GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modelling of Technological Processes, PG_00064296		
Field of study	Chemical Technology		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
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	3.0
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. Andrzej Rogala	
	Teachers	dr inż. Andrzej Rogala dr inż. Szymon Dudziak mgr inż. Dominik Dobrzyniewski	

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: 2709 MODELOWANIE PROCESÓW TECHNOLOGICZNYCH
https://enauczanie.pg.edu.pl/2025/course/view.php?id=2709

Additional information:

Classes are conducted using computer tools in fixed subgroups of 34 students. During the project classes, students are taught the basics of preparing simulation models, both on the basis of the knowledge gained in the course of their studies and through continuous interaction with the lecturer. They then proceed, in groups, to solve the tasks assigned by the lecturer. The lecturer remains actively involved, advises and guides students towards correct solutions or, if necessary, presents the solution together with a detailed explanation.

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	25.0	75

Subject objectives

The aim of the course is to acquire basic knowledge in the field of process modelling and the ability to apply it to build mathematical models using statistical software and process simulation programs for chemical processes.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U06] applies computer, statistical and specialised database methods to solve scientific and technological problems in technology and related fields	The student is able to apply IT methods, statistical methods and specialised databases to analyse and solve scientific and technological problems related to process modelling. The student can select appropriate software tools and databases for a given problem and correctly interpret the obtained results.	[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K7_U08] assesses the potential for commercialisation of a product or technology based on an analysis of scientific publications and patents	The student is able, on the basis of process modelling results and the analysis of scientific publications and patent databases, to make an initial assessment of the commercialisation potential of a designed process or technological solution. The student can identify the main technical and market limitations and indicate directions for further process modifications from the perspective of its industrial implementation.	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K7_W03] selects methods of data analysis, including statistical and modelling, useful for solving scientific and technological problems	The student knows and understands the basic methods of data analysis, including statistical methods and methods for modelling technological processes, as well as their limitations. The student is able to select appropriate analysis and modelling methods to solve typical scientific and technological problems related to the design of chemical processes.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

Subject contents

Course content – project
- preparation of the basis for a process design: chemical reactions, process conditions, physicochemical properties of reagents, information on the equipment required for the selected process, and a conceptual flow diagram of the process
- development of a model technological process using ChemCAD, including simulations and optimisation of process parameters
- development and optimisation of a process model using an advanced statistical software package
- development of a process model in the form of a computer program using AI

Prerequisites and co-requisites

Knowledge of the fundamentals of chemical and process engineering.

Good knowledge of the Fundamentals of Chemical Technology.

Good knowledge of Process Design.

Good knowledge of technical and industrial equipment.

Basic knowledge of inorganic, organic, and physical chemistry.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Grade from the project	60.0%	100.0%

Recommended reading	Basic literature	Bretsznajder, S., Kawecki, W., Leyko, J., & Marcinkowski, R. (1973). Podstawy ogólne technologii chemicznej. WNT Warszawa. Bortel, E., & Koneczny, H. (1992). Zarys technologii chemicznej. Wydaw. Naukowe PWN. Synoradzki, L., & Wisialski, J. (2006). Projektowanie procesów technologicznych. Od laboratorium do instalacji przemysłowej, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa. Chmielewski, T. (2013). Projektowanie procesów technologicznych-Spawalnictwo. Oficyna Wydawnicza Politechniki Warszawskiej. Mazerski, J. (2009). Chemometria praktyczna. Malamut, Warszawa. Bequette, B. W., & Bequette, W. B. (1998). Process dynamics: modeling, analysis, and simulation. Ogunnaike, B. A., & Ray, W. H. (1994). Process dynamics, modeling, and control (Vol. 1). New York: Oxford University Press.Matulewski J. (2018). Biegler L.T., Grossmann I.E., Westerberg A.W., Systematic Methods of Chemical Process Design, Prentice Hall, 1997. Turton R., Bailie R.C., Whiting W.B., Shaeiwitz J.A., Analysis, Synthesis and Design of Chemical Processes, 3rd ed., Prentice Hall, 2012. Corriou J.-P., Assaf J.-C. (eds.), Chemical Process Design, Simulation and Optimization, MDPI, 2021. Montgomery D.C., Design and Analysis of Experiments, Wiley, ostatnie wydanie. Quantrille T.E., Liu Y.A., Artificial Intelligence in Chemical Engineering, Academic Press, 1991/1992.
	Supplementary literature	CHEMCAD Version 8 User Guide, Chemstations Inc. Corriou J.-P., Assaf J.-C., Special Issue on Chemical Process Design, Simulation and Optimization, Processes, 8(12), 2020. Sher F. (ed.), Artificial Intelligence in Chemical Engineering, Elsevier, 2025
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Prepare a process model for dimethyl ether production in ChemCAD. Include calculations for pipelines and heat exchange, and propose at least one recycle loop for unreacted substrates. 2. Based on the obtained dataset describing process X as a function of temperature, pH, pressure and ionic strength, propose a model in the form of a mathematical equation using a statistical software package. 3. On the basis of the derived mathematical equations and the boundary conditions forming part of the mathematical model of process X, prepare a model in the form of a simple computer program using AI tools.	
Practical activites within the subject	Not applicable	

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