UNIWERSYTET GDAŃSKI

Course title
Wykład monograficzny – Nowoczesne metody syntezy chemicznej / Monographic lecture – Modern methods of chemical synthesis

ECTS code
13.3.1233

Name of unit administrating study
Faculty of Chemistry

Studies

Field of study	Type	Form	
Chemistry	Master	Full-time studies	

Teaching staff
Dr hab. Elżbieta Jankowska, profesor UG

Forms of classes, the realization and number of hours

A. Forms of classes, in accordance with the UG Rector's regulations
lecture

B. The realization of activities
In-class learning

Number of hours
lecture 30 h

ECTS credits

classes 30 h
tutorial classes 10 h
student's own work 35 h
TOTAL: 75 h - 3 ECTS

The academic cycle
Second year, summer semester

Type of course
obligatory

Language of instruction
Polish

Teaching methods
- multimedia presentation combined with a discussion
- solving problem tasks (designing reaction routes)

Form and method of assessment and basic criteria for evaluation or examination requirements

A. Final evaluation, in accordance with the UG study regulations
Course completion (with a grade)

B. Assessment methods
- solving problem tasks (designing reaction routes), individually and / or in a group
- written exam with open questions

written test exam

C. The basic criteria for evaluation or exam requirements
To get a positive grade from the course the student has to:
- solve a problem task (design the synthesis route/s), either individually or in a team

- pass the final test

Assessment criteria in accordance with the University of Gdansk Studies Regulations

Required courses and introductory requirements

a. Formal requirements
Completed course in "Organic Chemistry"

b. Prerequisites

Knowledge of basic issues in organic chemistry: functional groups occurring in organic compounds, nucleophilicity, electrophilicity, factors affecting the stability of organic particles, electronic and steric effects in the course of chemical reactions

Aims of education

Familiarizing students with:

- basic rules of carrying organic synthesis
- modern methods of organic synthesis, allowing the formation of new carbon-carbon and carbon-heteroatom bonds
- modern techniques of organic synthesis
- the concept of retrosynthesis

Enabling students to acquire skills of designing multi-step syntheses of organic compounds

Course contents

- basic rules of carrying a synthesis of organic compounds: preparation of reagents, monitoring the progress of the reaction, isolation and purification of reaction products, analysis of the final product, keeping lab notes

- creation of new carbon-carbon bonds using, inter alia, Heck reaction, Suzuki reaction, olefin metathesis, Michael reaction, Robinson annulation

- creation of new carbon-heteroatom bonds using, inter alia, Sharpless, Jacobsen, Mitsunobu and Buchwald-Hartwig reactions

- modern techniques of organic synthesis, including: microwave synthesis, solvent-free synthesis, synthesis using phase transfer catalysis, synthesis on a solid support, multicomponent reactions (including Mannich, Ugi, Passerini reactions)

- recognition of syntons in organic molecules, designing synthetic pathways for selected organic compounds

Bibliography of literature

A.1. Used during classes:
unpublished materials, prepared by a teacher.
A.2. Studied independently by the student:
J. Gawroński, K. Gawrońska, K. Kacprzak, M. Kvit, Contemporary organic synthesis, PWN 2004
J. Clayden, N. Greeves, S. Warren, Organic chemistry

B. Supplementary literature
J. Skarżewski - Introduction to organic synthesis, PWN 1999
G.S. Zweifel, M.H. Nantz, P. Somfai, Modern organic synthesis. An introduction, Wiley 2017

Knowledge

The student:

- describes the structure of substrates and catalysts needed to carry out the reactions discussed during the lectures
- describes the conditions that must be secured for the reaction to proceed effectively
- explains the general mechanism as well as the regio- and stereoselectivity of the discussed reactions
- characterizes the advantages and disadvantages of modern techniques of the organic syntheses discussed during the lecture
- defines the terms related to a synthesis and a retrosynthesis

Skills

The student:

- critically analyzes the possibility of using a selected chemical reaction to obtain the desired intermediate product;
- designs the optimal routes of multi-step syntheses;
- predicts the structure of products, based on the structure of substrates and the applied reaction conditions;
- predicts the side reactions that may obstacle obtaining the right product from the given substrates;

- proposes methods to solve common problems encountered during the synthesis, purification and analysis of organic compounds
- assesses the risks associated with a given type of a reaction and suggests precautions that will enable to safely carry out the desired chemical conversions

Social competence

The student:

- gets involved in a team work in solving project-type tasks;
- discusses in a group the methods of solving synthetic problems;

presents the group's proposed solutions of synthetic problems