GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Design of Technological Processes, PG_00036528		
Field of study	Chemistry		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
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	3	Language of instruction	Polish
Semester of study	5	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Process Engineering and Chemical Technology -> Faculty of Chemistry -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Robert Aranowski	
	Teachers	dr inż. Robert Aranowski	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	0.0	30.0	0.0	30
	E-learning hours included: 0.0						
	eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=1072						

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	30	10.0	35.0	75

Subject objectives	Student after finish the course should obtain knowledge and skills necessary for complex chemical and technological processes.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U06] can analyze the functioning of equipment, apparatus and technology lines used in laboratories and chemical industry, and can recognize and propose methods to solve the simple engineering tasks which he can meet as an Engineer and select and use routine methods, chemical apparatus and tools to solve practical engineering tasks, including also technological processes; can himself/herself read and make technical drawings using CAD software	Independently reads and creates PFD and P&ID drawings (ISO/PN symbols, layers, line/fitting designations), simple 2D piping layout drawings and assembly diagrams in CAD software.	[SU4] Assessment of ability to use methods and tools
[K6_K03] understands the importance of group and team activities in which members adopt various roles	The student is able to define and assume a role in a project team (e.g. project leader, technical leader, planner), and prepare a schedule for implementing project tasks.	[SK1] Assessment of group work skills
[K6_U08] is capable to design and carry out the experiment which is necessary to confirm a given hypothesis and sees wider context, often beyond-technical, of the analysed phenomena	Takes into account the safety, environment (e.g. DNSH), cost/ energy consumption, regulations and social aspects (e.g. acceptance, waste logistics) of the project.	[SU1] Assessment of task fulfilment
K6_W10	Knows the structure and principles of selection of basic machines and process equipment (heat exchangers, pumps, compressors, columns, reactors, mixers, valves) and typical design criteria (material, pressure, temperature, corrosion, ATEX).	[SW3] Assessment of knowledge contained in written work and projects

Subject contents

Course topics:

1. Introduction to technological process design. The essence of process design.
2. Sources of scientific and patent information. Industrial property protection. Method selection and the issue of patent protection.
3. Principles of creating design documentation: documentation of laboratory procedures, laboratory-scale technological methods, process design assumptions, process design documentation.
4. Chemical process concept. Selection of chemical reactions and separation methods. Selection of process type. Selection of laboratory technical solutions.
5. Interactions between chemical and technological concepts.
6. Chemical project concept.
7. Schematic diagram. Using AutoCAD.
8. Process flowchart. Using AutoCAD. Sankey diagram.
9. Material and energy balance. Using IT tools in design calculations.
10. Occupational health and safety issues. Fire hazards.
11. Selection of technological equipment. Basic equipment. Auxiliary equipment and devices. Examples of batch equipment selection.
12. Selection of construction materials and corrosion protection. Construction materials used in the chemical industry. The problem of chemical corrosion of materials. Corrosion protection methods.
13. Process control concept. Analysis of process parameter assumptions. Selection of measurement and execution devices.
14. Economic analysis of the project.
15. Project presentation.

Prerequisites and co-requisites

The basic knowledge of operation and processes unit, organic and inorganic technologies, construction of apparatuses and equipments of the chemical industry.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Teamwork	60.0%	20.0%
Design of technological process	60.0%	80.0%

Recommended reading	Basic literature	1. J. Głowiński, Przykłady i zadania do przedmiotu Podstawy technologii chemicznej, Politechnika Wrocławska, Wrocław 1991. 2. S. Kucharski, J. Głowiński, Podstawy obliczeń projektowych w technologii chemicznej, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2000. 3. Stelecki, L. Gradaoń, Podstawowe procesy przemysłu chemicznego, WNT, Warszawa 1985. 4. N.G. Anderson, Practical Process Research and Development, Academic Press, San Diego, California, USA 2000. 5. P.W. Atkins, Chemia fizyczna, PWN, Warszawa 2001. 6. Grzywa, Edward Jan, Technologia podstawowych syntez organicznych. T. 1, Surowce do syntez, Warszawa : Wydaw. Nauk.-Techn., 1995. 7. J. Pikoń Jerzy, Podstawy konstrukcji aparatury chemicznej. Cz. 1, Tworzywa konstrukcyjne, Warszawa: Państw. Wydaw. Nauk., 1979. 8. Myers Alan L., Obliczenia komputerowe w inżynierii chemicznej, Warszawa : Wydaw. Naukowo-Techniczne, 1979. 9. Pavlov, Konstantin Feofanovič, Przykłady i zadania z zakresu aparatury i inżynierii chemicznej. Tł.z j. ros, Warszawa : Państw. Wydaw. Tech., 1964. 10. Pikoń Jerzy, Aparatura chemiczna, Gliwice : Politechnika Śląska, 1971. 11. Szarawara Józef, Podstawy inżynierii reaktorów chemicznych, Warszawa : Nauk.-Techn., 1980.
	Supplementary literature	1. Myers Alan L., Obliczenia komputerowe w inżynierii chemicznej, Warszawa : Wydaw. Naukowo-Techniczne, 1979. 2. Marlewski, Adam Derive, Pomocnik matematyczny.Wersja 2.0, Poznań, Wydaw. NAKOM, 1992. 3. Linkiewicz Grzegorz, Mathcad 4.0/5.0 for Windows, Warszawa, Wydaw. EXIT, 1994.
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. The diethyl ether was obtained by the catalytic dehydration of ethanol at 450-500K. The raw material fed to the reactor after the initial evaporation and steam heated to a temperature of 450K. The reactor consists of a bundle of tubes inside which provided a solid catalyst. It is assumed that catalyst consumption is low and its presence in the stream exiting the reactor can be omitted. The product stream from the reactor pre-cooled to a temperature of 345K and subjected to separation column from which the ether is withdrawn as a pure distillate. The residue from the first column containing ethanol and water is subjected to separation in a second column, and the resultant overflow having 92 mole% of ethanol is recycled to the reactor. For the production of ether use of ethyl alcohol of 95 mole% ethanol. The conversion of ethanol is 0.9, and the process at atmospheric pressure. Introduce the process material balance for process efficiency DEE 1 kmol / h. 2. Draw the flow diagram of a catalytic cracking of crude oil vacuum distillation residues.	
Work placement	Not applicable	

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