



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Unconventional methods of materials synthesis

### Course

Field of study

Materials Engineering

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

Laboratory classes

Tutorials

Projects/seminars

Other (e.g. online)

### Number of credit points

2

### Lecturers

Responsible for the course/lecturer:

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Faculty of Materials Engineering and Technical

Physics

Piotrowo St 3, 60-965 Poznań

Responsible for the course/lecturer:

### Prerequisites

Basic knowledge of materials science and manufacturing processes of engineering materials.

### Course objective

Study of unconventional methods of materials synthesis and modification on a volumetric and surface scale.

### Course-related learning outcomes

Knowledge



1. Student has knowledge of trends in the development of modern materials manufacturing and processing techniques. K\_W12.
2. Student has knowledge of trends in the development of modern surface treatment technologies. K\_W12.
3. Student has knowledge of the methods of nanomaterials synthesis. K\_W12

#### Skills

1. Student is able to describe modern methods of materials synthesis and their surface layer modification. K\_U01.
2. Student is able to describe modern methods of nanomaterials synthesis. K\_U01

#### Social competences

1. Student is aware of the role of modern technologies in the development of society and economy. K\_K01, K\_K02.

#### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Credit on the basis of a test consisting of 3-5 questions, conducted on the last lecture.

#### Programme content

1. Introduction
  - a) Modern steels, superalloys, ceramics, composites
  - b) Coatings
  - c) Nanomaterials
  - d) Biomaterials
2. Synthesis methods of nanomaterials, construction materials, biomaterials and special materials
  - a) SPD
  - b) MA, HEBM
  - c) Crystallization
  - d) Methods of the surface layers formation
    - electrochemical treatment (etching, polishing, anodic oxidation)
    - vapor deposition (CVD, PVD)
    - ion implantation
    - sol-gel
    - thermal spraying
  - e) additive manufacturing technologies
    - SLS, SLM, EBM, LENS
  - f) technologies of porous materials
    - synthesis in combustion reactions
    - powder and fiber metallurgy
    - space holder technology
    - replica technique



- casting with "freezing"
- microwave sintering

### Teaching methods

1. Illustrated lecture describing the program content

### Bibliography

#### Basic

1. J. Jakubowicz, Obróbka powierzchniowa biomateriałów tytanowych, WPP Poznań 2019
2. R.W. Kelsall, I.W. Hamley, M. Geoghegan, Nanotechnologie, PWN Warszawa 2008
3. M. Jurczyk, Mechaniczna synteza, WPP Poznań 2003
4. K. Kurzydłowski, M. Lewandowska, Nanomateriały inżynierskie konstrukcyjne i funkcjonalne, PWN Warszawa 2010

#### Additional

1. M. Jurczyk, Nanomateriały wybrane zagadnienia, WPP Poznań 2001
2. Elsevier, Springer and MDPI scientific articles taken from the database

### Breakdown of average student's workload

	Hours	ECTS
Total workload	45	2,0
Classes requiring direct contact with the teacher	15	1,0
Student's own work (literature studies, preparation for tests/exam) <sup>1</sup>	25	1,0

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