COURSE DESCRIPTION CARD - SYLLABUS

Course name
Polymer processing

Course

Field of study
Product Lifecycle Engineering
Area of study (specialization)

Level of study
Second-cycle studies
Form of study
full-time

Year/Semester
1/2
Profile of study
general academic
Course offered in
English
Requirements
elective

Number of hours

Lecture
10
Laboratory classes
10
Other (e.g. online)

Tutorials
Projects/seminars
10

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Wydział Inżynierii Mechanicznej

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Responsible for the course/lecturer:

Prerequisites

Knowledge of material science of polymeric materials and methods of their processing.

The ability to logically thinking, associate facts and use contemporary information from professional and specialist literature.

Understanding the need for continuous knowledge acquisition and use of modern technological knowledge.

Course objective

Detailed knowledge of polymer processing methods.

Course-related learning outcomes

Knowledge

1. Student has detailed knowledge of polymeric materials and their processing properties.

2. Student should characterize, propose and define methods of processing polymer materials.

Skills

1. Student is able to choose polymer material and their processing conditions.

2. The student can propose the material, processing method and type of shaping tool.

3. Student is able to define the detailed conditions for processing plastics and their impact on the quality of the product.

4. Student is able to carry out polymer processing in a safe manner.

Social competences

1. The student is aware of the importance of using plastics in the economy and social life.

2. Student is able to cooperate in a group.

3. Student is able to think and act in an entrepreneurial manner.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

Written exam carried out at the end of the semester (credit if at least 50.1% of correct answers are obtained). Up to 50.0% - ndst, from 50.1% to 60.0% - dst, from 60.1% to 70.0% - dst +, from 70.1 to 80.0 - db, from 80.1% up to 90.0% - db +, from 90.1% - very good.

Laboratory:

Crediting based on the oral or written answer regarding the content of each laboratory exercise, report on each laboratory exercise as instructed by the laboratory teacher. All exercises must be passed (positive assessment of responses and reports) as a condition for obtaining credit for the laboratories.

Project: Credit based on the project implementation and oral response.

Programme content

Lecture:

1. Basic properties of amorphous and crystalline polymers.

2. Modification of processing properties of polymer materials, methods of their assessment.

3. Extrusion processing: process stability, impact of technological conditions on the quality of extruded products, construction and selection of extrusion line elements, basics of extrusion heads and calibration tools.

4. Advanced technologies for injection of polymer materials, injection with water and gas, micro injection, products with metal joints, IML technologies and multi-material injection, hot runner technique, normals for injection molds.

5. Methods of measuring and quality control in the processing of polymer materials.

6. Modern methods of making composites and nanocomposites.

Laboratory

1. Production of flat film in extrusion technology.

2. Assessment of properties for oriented films.

3. Injection of plastics and their modification with mineral fillers.

4. The use of recycled plastics in injection technique.

5. Assessment of the impact of modifications for injected materials.

Project

Development of guidelines for the production of a selected plastic detail. The content of the project must cover the following issues:

- technological conditions for the selected production method

- technological design of the manufactured product

- anticipated operating conditions and planned durability of the manufactured detail

- costs and time necessary to implement the production process

- possibilities of product recycling and production process waste management

- alternative methods for fast / flexible production

Teaching methods

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

2. Laboratory exercises: practical exercises, performing experiments, discussion, teamwork.

3. Project: multimedia presentation, consultation, discussion, teamwork.

Bibliography

Basic

1. G. Wypych - Handbook of Polymers. ChemTec Publishing, Toronto 2012.

2. Z. Tadmor, C.G. Gogos - Principles of polymer processing. Wiley&Sons, New Jersey 2006.

3. J.Karger-Kocsis - Polypropylene handbook. Springer Nature, Cham 2019

Additional

Journals: PlasticsEurope, Journal of Plastics Technology (Kunststoffe), Polimery (Polymers-Warsaw), CompositesWorld

Web: ScienceDirect, Scopus, Researchgate, Web of Science

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	20	1,0

1 delete or add other activities as appropriate