

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**SUPERVISOR DECLARING COURSE:** Jolanta Warchoł, Associate Professor  
**DEPARTMENT:** K26W03D05  
**SCIENTIFIC DISCIPLINE:**

**COURSE CARD**

**Course name in Polish:** Sorbenty na bazie surowców naturalnych w ochronie środowiska

**Course name in English:** Natural-based sorption materials in environmental protection

**Course language:** ~~Polish~~ / English

**University-wide general course type\*:** chemical engineering, environmental engineering, chemistry

**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:**

\* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)			15	
Grading	Exam	Exam	Oral presentation	Exam, inspection, evaluation classes

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

- 1. Basic knowledge about separation processes
- 2. Basic knowledge about diffusion processes

**COURSE OBJECTIVES**

- C1 Acquainting doctoral students with naturally occurring raw materials for the production of effective sorption materials
- C2. Developing synthetic thinking skills in the activation and modification of sorbents to increase their capacity and selectivity

**PROGRAM CONTENTS**

Form of classes	Number of hours
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Wa1	The use of natural resources as sorbents	2
Wa2	Use of natural resources as synthesis substrates	2
Wa3	Activation and modification of the surface of sorption materials for sorption materials	3
Wa4	Application of sorbents for soil remediation	2
Wa5	The use of sorbents for wastewater treatment	2
Wa6	The use of sorbents for water purification	2
Wa7	The use of sorbents for air purification	2
	Total hours	<b>15</b>

<b>TEACHING TOOLS USED</b>
N1. Informative lecture with elements of a problem lecture. N2. Multimedia presentation

<b>ACHIEVED SUBJECT LEARNING OUTCOMES</b>		
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
Social competence	P8S-KO	Knows what means collaboration in conducting the common research and analyses

<b>PRIMARY AND SECONDARY LITERATURE</b>
<p><b><u>PRIMARY LITERATURE:</u></b></p> <p>[1] Z. Sarbak, Adsorpcja i adsorbenty, Wydawnictwo naukowe UAM, 2000            [2] L.M.T. Martínez, O.V. Kharissova, B.I. Kharisov, Handbook of Ecomaterials, Springer, 2019.            [3] E.S. Dragan. Advanced Separations by Specialized Sorbents, Apple Academic Press, 2014.</p> <p><b><u>SECONDARY LITERATURE:</u></b></p> <p>[1] G.W. Cicziszwili, Zeolity Naturalne, WNT, 1990.</p>
<b>SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)</b>
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