COURSE DESCRIPTION CARD - SYLLABUS

Course name
AUTOMATION IN PLASTICS PROCESSING AND RECYCLING [S5IMECH>APRTS]

Course

Proposed by Discipline
–

Year/Semester
2/3

Level of study
Doctoral School

Course offered in
English

Form of study
full-time

Requirements
elective

Number of hours

Lecture
4

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

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Lecturers

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Prerequisites

Knowledge: General knowledge on processing and recycling of polymeric materials, automated technological lines, 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 and reccycling. Ability of the student to choose the right polymer recycling technology for different plastics products. Ability to propose the automation of polymer processing and recycling methods. 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 automated processing and recycling lines for polymeric materials processing methods. Enable students to understanding the possible methods of controlling and monitoring of manufacturing and recycling processes of plastics products. Demonstration of same examples of the modern polymer processing and recycling technologies. Familiarization with 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:

Methods for verification of learning outcomes - Test - exam (colloquium) in writing

Assessment criteria
3 - 50.1%-70.0%,
4 - 70.1%-90.0%,
5 - from 90.1%

Programme content

1. Automation of polymer processing technologies (injection, extrusion, thermoforming and rotational moulding).
2. Recycling of polymeric materials.
3. Automated recycling lines for various plastics products.
4. New trends in processing and recycling of polymeric materials.

Course topics

Automation of procesing processes, processing and recycling of plastics products, automatic processing and recycling lines for polymeric materials, controlling and monitoring of production lines, new trends in processing and recycling of polymeric materials.

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. C. Rauwendaal, „Polymer Extrusion”, Carl Hanser Verlag, Munich 2001.
4. Mark Kearns and Roy Crawford, Practical Guide to Rotational Moulding, Elsevier Inc., 2022.
5. Raju Francis, Recycling of Polymers: Methods, Characterization and Applications. Wiley ‐ VCH Verlag GmbH & Co. KGaA, 2017.
6. Norbert Niessner, Recycling of Plastics. Carl Hanser Verlag GmbH & Co. KG. Published by Elsevier 2023.

Additional
1. Articles in scientific journals: Polimery, Kunststoffe, Journal of Applied Polymer Science, Polymer, Polymers, Materials, Composites, Materials and Design, Polymer Engineering and Science, Sustainability, Journal of Materials Science, 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	25	1,00
Classes requiring direct contact with the teacher	4	0,00
Doctoral student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation)	21	1,00