COURSE DESCRIPTION CARD - SYLLABUS

Course name
Polymer nanomaterials [S1IMat1>NP]

Course

Field of study
Materials Engineering

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr hab. inż. Karol Bula prof. PP
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Lecturers

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:

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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, „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 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	2,00
Classes requiring direct contact with the teacher	25	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00