



## COURSE DESCRIPTION CARD - SYLLABUS

### Course name

Modern methods of synthesis of drugs - microwave organic synthesis in medicinal chemistry  
[S1IFar2>NMSŚLmsowcm]

### Course

Field of study

Pharmaceutical Engineering

Year/Semester

3/6

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

elective

### Number of hours

Lecture

0

Laboratory classes

0

Other

0

Tutorials

15

Projects/seminars

0

### Number of credit points

1,00

### Coordinators

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### Lecturers

### Prerequisites

Structured, theoretically founded knowledge in the field of organic, physical and drug chemistry, as well as from the basic course of Synthesis and technology of drugs.

### Course objective

Providing providing knowledge in scope of modern methods of organic synthesis, which allow for the creation of new bonds in molecules. Developing students' skills in solving basic problems in the field of single-stage syntheses of organic compounds, the ability to select synthesis methods and apply the latest techniques.

### Course-related learning outcomes

Knowledge:

1. Has structured, theoretically founded general knowledge in the field of inorganic, organic, physical and analytical chemistry enabling understanding, description and investigation of chemical phenomena and processes related to pharmaceutical engineering [K\_W4]
2. Knows the basic techniques, methods for characterization and identifying pharmaceutical products

and research tools used in pharmaceutical engineering, knows the classical and instrumental methods used in assessing the quality of substances for pharmaceutical purposes and in quantitative analysis in drugs, knows the physicochemical properties of substances for pharmaceutical purpose on the activity of drugs, knows the classification of analytical techniques together with the criteria for the selection of methods and their validation [K\_W7]

3. Has basic knowledge in the field of searching for new drugs, natural and synthetic products as well as their biochemical and molecular gripping points, pharmacopoeial standards and norms related to pharmaceutical engineering; knows methods and techniques for researching new drug substances in chemical, pharmaceutical and toxicological terms [K\_W24]

4. Knows the development of pharmaceutical engineering and research methods used in it, as well as directions of development of the pharmaceutical industry in the country and all over the world [K\_W14]

5. Has solid knowledge in the field of separation and purification processes of raw materials and products found in the pharmaceutical, cosmetics and chemical industries [K\_W15]

#### Skills:

1. Understands literature in the field of pharmaceutical engineering in Polish; reads and understands simple scientific and technical texts in English, is able to obtain information from literature, databases and other sources related to pharmaceutical engineering, also in English, is able to integrate and interpret them, draw conclusions and formulate opinions [K\_U1]

2. Is able to explain the basic phenomena associated with significant processes, to distinguish between types of chemical reactions and has the ability to select them for chemical processes, can characterize various states of matter, the structure of chemical compounds, including drug substances, using theories of their description, methods and experimental techniques [K\_U2]

3. Uses basic techniques, research equipment and apparatus useful in biotechnology, synthesis and analysis of pharmaceutically active substances, dosage form technology and toxicology, appropriate for pharmaceutical engineering, uses pharmacopoeial methods, prepares documentation [K\_U8]

#### Social competences:

1. Is aware of the need for lifelong learning and professional development [K\_K1]

2. Is ready to make an independent decisions and lead a team, critically assess his own actions and those of the team, take responsibility for the effects of these activities and is able to cooperate and work in a group, inspire and integrate the professional environment [K\_K2]

3. Is able to think and act in a creative and entrepreneurial way [K\_K6]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge is verified during oral statements during classes and during tests in open questions. Correct chemical language explains issues and describes the latest ways to solve problems related to the synthesis of organic compounds. In the case of on-line classes, the verification of knowledge will be carried out in the same form on the eMeeting platform.

### Programme content

Discussing in thematic blocks, with the active participation of students, examples of syntheses of therapeutic agents, in which the use of microwave irradiation had a significant impact on the course and mechanism of the reaction. The discussion will be preceded by an introduction on the operation of microwaves and the requirements for the selection of reagents and solvents.

### Course topics

none

### Teaching methods

Multimedia presentation introducing the topic, projection of the course of synthesis and analysis of products, current literature on the topic

### Bibliography

Basic:

1. J. Clayden, N. Greeves, S. Warren, P. Wothers, Chemia organiczna, tom I, II i III, WNT, Warszawa 2009.
2. J. Gawroński, K. Gawrońska, K. Kacprzak, M. Kwit, Współczesna synteza organiczna, PWN, Warszawa 2004
3. C. Willis, M. Wills, Synteza organiczna, Wyd. Uniwersytetu Jagiellońskiego, Kraków 2004

Additional:

1. J. Skarżewski - Wprowadzenie do syntezy organicznej, PWN, Warszawa 1999
2. M.B. Smith, J. March, Advanced Organic Chemistry, Reaction, Mechanism and Structure, J. Wiley & Sons, New Jersey 2007
3. R.B. Silverman, Chemia organiczna w projektowaniu leków, WNT, 2004.
4. G.L. Patrick, Chemia medyczna podstawowe zagadnienia, WNT, 2003.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	30	1,00
Classes requiring direct contact with the teacher	15	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	0,50