COURSE DESCRIPTION CARD - SYLLABUS

Course name

Polymer nanomaterials

Course

Field of study

Materials Science

Year/Semester

3/6

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

15

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

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Faculty of Mechanical Engineering

Piotrowo 3 st., 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

The student should have basic knowledge of the material science of polymeric materials, methods of melt processing of polymers, methods fortesting of microstructure and nanostructure.

Course objective

Learning about modern nanofillers and methods of producing polymer nanomaterials as well as their functional properties.

Course-related learning outcomes

Knowledge

1. Students have knowledge of engineering materials. They can recognize, describe and classify metals

and their alloys (ferrous alloys, non-ferrous metal alloys), polymeric, ceramic and composite materials (polymer, metal, ceramic and carbon matrix and layered materials), functional materials. - [K_W010].

2. Students have knowledge of material process technology. Can describe the processes of engineering materials production, techniques for obtaining nanomaterials, composite materials and thin films, methods of production of polymer and composite materials. - [K_W012].

Skills

1. Students are able to select engineering materials, methods of shaping the structure and properties of materials for technical applications depending on the structure, properties and conditions of use, select a technological process for the production and processing of materials. - [K_U01, K_U21].

Social competences

1. Students are able to cooperate in a group. - [K_K03].

2. Students are aware of non-technical aspects and effects of engineering activities, including the impact on the environment. - [K_K02].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture

Written colloquium at the end of the semester, contains 5 to 6 questions (credit if at least 50.1% of correct answers are obtained). Up to 50.0% - ndst, from 50.1% to 60.0% - dst, from 60.1% to 70.0% - dst +, from 70.1% to 80.0% - db, from 80, 1% to 90.0% - db +, from 90.1% - very good.

Programme content

Lecture

Characteristics of selected organic / inorganic functional nanofillers. Selected technologies for the production of nanocomposites based on thermoplastics polymers- multi-stage processing, design features of plasticizing systems of twin-screw extruders in the processing of nanocomposites. Methods of producing elastomeric nanomaterials. Assessment of the influence of manufacturing parameters on the microstructure and morphology of materials in the nanoscale and on the properties of the obtained materials. Discussion of the degree of filling of polymeric materials with nanoparticles and the mechanisms of materials toughening in the presence of nanoparticles. Functional nanomaterials application in packaging. Nanomaterials use in flame retardantation of polymers, and reinforced engineeringnanocomposites.

Teaching methods

Lecture: multimedia presentation illustrated with examples given on a board.

Bibliography

Basic

1. Tolinski M., Additives for polyolefins, wyd. Elsevier, Oxford2009.

2. Xanthos M., Functional Fillers for Plastics, wyd. WILEY-VCH, Weinheim, 2010.

3. Blum H.R., Functional fillers: a solution towards polymer sustainability & renewability. Proceedings of the Functional Fillers for Plastics, PIRA Intertech Corp.,Atlanta, 2008.

4. Ke Y.C., Stroeve. P., Polymer-Layered Silicate and Silica Nanocomposites, Elsevier, Oxford, 2005.

5. B. Jurkowski, B. Jurkowska, „Sporządzanie kompozycji polimerowych", wyd. WNT, Warszawa 1995.

Additional

1. Smits V., Chevalier P., Deheunynck D., Miller S.: Reinforced Plastics, wyd. Elsevier, Oxford 2008

2. Rozenberg B.A., Tenn R., Polymer-assisted fabrication of nanoparticlesand nanocomposites, Prog. Polym. Sci. 33 (2008) 40–112.

3. Wypych G.: Handbook of fillers, wyd. ChemTec Publishing, Toronto 1999.

Breakdown of average student's workload

	Hours	ECTS
Total workload	40	2,0
Classes requiring direct contact with the teacher	15	1,0
Student's own work (literature studies, preparation for laboratory classes, preparation for colloquium)[1]	25	1,0

[1] delete or add other activities as appropriate