

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

**SUPERVISOR DECLARING/CONDUCTING COURSE:**  
**DEPARTMENT:**  
**SCIENTIFIC DISCIPLINE: D10**

**COURSE CARD**

**Course name in Polish: Zaawansowana Chemia Organiczna**

**Course name in English: Advanced Organic Chemistry**

**Course language: ~~polish~~/ english**

**The course is intended for all PhD students: YES / NO**

- 1) ~~BASIC COURSE~~
- 2) ~~SPECIALIST COURSE~~
- 3) ~~SEMINAR~~
- 4) ~~HUMANISTIC COURSE~~
- 5) ~~LANGUAGE~~
- 6) ~~RESEARCH SKILLS~~

**Subject code: NCQ100260W**

\* 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**

1. Extended knowledge in the field of Organic Chemistry
2. Knowledge of the basic types of reactions and their mechanisms
3. Principles of Physical Chemistry
4. Knowledge on specific English language terms and nomenclature

**COURSE OBJECTIVES**

- C1 The relationship of the electronic structure of organic compounds, carbocations, carbenes, radicals and carbanions with their properties and reactivity in the light of the theory of molecular orbitals and VBO
- C2 Acidity, basicity, nucleophilicity and electrophilicity as structural factors of an organic compound that determine the course of a reaction
- C3 How to determine reaction mechanism?
- C4 Indication the postulates of the transition state theory in terms of optimization of the reaction course
- C5 Presentation of the basic methods of modifications of the reactivity of organic compounds by means of changing the reaction medium or reaction conditions (temperature, concentration)
- C6 The relationship between the transition state and the possibility of catalysis. Introduction to electrophilic and nucleophilic catalysis, general and specific acid and base catalysis

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C7 Demonstration how the reaction mechanism interferes with a reaction medium and concentration factors and the subsequent impact on the course of reactions important for modern organic synthesis

**PROGRAM CONTENTS**

<b>Form of classes</b>		Number of hours
	New look into the bonding in organic chemistry	4
	Structure of the molecule determines the stability and the reactivity	2
	Acids and bases, nucleophiles and electrophiles	2
	Molecular orbitals and HSAB theory. Klopman-Salem equation.	2
	Bonds weaker than covalent as an extra-stabilizing interaction	2
	Transition state theory	2
	The attempts to determine the transition state	2
	Catalysis as the only way to chemistry 2.0	4
	Mechanisms of the crucial reactions applied in the modern organic synthesis	10
	Total hours	30

**TEACHING TOOLS USED**

N1. lecture with multimedia presentation  
N2.  
N3.

**ACHIEVED SUBJECT LEARNING OUTCOMES**

Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	P8U_W	competently cites other authors in published and prepared for publication articles in peer-reviewed scientific journals, in peer-reviewed materials from international scientific conferences, in book editions
	P8S_WG	Possess the knowledge at an advanced level of basic nature for the field related to the area of scientific research, including the latest methods of research and verification of the results achieved
	P8S_UW	Gain the knowledge how to creatively interpret the obtained results and search for their application use

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	P8S_UW	Possess the scientific and technological skills related to the methodology and methodology of conducting scientific research and a critical evaluation of the obtained results
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**PRIMARY AND SECONDARY LITERATURE**

**PRIMARY LITERATURE:**

- [1] F. A. Carey, R. J. Sundberg, *Advanced Organic Chemistry*, Springer, 2007
- [2] M. B. Smith, *March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure*, 7th Edition, Wiley, 2013
- [3] E. V. Anslyn, D. A. Dougherty, *Modern Physical Organic Chemistry*, University Science Books, 2006

**SECONDARY LITERATURE:**

- [1] J. Clayden, N. Greeves, S. Warren, P. Wothers, *Organic Chemistry*, Oxford University Press, 2001

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