



Subject card

Subject name and code	Modelling of Technological Processes, PG_00064296						
Field of study	Chemical Technology						
Date of commencement of studies	February 2026	Academic year of realisation of subject			2026/2027		
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						
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						
	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_W03] selects methods of data analysis, including statistical and modelling, useful for solving scientific and technological problems	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.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
	[K7_U08] assesses the potential for commercialisation of a product or technology based on an analysis of scientific publications and patents	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.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
	[K7_U06] applies computer, statistical and specialised database methods to solve scientific and technological problems in technology and related fields	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.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools
Subject contents	<p>Course content – project</p> <ul style="list-style-type: none"> - 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	<p>Knowledge of the fundamentals of chemical and process engineering.</p> <p>Good knowledge of the Fundamentals of Chemical Technology.</p> <p>Good knowledge of Process Design.</p> <p>Good knowledge of technical and industrial equipment.</p> <p>Basic knowledge of inorganic, organic, and physical chemistry.</p>		
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	<p>Bretsznajder, S., Kawecki, W., Leyko, J., & Marcinkowski, R. (1973). Podstawy ogólne technologii chemicznej. WNT Warszawa.</p> <p>Bortel, E., & Koneczny, H. (1992). Zarys technologii chemicznej. Wydaw. Naukowe PWN.</p> <p>Synoradzki, L., & Wisiański, J. (2006). Projektowanie procesów technologicznych. Od laboratorium do instalacji przemysłowej, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa.</p> <p>Chmielewski, T. (2013). Projektowanie procesów technologicznych-Spawalnictwo. Oficyna Wydawnicza Politechniki Warszawskiej.</p> <p>Mazerski, J. (2009). Chemometria praktyczna. Malamut, Warszawa.</p> <p>Bequette, B. W., & Bequette, W. B. (1998). Process dynamics: modeling, analysis, and simulation.</p> <p>Ogunnaike, B. A., & Ray, W. H. (1994). Process dynamics, modeling, and control (Vol. 1). New York: Oxford University Press. Matulewski J. (2018).</p> <p>Biegler L.T., Grossmann I.E., Westerberg A.W., Systematic Methods of Chemical Process Design, Prentice Hall, 1997.</p> <p>Turton R., Bailie R.C., Whiting W.B., Shaeiwitz J.A., Analysis, Synthesis and Design of Chemical Processes, 3rd ed., Prentice Hall, 2012.</p> <p>Corriou J.-P., Assaf J.-C. (eds.), Chemical Process Design, Simulation and Optimization, MDPI, 2021.</p> <p>Montgomery D.C., Design and Analysis of Experiments, Wiley, ostatnie wydanie.</p> <p>Quantrille T.E., Liu Y.A., Artificial Intelligence in Chemical Engineering, Academic Press, 1991/1992.</p>
	Supplementary literature	<p>CHEMCAD Version 8 User Guide, Chemstations Inc.</p> <p>Corriou J.-P., Assaf J.-C., Special Issue on Chemical Process Design, Simulation and Optimization, Processes, 8(12), 2020.</p> <p>Sher F. (ed.), Artificial Intelligence in Chemical Engineering, Elsevier, 2025</p>
	eResources addresses	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 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 activities within the subject	Not applicable	

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