

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

SUPERVISOR DECLARING/CONDUCTING COURSE: Prof. Artur Mucha
DEPARTMENT OF CHEMISTRY
SCIENTIFIC DISCIPLINE: Chemistry Sciences

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

Form of classes		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
Knowledge	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
Skills	P8S_UW	Gain the knowledge how to creatively interpret the obtained results and search for their application use

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Skills	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)

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