DOCTORAL SCHOOL OF WROCŁAW UNIVERSITY OF SCIENCE AND TECHNOLOGY

SUPERVISOR/TEAM/ DECLARING/CONDUCTING COURSE: …….
DEPARTMENT ……

COURSE CARD

Course name in Polish: Funkcjonalne materiały dla ochrony środowiska i magazynowania energii……..……..
Course name in English: Functional materials for environmental protection and energy storage……..……
Course language Polish
University-wide general course type*:
1) basic science course (mathematics, physics, chemistry, computer science or other) :
…chemistry, materials science…….
2) humanities course: …….
3) management course: ……..
4) English language: ……
5) didactics of higher education course: ……

Specialized courses for PhD students receiving education in discipline*: ……..……..……
1) specialized course in discipline: ……..
2) interdisciplinary course in the field of several disciplines: ……
3) seminar in discipline or interdisciplinary: …….

Subject code: CIQ100166W

* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	30			
Grading	Exam	Exam	Oral presentation	Exam, inspection, evaluation classes

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

Basic knowledge in chemistry and materials science

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COURSE OBJECTIVES

C1. Familiarizing the students with catalytic systems in the environmental protection
C2. Introduction to functional polymer membranes, sorbents and hybrid materials for environmental protection
C3. Familiarizing the students with innovative processes for producing and storage of energy
C4. Familiarizing the students with tailoring of structure and texture of porous materials for environmental protection and energy storage

PROGRAM CONTENTS

Form of classes - lecture (Lec)		Number of hours
Lec1	Interfacial phenomena, molecular interactions, phenomenon of catalysis.	2
Lec2	Simple and mixed oxides	2
Lec3	Sulfides of transition metals	2
Lec 4	Silica-based mesoporous materials	2
Lec 5	Examples of applications	2
Lec6	Polymer membranes in environmental protection	2
Lec 7	Polymer sorbent in water treatment	2
Lec 8	Polymer materials for hybrid processes	2
Lec 9	Sourcing of strategic materials by means of electrochemical processes	2
Lec 10	Salinity gradient for gathering 'blue energy'	2
Lec 11	Functionalization in carbon materials	2
Lec 12	Tailoring of structure and texture	2
Lec 13	Chemical functionalization of carbon surface	2
Lec 14	Carbon materials for energy storage	2
Lec 15	Exam	2
	Total hours	**30**

TEACHING TOOLS USED

N1. Lecture with multimedia presentation
N2. Discussion with students

ACHIEVED SUBJECT LEARNING OUTCOMES

Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	PSU_W	- student competently quotes other authors in articles published and prepared for publication in peer-reviewed scientific journals, per-reviewed materials from international scientific conferences, and in book editions preceding
Knowledge	P8S_WG	- has an advanced knowledge fundamental to a field relevant to his/her research, including the most advanced methods of research and verification of results achieved
Skills	P8U_U	- is able to classify scientific publishers, including scientific journals, and scientific achievements according to accepted rules for: - journals included in international databases Scopus and Web of Science - impact factor (if), - quoting, - Hirsch index, - i 10-indicator
Skills	P8S_UW	- student has scientific and technological skills relevant

		to methods and methodology of conducting scientific research and critical evaluation of the results obtained
Skills	P8S_UW	- is able to creatively interpret the results obtained and to search for their application
Social competence	P8S_K	student knows which activities lead to the creation of achievements in violation of law, including copyright, or good practices in science and what constitutes grounds for resuming proceedings for the conferment of the academic degree of *doktor* and *doktor habilitowany* or the title of *profesor*
Social competence	P8S_KK	understands and accepts the functions of the doctoral student care in the process of research planning, implementation and analysis of research results

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] H. Marsh, F. Rodriquez-Reinoso, Activated Carbon, Elsevier, Amsterdam, 2006.
[2] M. Bodzek Wykorzystanie procesów membranowych w uzdatnianiu wody, 2003
[3] R. Baker, Membrane Technology and Application, 2004
[4] Y. Gogotsi (Ed.), Carbon Nanomaterials, CRC, Taylor and Francis Group, 2006.

SECONDARY LITERATURE:

[1] Aktualne publikacje w czasopismach naukowych
[2] N.Li. Advanced Membrane Technology, 2008
[3] T.D.Burchell (Ed.), Carbon Materials for Advanced Technologies, Pergamon, 1999.

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

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