COURSE DESCRIPTION CARD - SYLLABUS

Course name
Processing of polymer materials [S1IBio1E>PTS]

Course

Field of study
Biomedical Engineering

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of physics, chemistry, and materials science. The ability to think logically, to use information obtained from the library and the Internet. Understanding the need to learn and acquire new knowledge.

Course objective

Acquisition of knowledge concerning various processing technologies and characterization methods of polymeric materials, as well as evaluation of the relationship between polymer structure and the properties of plastics.

Course-related learning outcomes

Knowledge:
Student should be able to characterize bulk materials prepared for processing .
Student should be to describe typical technology used in polymer processing.

Skills:
Student should be able to make selection of the technology for making plastic parts.

Student is able to select machine and equipment for realizing some technological processes .

Social competences:
Student is prepared for cooperation in a workgroup
Student is able to define priorities which are enable for resolving tasks.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
The lecture course is assessed on the basis of a final test conducted at the end of the semester. The assessment consists of open-ended and/or multiple-choice questions covering the lecture content.

Laboratory classes:
Completion of the laboratory course requires obtaining a passing grade for each laboratory exercise. The final assessment is based on:

an oral or written assessment verifying preparation for the laboratory exercise,
performance of the laboratory task,
preparation and timely submission of laboratory reports in accordance with the instructor’s guidelines.

All laboratory exercises must be successfully completed in order to obtain credit. Assessment criteria and grading scale are consistent with the applicable Study Regulations.

Programme content

Lecture
1. Preparation of bulk materials for processing, drying, pelletizing, mixing.
2. Injection molding technique, IMM construction, injection molds, processing parameters.
3. Extrusion of polymeris materials, single and twin screw plastisizing units, extrusion profile calibration.
4. Laminating technique, resins, fillers, hand lay-up techniques and other
5. Vacuum forming technology.
6. Welding of plastics, joining with adhesives.
7. Application of polymers as a thin protective layers on metals.

Laboratory classes
1. Injection molding technique.
2. Extrusion technique.
3. Laminating.
4. Thermoforming.
5. Joining techniques of plastic parts.
6. Thin protective polymer layers technique application.

Course topics

Lecture:
Technological processes used in polymer processing, including injection molding, extrusion, lamination, vacuum thermoforming, 3D printing, and application of polymer coatings. Physical and technological phenomena occurring during processing operations. The influence of processing parameters on the structure and functional properties of plastic products. Typical defects of products manufactured using different polymer processing technologies, together with methods of their identification and prevention. Characteristics of individual processing technologies and their applications in industrial practice.

Laboratory classes:
Laboratory exercises involving polymer processing technologies, including injection molding, extrusion, lamination, thermoforming, 3D printing, and application of polymer coatings.

Teaching methods

Lecture:
Lectures conducted in the form of multimedia presentations supported by animations, practical examples, and discussion of selected technological problems.

Laboratory classes:
Laboratory classes involving the performance of experimental procedures and technological processes, analysis and interpretation of obtained results, and discussion of the course and outcomes of the experiments.

Bibliography

- Dominick V. Rosato, Donald V. Rosato and Matthew V. Rosato. (2004). Plastic Product Material and Process Selection Handbook. Elsevier. 10.1016/B978-1-85617-431-2.X5000-2
- Sebastião V. Canevarolo, Jr. (2020). Polymer Science - A Textbook for Engineers and Technologists. Elsevier. 10.1016/C2018-0-01770-3.
- Nigel Mills, Mike Jenkins and Stephen Kukureka. (2020). Plastics - Microstructure and Engineering Applications. Elsevier. 10.1016/C2017-0-00694-8.
- Christian Bonten. (2020). Plastics Technology - Introductions and Foundations. Hanser. 10.1016/C2019-0-01366-0.
- Ulf Bruder. (2019). User's Guide to Plastic. Hanser. 10.1016/C2018-0-01800-9.
- Ram K. Gupta. (2023). Specialty Polymers - Fundamentals, Properties, Applications and Advances. Taylor & Francis. 10.1201/9781003278269.
- Robert Sikora. (1993). Przetwórstwo tworzyw wielkocząsteczkowych. Wydawnictwo Edukacyjne Żak.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00