COURSE DESCRIPTION CARD - SYLLABUS

Course name

Polymer nanomaterials

Course

Field of study

Materials science

Year/Semester

1/2

Area of study (specialization)

Nanomaterials

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

polish

Form of study

full-time

Requirements

compulsory

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:

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Wydział Inżynierii Mechanicznej

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge of the material science of polymeric materials and nanocomposites

Skills of logical thinking, using information obtained from basic and specialist literature in the field of materials science

social competencies understanding the need to learn and acquire new, in-depth material knowledge

Course objective

Understanding the methods of creating and characterizing nanocomposites with special applications

Course-related learning outcomes

Knowledge

1. Student powinien rozróżniać typy nanokompozytów polimerowych - [K_W08 K_W04]

2. Student określał normy dotyczące właściwości nanokompozytów polimerowych - [K_W05]

3. Uczeń odpowiedzialny jest za wytworzenie oraz skład nanokompozytu dla kształtowania zależnościK_W08, K_W07, K_W

Skills

1. Student can interpret dependencies and influences of polymer nanocomposite - [K_U11, K_U13]

2. Students present nanocomposite composition for properties - [K_U13]

3. The student can assess the influence on the boundary boundaries in polymer nanocomposites with their reference to properties - [K_U12 K_U13]

Social competences

1. The student has the importance of applying the materials in the economy and life of management - [K_K02]

2. The student can work in a group - [K_K03]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: credit based on a test conducted at the end of the semester, containing 6 general questions; pass in the case of a correct answer to min. 3 questions: <3? next, 3? dst, 4? dst +, 4.5 - db, 5? db +, 6? very good

Laboratory: pass based on an oral or written answer regarding the content of each performed laboratory exercise, and report on each laboratory exercise according to the instructions of the laboratory teacher. All exercises must be passed (positive grade from the answers and the report) as a condition for obtaining credit for the laboratories

Programme content

Lecture:

1. Definition of the composition and applications of basic polymer nanocomposites

2. Advantages and disadvantages of polymer nanocomposites

3. Basic nanofillers, their characteristics, and application

4. Methods of producing polymer nanocomposites "in situ", in solution or the melt state

5. Interactions between the matrix and nanofillers, adhesion, and phenomena at the interface

6. Methods of shaping the properties of special nanocomposites

7. Crystallization and other phenomena in the matrix

8. Examples of applications of nanocomposites

9. Thermal and calorimetric methods in the evaluation of polymer nanocomposites

10. The influence of external physical fields on the structure and properties of polymer nanocomposites

Lab:

1. Extrusion of nanocomposites polyamide 6 / halloysite nanotubes and injection of test samples

2. Extrusion of nanocomposites polyethylene/halloysite nanotubes and injection of test samples

3. Extrusion of polyamide 6 / montmorillonite nanocomposites and injection of test samples

4. Extrusion of polyethylene/montmorillonite nanocomposites and injection of test samples

5. Research on the mechanical properties of polyamide nanocomposites

6. Research on the mechanical properties of polyethylene nanocomposites

Teaching methods

1. Lecture: multimedia presentation, presentation illustrated with examples given on the blackboard.

2. Laboratory exercises: practical exercises, performing experiments and measurements, discussion, team work.

Bibliography

Basic

1. Przygocki W., Włochowicz A.: Fulereny i nanorurki, WNT, Warszawa 2001

2. Huczko A., Bystrzejewski M., Fulereny 20 lat później, Wyd. Uniwersytetu Warszawskiego, 2007

Additional

1. Huczko A.: Fulereny, PWN, Warszawa 2000

2. Huczko A.: Nanorurki węglowe, PWN, Warszawa

Breakdown of average student's workload

	Hours	ECTS
Total workload	70	2,0
Classes requiring direct contact with the teacher	35	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	35	1,0

[1] delete or add other activities as appropriate