COURSE DESCRIPTION CARD - SYLLABUS

Course name
PROCESSING OF POLYMERIC MATERIALS

Course

Proposed by Discipline
Mechanical Engineering
Type of studies
Doctoral School
Form of study
full-time

Year/Semester
II/3
Course offered in
English
Requirements
elective

Number of hours

Lecture
8

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

Knowledge:
General knowledge on polymeric materials and composites, polymer processing, mechanical engineering.

Skills:
Ability of the student to obtain information from recommended literature sources. Ability of the student to use information obtained from the references to get knowledge related to polymer processing. Ability of the student to choose the right polymer processing technology for producing the plastics products.

Social competencies:
Thinking and critical assessment of the student knowledge. Understanding of the need for training, supplementing of the knowledge and improving students professional competences. Ability to work in a team and to collaborative solve the problems.

Course objective

The main aim of the course is to familiarize PhD students with the most important polymer processing methods. Enable students to understanding the possible methods of controlling manufacturing processes of plastics products. Demonstration of the modern polymer processing technologies including polymer composites and biocomposites. Presentation of advantages and disadvantages of particular processing methods. Familiarization with basic plastic recycling methods. Indication the recent research trends and future directions in processing and recycling of the polymeric materials.

Course-related learning outcomes

Knowledge

A PhD student who graduated from doctoral school knows and understands:
1) Global achievements, covering theoretical foundations as well as general and selected specific issues that are relevant to scientific disciplines studied at the doctoral school, to the extent that enables revision of existing paradigms, [P8S_WG/SzD_W01]
2) Key developmental trends of disciplines of science in which education at the doctoral school takes place, [P8S_WG/SzD_W02]
3) Basic principles of knowledge transfer to the economic and social sphere as well as those of commercialization of results of scientific activities and know-how related to these results. [P8S_WK/SzD_W07]

Skills

A PhD student who graduated from doctoral school can:
1) Use knowledge from different branches of science to creatively identify, formulate and innovatively solve complex problems or to perform research tasks such as: - define the aim and subject of scientific research, form a research hypothesis, - develop research methods, techniques and tools and use them creatively, - draw conclusions on the basis of research results, [P8S_UW/SzD_U01]
2) Critically analyze and assess scientific research results, work of experts and other creative activities together with their contribution into knowledge development, [P8S_UW/SzD_U02]
3) Communicate on specialist issues on the level that allows active participation in the international scientific community. [P8S_UK/SzD_U04]

Social competencies

A PhD student who graduated from doctoral school is ready to:
1) Critically assess achievements within a given scientific discipline, [P8S_KK/SzD_K01]
2) Acknowledge the importance of knowledge in solving cognitive and practical problems, [P8S_KK/SzD_K03]
3) Fulfilling the social obligations of researchers and creators, [P8S_KO/SzD_K04]
4) Maintain and develop the ethos of research and creative communities, including: conducting independent scientific activity, - respecting the principle of public ownership of the results of scientific activities, including the principles of intellectual property protection. [P8S_KR/SzD_K07]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

PQF code	Methods for verification of learning outcomes	Assessment criteria
W01, W02, W07	Test - exam (colloquium) in writing	3 - 50.1%-70.0%, 4 - 70.1%-90.0%, 5 - from 90.1%
U01, U02, U04	Test - exam (colloquium) in writing	3 - 50.1%-70.0%, 4 - 70.1%-90.0%, 5 - from 90.1%
K01, K03, K04, K07	Test - exam (colloquium) in writing	3 - 50.1%-70.0%, 4 - 70.1%-90.0%, 5 - from 90.1%

Programme content

1. Characteristic features of polymer plastics processing.
2. Injection moulding technology.
3. Extrusion moulding technology.
4. Technologies for producing hollow products: injection stretch blow moulding and extrusion blow moulding.
5. Production of multilayer and special films.
6. Rotational moulding technology.
7. Recycling of polymeric materials.
8. New trends in processing and recycling of polymeric materials.

Course topics

1. Polymers processing methods.
2. Special technologies in polymers processing.
3. Advantages and disadvantages of different polymers processing methods.
4. An overview of polymers recycling methods.

Teaching methods

Lecture: multimedia presentation including movies, illustrations and examples.

Bibliography

Basic

1. Morton M. Denn, Polymer Melt Processing, Cambridge University Press, 2014.
2. Tim A. Ostwald, Understanding Polymer Processing, Carl Hanser Verlag, Munich 2010.

3. Guido Tosello, Micro Injection Moulding, Hanser Publications, Cincinnati, 2018.
4. C. Rauwendaal, „Polymer Extrusion", Carl Hanser Verlag, Munich 2001.
5. Mark Kearns and Roy Crawford, Practical Guide to Rotational Moulding, Elsevier Inc., 2022.
6. Progelhof R. C.: Polymer Engineering Principles, Hanser Publishers, New York, 1993.
7. Charrier J-M.: Polymer Materials and Processing, Hanser Publishers, New York, 1990.

Additional

1. Articles in scientific journals: Polimery, Kunststoffe, Journal of Applied Polymer Science, Polymer, Polymers, Materials, Composites, Journal of Natural Fibers, Materials and Design, Polymer Engineering and Science, Plastics, Rubber and Composites: Macromolecular Engineering, Sustainability, Polymer Bulletin, Journal of Materials Science, Rotoworld Magazine, International Polymer Processing, Polymer Processing and Engineering, Recycling, Resources, Conservation and Recycling, Waste Management and Research.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	8	0
Doctoral student's own work (literature studies, preparation for tutorials, discussion, consultations, homework) [1]	42	2,0

[1] delete or add other activities as appropriate