



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Selected aspects of modern chemistry

### Course

Field of study

Technologia Chemiczna

Area of study (specialization)

Composites and Nanomaterials

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

I/1

Profile of study

general academic

Course offered in

English

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

### Number of credit points

2

### Lecturers

Responsible for the course/lecturer:

Barbara Górską, BEng, PhD

Responsible for the course/lecturer:

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### Prerequisites

Student has basic knowledge of general chemistry, inorganic chemistry, organic chemistry, physical chemistry, chemical technology and chemical engineering, as well as broadly understood environmental protection. Student is able to obtain information from suggested sources. Student is able to communicate in English. Student understands the need of self-education. Student is able to study literature recommended by lecturer. Student should understand the importance of working separately and as a part of team.



### Course objective

The main goal of the subject is to give a general overview into modern chemistry considered as a holistic matter, including advanced techniques and nanomaterials.

### Course-related learning outcomes

#### Knowledge

K\_W2 - has improved knowledge in chemistry and other related areas of science, allowing to formulate and solve complex tasks related to chemical technology

K\_W6 - has improved knowledge of the latest chemical and material technologies, including advanced materials and nanomaterials technologies, knows current trends in the development of chemical industrial processes

K\_W11 - has a well-established and improved knowledge of the selected specialty

K\_W14 - has knowledge of selected aspects of modern chemical knowledge and aspects of copyright and industrial property

#### Skills

K\_U1 - has the ability to obtain and critically evaluate information from literature, databases and other sources, and formulate opinions and reports on this basis

K\_U3 - can use English in professional contacts

K\_U9 - is able to design and conduct chemical reactions on a laboratory scale in various conditions and properly use the results of these tests to scale up

K\_U17 - can critically assess the practical usefulness of using new developments in chemical technology

#### Social competences

K\_K1 - is aware of the need for lifelong learning and professional development

K\_K2 is aware of the limitations of science and technology related to chemical technology, including environmental protection

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - written exam graded on the basis of a points system (0-100 points)

|   |                |
|---|----------------|
| 3 | 50.1 -70.0 pkt |
| 4 | 70.1 -90.0 pkt |
| 5 | 90.1 -100 pkt  |

### Programme content



1. Description of the composition, structure and physical and chemical properties of substances as well as the transformations of the substances into the different phases.
2. Ionic liquids (definition, classification, synthesis, physicochemical properties and application).
3. Supercritical fluids (definition, properties, examples and application).
4. Xerogels and aerogels (classification, synthesis, physicochemical properties and application).
5. Liquid crystals (definition, classification, synthesis, physicochemical properties and application).
6. Graphene (synthesis, physicochemical properties and application).
7. Propellants (classification, characterization, synthesis, physicochemical properties and application).
8. Titanium dioxide (definition, classification, synthesis, physicochemical properties and application).
9. Nanomaterials. Nanodiamonds (definition, classification, characterization, synthesis, physicochemical properties and application). Nanodots (definition, classification, synthesis, physicochemical properties and application).

Laboratories provide an introduction to basic techniques used in experimental chemistry. Proper laboratory procedures, chemical safety rules, and environmentally safe methods of chemical disposal and waste minimization are important components of the course. Experiments are selected to provide illustration and reinforcement of course topics.

### Teaching methods

Lecture: multimedia presentation

### Bibliography

Basic

1. P. Wasserscheid, T. Welton (Eds.), Ionic liquids in synthesis, Wiley-VCH, 2003.
2. Y. Arai, T. Sako, Y. Takebayashi, (Eds.), Supercritical fluids : molecular interactions, physical properties, and new applications, Springer, 2002.

Additional

1. R. H. Petrucci, F. G. Herring, J. D. Madura, C. Bissonnette, General Chemistry: Principles and Modern Applications (10th Edition), Pearson Prentice Hall, 2009.
2. D. W. Oxtoby, H. Pat Gillis, A. Campion, Principles of Modern Chemistry, Cengage Learning, 2008.



### Breakdown of average student's workload

|   | Hours | ECTS |
|---|-------|------|
| Total workload  | 60    | 2,0  |
| Classes requiring direct contact with the teacher   | 50    | 1,7  |
| Student's own work (literature studies, preparation for laboratory classes, preparation for tests) <sup>1</sup> | 10    | 0,3  |

<sup>1</sup> delete or add other activities as appropriate