



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Engineering of nanoporous materials

### Course

Field of study

Technologia Chemiczna (Chemical Technology)

Area of study (specialization)

Composites and Nanomaterials

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

I/2

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

4

### Lecturers

Responsible for the course/lecturer:

Dr Eng. Justyna Szadzińska

Responsible for the course/lecturer:

### Prerequisites

A student starting this subject should have the knowledge of the subjects included in the programme of the first-cycle studies, i.e. a basic knowledge in the field of mathematics, physics and chemistry, chemical technology and chemical engineering in order to understand and interpret physical phenomena as well as processes occurring in porous materials. A student should also have the ability to obtain information from different sources, self-study, work individually and in a team, as well as to plan and carry out experiments including interpretation of results and conclusions.

### Course objective

The aim of the course is to give students the basic knowledge of engineering of different porous materials with a focus on nanoporous materials in the field of structure and properties study, functional features and possibilities of practical application of various porous bodies.

### Course-related learning outcomes

Knowledge

1. A student demonstrates a basic knowledge of the characteristics, structure parameters, classification and application of porous materials (including nanomaterials) as well as is able to analyse and determine



their various properties.

K\_W7

2. A student has knowledge of the different methods used in determination of porous materials (including nanoporous materials), understands phenomena, processes and related laws with porous media and can name them correctly.

K\_W4, K\_W11

3. A student is familiar with basic functioning of control-measurement systems and apparatus used in the study of porous materials.

K\_W13

Skills

1. A student is able to analyse porous materials (including nanomaterials) by using adequate techniques and apparatus, and also has reporting ability.

K\_U6, K\_U18, K\_U23

2. A student is able to choose the right way to solve simple engineering tasks related to chemical and process engineering of porous materials.

K\_U12

Social competences

1. A student is aware of the need for lifelong learning and continuous professional development.

K\_K1

2. A student is aware of the responsibility for teamwork tasks.

K\_K4

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during the lecture is verified on the basis of a written exam consisting of closed and open tasks differently scored. Passing threshold: 50% of points. Skills and knowledge acquired during laboratory classes are verified on the basis of the tests. Passing threshold: 50% of points.

### Programme content

The scope of the subject involves issues related to the structure of different porous materials, methods of structure testing and determination (including apparatus), saturation processes, sorption and desorption isotherms, extraction of substances from the porous materials, diffusion, heat transfer in porous media, capillary measurement, filtration as well as practical application of porous bodies (including nanoporous materials).

### Teaching methods

1. Lecture: a multimedia presentation illustrated with examples given on the blackboard by the teacher.



2. Laboratory classes: performing of tasks given by the teacher - practical exercises based on theoretical base for the exercises.

## Bibliography

### Basic

1. Engineering of porous materials, Banaszak, J., Poznan University of Technology: Poznan, 2005 (in Polish).
2. Engineering of porous materials, Kowalski, S.J., Poznan University of Technology: Poznan, 2004 (in Polish).
3. Handbook of porous media, Second Edition, Kambiz, V., CRC Press: Boca Raton, 2005.
4. Mechanics and Physics of Porous Solids, Coussy, O., John Wiley & Sons: Chichester, 2010.
5. The physics of flow through porous media, Scheidegger, A.E., University of Toronto Press, 1974.

### Additional

1. Mass movement in porous bodies, Aksielrud, G.A., Altszuler, M.A., WNT: Warsaw, 1987 (in Polish).
2. Mechanical properties of matter, Cottrell, A.H., PWN: Warsaw, 1970 (in Polish).

## Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	55	2,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam, report preparation) <sup>1</sup>	45	2,0

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