GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	TEAM PROCESS PROJECT, PG_00064410						
Field of study	Chemistry						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2028/2029			
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	3		Language of instruction	Polish			
Semester of study	6		ECTS credits	4.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Process Engineering and Chemical Technology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Robert Aranowski				
	Teachers						

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	0.0	45.0	0.0	45

E-learning hours included: 0.0

eNauczanie source addresses:

Moodle ID: 6921 Projekt Procesowy Zespołowy, Chemia, 2027/28-02
https://enauczanie.pg.edu.pl/2025/course/view.php?id=6921

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

The aim of the course is to develop the ability to design, analyze, and evaluate technological processes based on real engineering data and current design standards used in the chemical, energy, and environmental industries. The course builds competencies in team-based project work, including role distribution, task management, integration of results, and responsibility for jointly developing a complete process design.

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	Is able to analyse the operation of process equipment and devices and their interconnections within a designed technological installation, and to select the basic equipment required for the process.	[SU1] Assessment of task fulfilment
[K6_U01] gathers information from literature, databases and other sources, interpreting, critically evaluating, summarising, formulating and justifying opinions, independently analyses and produces technical drawings with the use of computer assistance	Is able to obtain, analyse and critically evaluate information from literature, databases and technical sources and use it to justify the adopted design solutions and prepare project documentation, including process diagrams using computer-aided tools.	[SU1] Assessment of task fulfilment
[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	Is able to use computer-based calculation, simulation and design tools to develop a technological process design, perform material and energy balances, select basic process equipment and carry out a preliminary economic analysis.	[SU1] Assessment of task fulfilment
[K6_W04] identifies the conditions of chemical processes occurring in the analysed systems through the appropriate selection of methods to solve them, by taking into account the interdependence of the structure and properties of key materials in sustainable development technologies	Has knowledge of the physicochemical and process-related conditions necessary for the development of a technological process design, including the selection of construction materials with consideration of their properties and the principles of sustainable development.	[SW2] Assessment of knowledge contained in presentation

Subject contents

Course content – project

Introduction to the implementation of a team-based technological project. Definition of the project scope, documentation requirements, project structure and principles of teamwork organization. Development of a preliminary technological process concept, definition of process fundamentals and functional description, and selection of main unit operations. Preparation of a conceptual process diagram and identification of input and output streams. Selection of technological parameters and data required for process calculations. Development of a detailed process description and relationships between process equipment and streams. Preparation of a Process Flow Diagram (PFD). Preparation of material and energy balances and analysis of process variants using computational and simulation tools. Determination of utility requirements and analysis of possibilities for reducing energy consumption. Selection of construction materials considering process fluid properties and corrosion risks. Selection of main process equipment, determination of key equipment parameters, and preparation of an equipment list and operating schedule. Development of a process monitoring and control concept, including key controlled variables, measurement points and final control elements. Analysis of process safety and occupational health and safety requirements. Assessment of environmental impact, identification of emissions, wastewater and waste, and determination of measures to minimize their generation. Preparation of a preliminary economic justification considering capital expenditures (CAPEX) and operating expenditures (OPEX). Development of basic design guidelines for civil, mechanical and electrical engineering, instrumentation and control. Integration of project documentation, presentation and defence of the completed project.

Prerequisites and co-requisites

The student should have a fundamental knowledge of chemical engineering, including mass and energy balances, heat and mass transfer, chemical reaction kinetics, hydraulics, and basic unit operations and process equipment. Knowledge of the fundamentals of technological process design, identification of process streams and operating parameters, as well as basic process safety and environmental protection principles is required. The student should be able to perform basic process calculations and use numerical computing environments and process simulation software. Basic knowledge of technical drawing, preparation of process diagrams and components of process installations, as well as the fundamentals of measurement and automatic process control systems, is required. The student should be able to search for and analyse technical data, prepare technical documentation and present results, and collaborate effectively within a project team.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Assessment of activity and teamwork	60.0%	20.0%
Assessment of the team project	60.0%	60.0%
Project presentation	60.0%	20.0%

