GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Design of Technological Processes, PG_00052572		
Field of study	Chemistry in Construction Engineering		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
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	2	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Process Engineering and Chemical Technology -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Robert Aranowski	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	30.0	15.0	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	35.0	100

Subject objectives

Student after finish the course should obtain knowledge and skills necessary for complex chemical and technological processes design and in particular choose the right path of chemical and physical transformations as well as mass and energy balances.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K7_U04	Student is able to design technological processes, especially in construction material chemistry, use programming tools such as ChemCAD, Inventor, SciLab, PowerPoint	[SU4] Assessment of ability to use methods and tools
K7_W08	Student has the necessary knowledge to determine the influence of process parameters on the properties of the materials produced in the designed process	[SW3] Assessment of knowledge contained in written work and projects
K7_U01	Student during the development of a technological project is able to use information from literature and patent databases such as: Chemical Abstracts / ChemFinder, Beilstein, Patent databases, Electronic databases of the STN system	[SU2] Assessment of ability to analyse information
K7_U14	The student is able to optimise the technical and technological solutions during the selection of apparatus for the designed process	[SU4] Assessment of ability to use methods and tools
K7_K01	A student uses the most recent solutions found in the literature, in order to develop technological concept for the project	[SK2] Assessment of progress of work

Subject contents	The essence of the the law the suit project. The chemical conception of the project: the general concept of the proposed method, the profile of materials, the main product and side products, the character of wastes and waste waters with the discussion of the possibility of their utilization, storing or neutralizing. The block diagram and flaw sheet diagram of the process, the parameters of processes and operations. Calculation of the physic-chemical propriety of the mixtures (gravity, viscosity, critical parameters). Material balance, Himmelblau"s method, material balance system equations, calculation mass balance of processes with the chemical reaction. Energy balance, calculation of the changes of the enthalpy, the enthalpy of dissolving, the enthalpy of the reaction, the influence of temperature and pressure on the enthalpy of reaction. Aquatic legal survey, Business plan.
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
Design of technological process	80.0%	50.0%
Test	60.0%	50.0%

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

Adresy na platformie eNauczanie:

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.

1. Draw the flow diagram of a catalytic cracking of crude oil vacuum distillation residues.

Work placement	Not applicable