Zał. nr 5 do ZW 78/2023

Attachment no. 4. to the Program of Studies

FACULTY of Chemistry

SUBJECT CARD

Name of subject in Polish … Numeryczne zastosowania w nano-inżynierii
Name of subject in English …… Numerical applications in nano-engineering
Main field of study (if applicable): …Chemical engineering and technology…….
Specialization (if applicable): …Advanced chemical engineering and green technology…..
Profile: academic
Level and form of studies: 2nd level
Kind of subject: obligatory
Subject code W03CET-SM2008W, W03CET-SM2008P
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15		30		
Number of hours of total student workload (CNPS)	25		50		
Form of crediting (Examination / crediting with grade)	Exam		Crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	1		2		
including number of ECTS points for practical classes (P)			2		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	0.6		1,2		

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of mathematics, physics, and mass transfer phenomena at the bachelor's level (chemical engineering or related)
2. Understanding of numerical algorithms
3. Basic understanding of chemical thermodynamics

SUBJECT OBJECTIVES

C1 To familiarize students with the current state of nano-type research
C2 To understand future applications in nano-materials
C3 To familiarize students with specific properties in the nano-scale
C4 To introduce students to the modeling methodology of nano-porous materials

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01 – student understands the notion of nano-engineering and its role in future technologies
PEU_W02 - student knows the current trends of nano-technology developments
PEU_W03 - student knows how to model numerically the properties of nano-objects

relating to skills:
PEU_U01 – student is able to find and understand the literature related to nanotechnology
PEU_U02– student is able to discuss the current trends in nanotechnology
PEU_U03 – student can design a numerical modeling analyze of nano-materials

PROGRAMME CONTENT

Lecture		**Number of hours**
Lec 1	Characteristics of the nano-scale properties.	2
Lec 2	Numerical projects: basic notions and definitions	2
Lec 3	Numerical projects in nano-materials.	2
Lec 4	Surface and deformations in nanoscale. Nanoporous materials.	2
Lec 5	Industrial applications of nanoporous materials	2
Lec 6	Characteristics of nanoporous materials: adsorption	2
Lec 7	Microscopic models of nanoporous materials and adsorption	2
Lec 8	Interpretation of simulations of adsorption and diffusion in nanoprorous materials	1
	Total hours	15

Project		**Number of hours**
Proj 1	Definitions of models for simulations, basic Linux notions	4
Proj 2	Setting-up and optimalization of the input data	6
Proj 3	Examples of the Monte Carlo simulation methods	4
Proj 4	Simulation of adsorption in porous systems	6
Proj 5	Analysis of the simulation results: the role of adsorption energy	4
Proj 6	Transport in nanaopores	6
Proj 7	Adsorption in nanoporous systems	3
	Total hours	**30**

TEACHING TOOLS USED

N1. Multimedia presentation
N2. Discussions and exercises
N3. Consultations

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P –	Learning outcomes code	Way of evaluating learning outcomes achievement

concluding (at semester end)		
F (project)	PEU_U01 – U03	Grading based on the work on projects
P (lecture)	PEU_W01 -W03	Exam

PRIMARY AND SECONDARY LITERATURE

LITERATURA PODSTAWOWA:

[1] Akhlesh Lakhtakia, Nanometer structures: Theory, modeling and simulation, SPIE Press 2004

LITERATURA UZUPEŁNIAJĄCA:

Internet.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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