Recommended reading	Basic literature	1. L. Synoradzki, J. Wisialski, Projektowanie Procesów Technologicznych, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2019. 2. L. Synoradzki, J. Wisialski (praca zbiorowa), Projektowanie procesów technologicznych. Bezpieczeństwo procesów chemicznych, Oficyna Wydawnicza Politechniki Warszawskiej, 2012. 3. J. Głowiński, Przykłady i zadania do przedmiotu Podstawy technologii chemicznej, Politechnika Wrocławska, Wrocław 1991. 4. S. Kucharski, J. Głowiński, Podstawy obliczeń projektowych w technologii chemicznej, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2000.
	Supplementary literature	1. W. M. Lewandowski, R. Aranowski, Technologie ochrony środowiska w przemyśle i energetyce, Wydawnictwo Naukowe PWN, Warszawa, 2016. 2. Stelecki, L. Gradaoń, Podstawowe procesy przemysłu chemicznego, WNT, Warszawa 1985. 3. N.G. Anderson, Practical Process Research and Development, Academic Press, San Diego, California, USA 2000. 4. P.W. Atkins, Chemia fizyczna, PWN, Warszawa 2001. 5. Grzywa, Edward Jan, Technologia podstawowych syntez organicznych. T. 1, Surowce do syntez, Warszawa : Wydaw. Nauk.-Techn., 1995. 6. Pikoń Jerzy, Podstawy konstrukcji aparatury chemicznej. Cz. 1, Tworzywa konstrukcyjne, Warszawa: Państw. Wydaw. Nauk., 1979. 7. Myers Alan L., Obliczenia komputerowe w inżynierii chemicznej, Warszawa : Wydaw. Naukowo-Techniczne, 1979. 8. Pavlov, Konstantin Feofanovič, Przykłady i zadania z zakresu aparatury i inżynierii chemicznej. Tł.z j. ros, Warszawa : Państw. Wydaw. Tech., 1964. 9. Pikoń Jerzy, Aparatura chemiczna, Gliwice : Politechnika Śląska, 1971. 10. Szarawara Józef, Podstawy inżynierii reaktorów chemicznych, Warszawa : Nauk.-Techn., 1980.
	eResources addresses	
Example issues/ example questions/ tasks being completed	Project Problem Description The goal of the project is to develop a complete carbon dioxide absorption unit for flue gas treatment using an aqueous monoethanolamine (MEA) solution. The task of the project team is to design a process enabling at least 85% CO2 removal efficiency from a process gas stream with a typical composition for fossil-fuel combustion (1015% CO2, 46% O2, remainder N2). The project includes preparing the technological concept, performing process calculations, selecting equipment, and conducting safety, environmental, and economic analyses of the installation. In the first stage, a conceptual process flow diagram must be developed and fully described, including CO2 absorption in the contactor column and solvent regeneration in the desorption column. As part of the process design, students must determine the MEA concentration, select operating parameters (temperatures, pressures, flow rates), and prepare mass and energy balances based on process simulations performed in ChemCAD, supplemented with engineering calculations in Scilab/Matlab. Next, the student should prepare the technological Process Flow Diagram (PFD) and a simplified Piping and Instrumentation Diagram (P&ID), created in AutoCAD, including the main equipment, process streams, basic control instruments, and measurement points. In the further part of the project, selecting and sizing the equipment is required, including the absorption column, desorption column, heat exchangers, pumps, and storage tanks. A 3D model of one selected piece of equipment must also be created in Inventor to illustrate its design and assembly principles. The project must include an analysis of construction materials and corrosion protection methods, an assessment of operational safety, and identification of hazards related to high temperatures, steam, chemical substances, and pressurized systems. The student must also prepare an environmental impact assessment, including emissions after treatment, spent solvent management, and proposed measures to reduce the installations environmental impact. The final element of the project is preparing a preliminary economic justification, including an estimate of capital expenditures (CAPEX), operating costs (OPEX), utility consumption, and a basic profitability assessment (e.g., payback period or NPV). The project should conclude with the preparation of complete project documentation and its presentation, in which the team justifies the adopted technical, construction, and operational solutions.	
Practical activites within the subject	Not applicable	

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