



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Polymer nanomaterials

Course

Field of study

Materials Science

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

15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

DSc. Eng. Karol BULA

Responsible for the course/lecturer:

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Faculty of Mechanical Engineering

Piotrowo 3 st., 60-965 Poznań

Prerequisites

The student should have basic knowledge of the material science of polymeric materials, methods of melt processing of polymers, methods for testing 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

The student has knowledge of the science of materials that allows to determine the properties of



polymer nanomaterials, the criteria for the selection of nanofillers and the methods of producing polymer nanocomposites.

Skills

The student is able to describe the groups of materials, nanomaterials, technology of their preparation, as well as to select the components for the production of nanomaterials.

Social competences

The student is aware of the non-technical aspects and effects of engineering activities, including the impact on the environment.

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 in case of obtaining at least 50,1% correct answers).

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 engineering nanocomposites.

Teaching methods

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

Bibliography

Basic

1. Tolinski M., Additives for polyolefins, wyd. Elsevier, Oxford 2009.
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, „Sporządzenie 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 nanoparticles and 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	50	2,0
Classes requiring direct contact with the teacher	25	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