



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Imaging methods in chemistry

### Course

Field of study

Chemical Technology

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/6

Profile of study

general academic

Course offered in

Polish

Requirements

elective

### Number of hours

Lecture

15

Tutorials

Laboratory classes

Projects/seminars

Other (e.g. online)

### Number of credit points

1

### Lecturers

Responsible for the course/lecturer:

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Wydział Technologii Chemicznej

ul. Berdychowo 4, 60-965 Poznań

Responsible for the course/lecturer:

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### Prerequisites



The student has basic knowledge of physical chemistry, analytical chemistry as well as physics and computer science.

### Course objective

Obtaining basic knowledge in the field of image processing for the 2D and 3D characterisation of materials and products and its physicochemical properties in chemical industry and for the analysis of the single processes progress. Getting to know the possibilities of imaging devices and the so-called machine vision for the purposes of chemical analysis and control of technological processes.

### Course-related learning outcomes

#### Knowledge

1. The student knows the necessary principles of operation of control and measurement systems and electronic control systems used in chemical technology [K-W06]
2. The student has the necessary knowledge of techniques and methods for the characterization and identification of chemical substances - [K\_W11]
3. The student knows the basic methods, techniques, tools and materials used in solving simple problems in the field of technology and chemical engineering - [K\_W15]

#### Skills

1. The student is able to obtain the necessary information from the literature, databases and other sources concerning chemical sciences, interprets them properly, draws conclusions, formulates and justifies opinions - [K\_U01]
2. The student is able to work both individually and as a team in a professional and other teams
3. The student has the ability to self-study - [K\_U05]
4. The student uses computer programs supporting the implementation of tasks typical for chemical technology and engineering, plans chemical experiments, studies the course of chemical processes and correctly interprets the obtained results - [K\_U07]
5. The student is able to evaluate the usefulness of routine methods and techniques appropriate for solving practical engineering problems in chemical technology, is also able to select and apply the appropriate method and technique - [K\_U14]
6. Student determines the physical, chemical, mechanical and thermal properties of chemical compounds and materials - [K\_U22]
7. The student selects the methods and analytical techniques for the control of the progress of processes and assessment of the quality of raw materials and products - [K\_U32]

#### Social competences

1. The student understands the need for training and improving his / her professional, personal and social competences. - [K\_K01]



2. The student is able to cooperate and work in a team, inspire and integrate engineering environments.  
- [K\_K03]

3. The student correctly recognizes problems and makes the right choices related to the performance of the profession, in accordance with the principles of professional ethics - [K\_K05]

4. The student is able to think and work in an entrepreneurial way [K\_K06]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The lecture is credited on the basis of a report containing digitally improved microscopic images of metallic coating samples at various magnifications together with applying a scale to the photos, and a description of the filters used.

### Programme content

The lecture will allow the students to learn about modern methods of imaging and image analysis, the development of it. This development is related to the progress in the field of optoelectronics, detectors designed to work in various ranges of the electromagnetic radiation spectrum, significant development of image digitization methods and computer techniques (including artificial intelligence). The lecture will introduce the student to the basics of image mathematical theory, optical imaging, visualization of the field of physical properties, visualization of chemical properties, 3D visualization as well as errors and limitations of optical imaging and visualization methods.

### Teaching methods

Lectures supply the theoretical principles and basic knowledge of theory of visualization and selected imaging techniques in chemistry.

### Bibliography

Basic

1 - Ch. D. Watkins, A. Sadun, S. Arenka: Nowoczesne metody przetwarzania obrazu. WNT 1995

2 - Woźnicki: Przetwarzanie obrazu. WKŁ 1996

3 -M. Szklarczyk Mikroskopia chemiczna i analityczne techniki wielowymiarowe oraz sprzężone PWN 2019

Additional

Web pages

[www.minorplanetobserver.com](http://www.minorplanetobserver.com)

[www.techexpo.com/opto-knowledge](http://www.techexpo.com/opto-knowledge)

[www.vision1.com](http://www.vision1.com)



### Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1
Classes requiring direct contact with the teacher	17	
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	8	

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