

Faculty of Chemical Technology and Engineering

<i>Field of study</i>	Chemical Engineering						
<i>Mode of study</i>	stationary		<i>Level</i>	first cycle			
<i>Graduate's qualification</i>	inżynier						
<i>Area(s) of study</i>	nauki techniczne						
<i>Educational profile</i>	general academic						
<i>Module</i>							
<i>Course unit</i>	Interfacial Phenomena						
<i>Code</i>	ChEn_1A_S_C05						
<i>Field of specialisation</i>							
<i>Administering faculty</i>	Institute of Inorganic Chemical Technology and Environmental Engineering						
<i>ECTS</i>	5,0	<i>ECTS (forms)</i>		5,0			
<i>Form of course credit</i>	credits		<i>Language</i>	english			
<i>Electives</i>			<i>Elective group</i>				

<i>Form of instruction</i>	<i>Code</i>	<i>Semester</i>	<i>Hours</i>	<i>ECTS</i>	<i>Weight</i>	<i>Credit</i>
lecture	W	3	15	1,5	0,40	credits
lecturing course	A	3	15	1,5	0,30	credits
laboratory course	L	3	30	2,0	0,30	credits

<i>Leading teacher</i>	Moszyński Dariusz (Dariusz.Moszynski@zut.edu.pl)
<i>Other teachers</i>	Kaleńczuk Ryszard (Ryszard.Kalenczuk@zut.edu.pl), Mijowska Ewa (Ewa.Borowiak-Palen@zut.edu.pl), Moszyński Dariusz (Dariusz.Moszynski@zut.edu.pl), Zielinska Beata (Beata.Zielinska@zut.edu.pl)

<i>Prerequisites</i>	
W-1	physical chemistry

<i>Module/course unit objectives</i>	
C-1	Student knows the structure of surfaces and interfaces.
C-2	Student knows fundamental laws applicable to the processes performed on interfaces
C-3	Student knows the basic experimental methods applied to evaluate the properties of interfaces and is able to perform respective experiments.

<i>Course content divided into various forms of instruction</i>		<i>Number of hours</i>
T-W-1	The Physics of Surfaces	3
T-W-2	Electrostatic Phenomena, Interfacial and Surface Potentials	2
T-W-3	Electrokinetic Phenomena	2
T-W-4	Adsorption at Interfaces	2
T-W-5	Properties of Monolayers	2
T-W-6	Reactions at Liquid Surfaces	2
T-W-7	Disperse Systems and Adhesion	2
T-A-1	Physics of Surfaces - calculations	5
T-A-2	Adsorption at Interfaces - calculations	5
T-A-3	Simulation of Reactions at Liquid Surfaces	5
T-L-1	Monolayers observed by electron spectroscopy	5
T-L-2	Adsorption/desorption phenomena as a tool for surface evaluation	5
T-L-3	Segregation to gas-solid interface	5
T-L-4	Study on synthesis of ordered and disordered mesoporous silica	5
T-L-5	Study on adsorption of organic dyes on activated carbons	5
T-L-6	Measurement of the surface tension of a liquid by a stalagmometric method	5

<i>Student workload - forms of activity</i>		<i>Number of hours</i>
A-W-1	uczestnictwo w zajęciach	15
A-W-2	Analiza literatury przedmiotu	15
A-W-3	analiza przypadków	15
A-A-1	uczestnictwo w zajęciach	15



Student workload - forms of activity			Number of hours
A-A-2	przygotowanie do zajęć audytorijnych		15
A-A-3	analiza literatury		15
A-L-1	uczestnictwo w zajęciach		30
A-L-2	opracowanie sprawozdań z laboratorium		30

Teaching methods / tools

M-1	wykład
M-2	metoda przypadków
M-3	seminarium
M-4	ćwiczenia laboratoryjne

Evaluation methods (F - progressive, P - final)

S-1	F	egzamin
S-2	F	sprawozdania z zajęć laboratoryjnych

Designed learning outcomes	Reference to the learning outcomes designed for the fields of study	Reference to the learning outcomes defined for the particular areas of education	Reference to learning outcomes leading to the degree of "inżynier"	Course objectives	Course content	Teaching methods	Evaluation methods
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Knowledge

ChEn_1A_C05_W01 Student knows the basic phenomena on interfaces	ChEn_1A_W15 ChEn_1A_W20	P6S_WG_TA11	P6S_WG_IA11	C-1	T-W-1	M-1	S-1
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Skills

ChEn_1A_C05_U01 Is able to distinguish between interfacial phenomena and to find a proper tools to analyse them	ChEn_1A_U01 ChEn_1A_U03 ChEn_1A_U05 ChEn_1A_U07 ChEn_1A_U08 ChEn_1A_U16	P6S_UO P6S_UU P6S_UW_TA11 P6S_UW_TA14	P6S_UW_IA11 P6S_UW_IA14	C-2	T-A-3	M-1 M-2 M-4	S-1 S-2
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Other social / personal competences

ChEn_1A_C05_K01 Is able to use tools and methods for phenomena analysis	ChEn_1A_K01 ChEn_1A_K03 ChEn_1A_K04 ChEn_1A_K05	P6S_KK P6S_KO P6S_KR		C-3	T-L-1	T-L-2	M-1 M-2 M-3 M-4	S-1
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Required reading

1. G.A. Somorjai, Introduction to surface chemistry and catalysis, Wiley, 1994
2. John C. Vickerman, Ian S. Gilmore, Surface analysis: the principal techniques, Wiley, 2009
3. Dongyuan Zhao, Ying Wan, Wuzong Zhou, Ordered Mesoporous Materials, Wiley-VCH, 2013

Supplementary reading

1. Luigi Pasqua, Update on Silica-based Mesoporous Materials for Biomedical Applications, smithersrapra.com, 2011