

SYLLABUS

Topic of the course	Elements of Physical Organic Chemistry
Institution where the course will take place	Institute of Bioorganic Chemistry Polish Academy of Sciences, Poznań
Language	English
Learning objectives	PhD student: 1. Gets advanced subject and methodological knowledge of physical organic chemistry. 2. Learns research methods and techniques used in contemporary physical organic chemistry. 3. After completing the course, the PhD student should be able to: (i) analyze chemical bonds in organic compounds in the light of the theory of localized bonds and molecular orbitals, (ii) have detailed knowledge of the electronic structure of organic compounds and be able to predict the influence of the compound structure on its properties and reactivity (iii) be able to predict the directions and results of important chemical reactions based on the dependence of reactivity on the chemical structure, (iv) solve practical chemical problems based on the analysis of the physico-chemical factors of chemical reactions, (iv) read and understand scientific articles on structure and reactivity of compounds organic.
Learning outcomes, according to Attachment 2 to the Programme of the Study (valid from October 1 st 2026)	P8S_WG (pkt.1 and 2), P8S_UW (pkt.1 and 2), P8S_UK (pkt.3)
Type of the course	Obligatory course for Ph.D. students in chemical sciences
Semester/Year	Autumn/winter term 2026/7
Name of the lecturer	Prof. dr hab. Jacek Stawiński
Name of the examiner	Prof. dr hab. Jacek Stawiński
Teaching methods	Lectures/Seminars with audio-visual techniques.
Attendance requirements	Working knowledge of English language and organic chemistry at the university level.
Number of ECTS points	4 ECTS. One ECTS point corresponds to 6 hours of lectures and 4 hours of individual work of a doctoral student related to the assimilation of the material presented during lectures (<i>vidi</i> source texts).
Number of lectures	24 h
Didactic methods	Lectures using current audio-visual techniques and seminars (problem solving).
Methods of verification and assessment of learning outcomes	Written exam and individual discussion of the examination work.

Conditions of a positive evaluation	A passing grade of the exam.
Course content	The aim of the course is to review the basic physicochemical principles determining the relationship between the structure and reactivity of organic compounds. It will discuss, <i>inter alia</i>, (i) contemporary theories of chemical bonds with application to organic chemistry (theories of localized bonds and theories of molecular orbitals) with particular emphasis on bonds, structure and reactivity of intermediates, (ii) issues of the relationship between the structure and energy of chemical compounds (thermodynamics and kinetics of transition compounds, conformational and electronic effects, the influence of substituents on stability and reactivity, <i>etc.</i>), (iii) introduction to the energy surface analysis of potential chemical reactions (transition state theory, postulates and rules for kinetic analysis of chemical reactions, Hammond postulate, Curtin-Hammett principle, <i>etc.</i>).
Literature of the course materials	1. F. A. Carey, R. J. Sundberg: Advanced Organic Chemistry. Part A. Structure and Mechanisms, Springer Science 2007 2. R. A. Y. Jones: Physical and Mechanistic Organic Chemistry, Cambridge University Press 1984 (PWN, polskie tłumaczenie). 3. L.P Hammett: Physical Organic Chemistry. 4. Lecture materials.