COURSE DESCRIPTION CARD - SYLLABUS

Course name

Polymers and Polymer Composites

Course

Field of study

Chemical Technology

Area of study (specialization)

Composites and Nanomaterials

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

II/2

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

Prerequisites

Student should have knowledge of the basic principles of general chemistry, organic chemistry, physical chemistry, polymer chemistry and polymer technology. The student has knowledge in the field of technology and chemical engineering, machine science and apparatus of the chemical industry. Knows and applies the techniques of good work in the chemical laboratory, can use basic laboratory equipment. Is able to obtain information from literature, databases and other properly selected sources.

Course objective

Obtaining knowledge about polymer composites, selection of the matrix, filler and processing methods. To familiarize students with the properties, applications and basic methods of polymer composites analysis. Developing the skills of acquiring technological knowledge in the field of processing of polymer composites and becoming familiar with the principles of functioning of modern processing plants.

Course-related learning outcomes

Knowledge

Student has expanded and in-depth knowledge in the field of polymer chemistry and other related areas of science, allowing to formulate and solve complex tasks related to polymer technology (K_W2). The student has knowledge in the field of processing, including the appropriate selection of polymer materials, raw materials, methods, techniques, apparatus and equipment for their implementation and characterization of the products obtained (K_W3). The student has expanded knowledge about advanced devices and apparatus used in processing polymer materials (K_W13).

Skills

Student has the ability to obtain and critically evaluate information from literature and other sources (K_U1). He works in a group to prepare and perform experiments in the laboratory (K_U2). Student has the ability of presenting the results of laboratory exercises in concise and proper manner (K_U6). Student has the ability of analysing and interpreting of the results of experiments from the area of polymer chemistry and technology (K_U21). Can use English in professional contacts (K_U3). Student knows and observes the safety rules related to the performed work (K_U19).

Social competences

Student is conscious of limitations of science and technology in the area of polymer chemistry and technology, including environment protection (K_K2). Student is conscious of limitation of his knowledge and understands the need of further continuous education in area of polymer chemistry and technology (K_K1). Students can work in a team and are aware of their responsibility for their work and responsibility for the results of the teamwork (K_K4).

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Stationary: written exam (5 open questions) (student obtains a pass by achieving at least 51% of points). Online: final test (20 closed questions) using the test module on the eKursy platform (student obtains a pass by achieving at least 51% of points).

Laboratory classes: Stationary form. Establishing a final grade on the basis of partial grades obtained during the semester: oral answers or written tests from the material included in the exercises and the given theoretical issues; the presence and performance of all laboratory exercises provided for in the study program; activity in the classroom and the way of exercise performance; grades from reports prepared after each exercise. Online form: Establishing a final grade on the basis of partial grades obtained during the semester; an oral answer and / or a written test (test, 10-20 closed questions) from the material contained in the exercises, instructional videos, and the theoretical issues provided, conducted in "live view" mode with the web camera on, in direct contact with the teacher via the platform eKursy; online presence and completion of all laboratory exercises provided in the study program; grade from the reports prepared after each exercise and sent via the eKursy platform or by e-mail using the university's e-mail system. A final grade will be given based on the average grade of the oral/written answers and reports for each exercise, divided by the number of exercises performed. Grade criteria: 3 - 50.1%-60.0%; 3.5 - 60.1%-70%; 4 - 70.1%-80.0%; 4.5 - 80.1%-90%; 5 - from 90.1%.

Programme content

The lecture covers the following topics:

Basic concepts (composite, matrix, filler), structure and types of composites, properties and application of polymer composites, polymer matrices, powder, fiber and structural fillers, methods of processing polymer composites based on thermoplastic and thermosetting matrix.

The laboratory covers the following issues:

1. Radical copolymerization of styrene with maleic anhydride.

2. Thermal transitions in polymers measured by differential scanning calorimetry (DSC).

3. Morphology of crystalline polymers.

Teaching methods

Lecture: informative lecture with multimedia presentation.

Laboratory classes: performing experiments and getting acquainted with research equipment and chemical reagents used in their conduct, teaching materials for the laboratory in pdf files, tutorial videos on the eKursy platform.

Bibliography

Basic

1. Crawford, R. J., Plastics engineering, Butterworth-Heinemann, 1998

2. Harper, Ch. A., Moder Plastics Handbook, McGraw-Hill, 1999

3. Mazumdar S. K., Composites manufacturing, CRC Press, 2002

4. G. Odian, Principles of Polymerization, 4th ed., Wiley, 2004.

5. H.R. Allcock, F.W. Lampe Contemporary Polymer Chemistry, 2nd ed., Prentice Hall, 1990.

6. L.H. Sperling Introduction to Physical Polymer Science, 4th ed., Wiley, 2006.

7. Handbook of Plastics Technologies, C.A. Harper. Ed., The McGraw-Hill Companies, 2006, e-book

Additional

1. S. Fakirov Fudamentals of Polymer Science for Engineers, Wiley, 2017

2. M. Rubinstein, R. H. Colby Polymer Physics, Oxford, 2003

3. R. A. Pethrick Polymer Science and Technology for Scientists and Enginineers, Whittless Publishing, 2010

4. J. W. Nicholson The Chemistry of Polymers, 5th ed., Royal Society of Chemistry, 2017

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	3,0
Classes requiring direct contact with the teacher	30	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	30	1,0

[1] delete or add other activities as appropriate