Bernoulli equation and the continuity equation. Pump selection and the design of a pipeline installation.	
Practical activites within the subject	Not applicable	

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