



Subject card

Subject name and code	Modelling of Technological Processes - Team Project, PG_00045476						
Field of study	Chemical Technology						
Date of commencement of studies	February 2022	Academic year of realisation of subject			2022/2023		
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						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Andrzej Rogala				
	Teachers		dr inż. Andrzej Rogala				
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	0.0	45
	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	45		5.0		25.0	75
Subject objectives	The aim of the course is to acquire basic knowledge in the field of modeling of technological processes and the ability to use it to build and optimize mathematical models with the use of statistical and chemical process simulation programs.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K7_K04		The student is able to supervise the group's work during the preparation of the technological process model. The student is able to work in a group under the supervision of another person and actively participate in the implementation of the assigned tasks. The student can organize work adequately to the time allocated for the task.		[SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness [SK1] Assessment of group work skills		
	K7_U03		Student can create and optimize model of technological process. Basing on chemical conception student can prepare basics for modeled process project. Basing on previous knowledge student can optimize model of technological installation. Student can use software like ChemCad, Statistica and programming language C# for design and optimization of technological process.		[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		

Subject contents	<p>Lecture:</p> <ul style="list-style-type: none"> - basic information on chemical technology and design of technological processes: technological principles in relation to modeling, preparation of process design, design-research-model process from the laboratory to the technological installation, terminology, - introduction to modeling, definitions and terminology, division of models, mathematical and physical models, elements of statistics in modeling, planning of experiments and building models, optimization of mathematical models, - simulations and optimization of technological processes, introduction to the ChemCad environment, basic simulation parameters, thermodynamic and kinetic models in the ChemCad program, principles of simulation preparation, - basics of programming in C #, implementation of a mathematical model into a computer program, the basics enabling preparation of a program for optimization of a mathematical model, <p>Project:</p> <ul style="list-style-type: none"> - preparation of the basics of the technological design: chemical reactions, method of conducting the process, physicochemical properties of the reagents and information on the equipment necessary to implement the selected process, schematic diagram of the design, preparation of the model technological process using the ChemCAD program, conducting simulations and optimization of process parameters in a steady state, - preparation and optimization of the technological process model using an advanced statistical program, - preparation of a technological process model in the form of a computer program written in C # 											
Prerequisites and co-requisites	<p>Knowledge of the basics of chemical and process engineering.</p> <p>Good knowledge of the basics of chemical technology Good knowledge of Designing Technological Processes. Good knowledge of technical and industrial equipment. Basics of inorganic, organic and physical chemistry.</p>											
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Subject passing criteria</th> <th style="width: 33%;">Passing threshold</th> <th style="width: 33%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Grade from the project</td> <td>60.0%</td> <td>65.0%</td> </tr> <tr> <td>Grade from passing the lecture</td> <td>60.0%</td> <td>35.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Grade from the project	60.0%	65.0%	Grade from passing the lecture	60.0%	35.0%
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Recommended reading	Basic literature	<p>Bretsznajder, S., Kawecki, W., Leyko, J., & Marcinkowski, R. (1973). <i>Podstawy ogólne technologii chemicznej</i>. WNT Warszawa.</p> <p>Bortel, E., & Koneczny, H. (1992). <i>Zarys technologii chemicznej</i>. Wydaw. Naukowe PWN.</p> <p>Synoradzki, L., & Wisiański, J. (2006). <i>Projektowanie procesów technologicznych. Od laboratorium do instalacji przemysłowej</i>, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa.</p> <p>Chmielewski, T. (2013). <i>Projektowanie procesów technologicznych-Spawalnictwo</i>. Oficyna Wydawnicza Politechniki Warszawskiej.</p> <p>Mazurski, J. (2009). <i>Chemometria praktyczna</i>. Malamut, Warszawa.</p> <p>Bequette, B. W., & Bequette, W. B. (1998). <i>Process dynamics: modeling, analysis, and simulation</i>.</p> <p>Ogunnaike, B. A., & Ray, W. H. (1994). <i>Process dynamics, modeling, and control (Vol. 1)</i>. New York: Oxford University Press.</p> <p>Matulewski J. (2018), <i>VISUAL STUDIO 2017. TWORZENIE APLIKACJI WINDOWS W JĘZYKU C#</i></p>										
	Supplementary literature	<p>Beebe, K. R., Pell, R. J., & Seasholtz, M. B. (1998). <i>Chemometrics: a practical guide (Vol. 4)</i>. New York: Wiley.</p> <p>Morgan, E. D. (1995). <i>Chemometrics: experimental design (Vol. 41)</i>. John Wiley & Son Ltd.</p>										
	eResources addresses											
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Prepare the model of the technological process of dimethyl ether production in ChemCAD software. Include pipeline, heat transfer calculations, and suggest at least one node for recycling unreacted substrates. 2. Basing on the obtained of process X depending on temperature, pH, pressure and ionic strength, propose a model in the form of a mathematical equation using a statistical software. 3. Basing on the mathematical equations and boundary conditions that are part of the mathematical model describing the X process, prepare the model in the form of a simple computer program using the C# programming language. 											
Work placement	Not applicable											