DOCTORAL SCHOOL OF WROCŁAW UNIVERSITY OF SCIENCE AND TECHNOLOGY

SUPERVISOR/TEAM/ DECLARING/CONDUCTING COURSE: **Jolanta Warchoł**
DEPARTMENT: Chemical Department
SCIENTIFIC DISCIPLINE: Chemical Engineering

COURSE CARD

Course name in Polish: Badanie i modelowanie procesów sorpcyjnych
Course name in English: Research and modeling of sorption processes
Course language ~~Polish /~~ English*
University-wide general course type*:
The course is intended for all PhD students: YES / NO
1) BASIC COURSE
~~**2) SPECIALIST COURSE**~~
~~**3) SEMINAR**~~
~~**4) HUMANISTIC COURSE**~~
~~**5) LANGUAGE**~~

Subject code: CIQ100095W

* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	30			
Grading	Exam			
Number of ECTS points	**0**			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Principles of chemical processes
2. Principles of chemical engineering (mass and energy transport)

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COURSE OBJECTIVES
C1. To acquaint PhD students with the methods of sorption processes research and modelling
C2 To acquaint PhD students with state-of-the-art techniques of sorption-based processes application

PROGRAM CONTENTS

Form of classes – lecture (Lec)		Number of hours
Lec1	History of sorption separation processes	2
Lec2	Sorption materials: division, properties and analysis	2

Lec3	Activation of sorption materials: analysis and application	2
Lec4	Modification of sorption materials: analysis and application	2
Lec5	Mass and heat transport into sorption materials	2
Lec6	Adsorption equilibrium: model development, implementation and optimization methods	2
Lec7	Ion exchange equilibrium: model development, implementation and optimization methods	2
Lec8	Multicomponent equilibrium: experimental research and competitive model development	2
Lec9	Non ideal behavior of solid and liquid phase, activity coefficients	2
Lec10	Sorption kinetics, experimental research and model development	2
Lec11	Sorption dynamics, experimental research and model development	2
Lec12	Biosorption process analysis	2
Lec13	Sorption techniques in water treatment	2
Lec14	Materials recovery and industrial by-products treatment	2
Lec15	Sorption techniques in exhausted gases purification	2
	Total hours:	**30**

Form of classes – foreign language course (Lng)		Number of hours
Lng1		
Lng2		
Lng3		
..		
	Total hours:	

Form of classes – seminar (Sem)		Number of hours
Sem1		
Sem2		
Sem3		
…		
	Total hours:	

Form of classes – mixed forms (mix)		Number of hours
Mix1		
Mix2		
Mix3		
…		
	Total hours	

TEACHING TOOLS USED
N1.Lectures N2.Literature survey

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ACHIEVED SUBJECT LEARNING OUTCOMES		
Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	P8U-W	Knows how to present contributions of other authors, knows literature
Knowledge	P8S-WG	Has knowledge on sorption processes and their modelling
…		
Skills	P8U-U	Knows how to use bases WoS and Scopus for a search of sorption-based processes usage
Skills		
…		
Social competence	P8S-KO	Knows what means collaboration in conducting the common research and analyses
Social competence		
…		

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] D. M. Ruthven, Principles of Adsorption and Adsorption Processes, John Wiley & Sons, 1984. [2] O. Levenspie, Chemical Reaction Engineering, Wiley, 1998. [3] M.J. Slater, Principles of Ion Exchange Technology, Butterworth-Heinemann, 2013 [4] C. Tien, Introduction to Adsorption: Basics, Analysis, and Applications, Elsevier, 2018 [5] A. Bonilla-Petriciolet, D. Mendoza-Castillo, H. Reynel-Ávila, Adsorption Processes for Water Treatment and Purification, Springer 2017 **SECONDARY LITERATURE:** [6] B. Roop Chand, G. Meenakshi, Adsorpcja na węglu aktywnym, WNT Warszawa 2009 [7] W. Rudzinski, D.H. Everett. Adsorption of Gases on Heterogeneous Surfaces. Academic Press, 2012
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)
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