COURSE DESCRIPTION CARD - SYLLABUS

Course name
Processing of polymeric materials [S2TCh2E-KiN>PMP]

Course

Field of study
Chemical Technology

Year/Semester
1/1

Area of study (specialization)
Composites and Nanomaterials

Profile of study
general academic

Level of study
second-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

The student has the necessary knowledge of chemistry to enable understanding of chemical phenomena and processes. The student has knowledge in the field of technology and chemical engineering, machine science and apparatus of the chemical industry.

Course objective

Transfer of knowledge in the field of processing of polymeric materials. Developing the skills of acquiring technological knowledge in the field of processing of polymeric materials and becoming familiar with the principles of functioning of modern processing plants.

Course-related learning outcomes

Knowledge:
1. The student has expanded and in-depth knowledge in the field of processing of polymer materials necessary for modeling, planning, optimization and characterization of industrial technological processes. [K_W1, K_W11]
2. 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]
3. The student has expanded knowledge about advanced devices and apparatus used in processing polymer materials. [K_W13]

Skills:
1. The student has the ability to obtain and critically evaluate information from literature, databases and other sources and formulate opinions and reports on the processing of polymeric materials on this basis. [K_U1]
2. The student has the ability to communicate with specialists and non-specialists in the field of processing of polymeric materials and related fields. [K_U4]
3. The student posiada umiejętność wykorzystywania wiedzy nabytej w ramach specjalności w działalności zawodowej. [K_U23]

Social competences:
1. The student is aware of the need for lifelong learning and professional development in the processing of polymer materials. [K_K1]
2. The student is aware of the limitations of science and technology related to the processing of polymeric materials, including environmental protection. [K_K2]
3. The student is able to think and act in a creative and entrepreneurial way. [K_K6]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Stationary: written exam. Online: final test using the test module on the eKursy platform. Student obtains a pass by achieving at least 51% of points.
Laboratory classes: Stationary form - oral answer or written test from the material contained in the exercises and the given theoretical issues; presence and realization of all laboratory exercises provided in the study program; grade from reports prepared after each exercise. A final grade will be given based on the average grades of the oral/written answers and reports for each exercise, divided by the number of exercises performed. Online form - oral answer and/or written test from the material contained in the exercises, tutorial videos and the theoretical issues provided, conducted in the "live view" mode with the webcam turned on via eMeeting or Zoom platform during a direct conversation with the teacher and/or using the test module on the eKursy platform; 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.

Programme content

Issues in the field of processing of polymeric materials, and concerning the principles of functioning of modern processing plants.

Course topics

The course content includes the following topics:
- plastics as construction materials, composition of plastics, examples and applications, modification of polymers and properties;
- basics of polymer rheology, polymer melt flows (stresses, deformations in flow, Barus effect;
- plastics processing techniques: pressure processing - pressing, centrifugal casting, vacuum forming, extrusion (method definition, extrusion line composition, screw theory, technology and products), injection of thermoplastic plastics (definition, description of methods, process parameters, examples of products, basics of process calculations) and joining plastics: welding and sealing.
Laboratory exercises include, among others:
1. Testing for mechanical properties of polymer materials
2. Injection molding
3. Material recycling of polymer materials
4. Blow film extrusion
5. Combining polymer materials: welding and sealing
6. Thermoforming

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples on the board.
2. Laboratories - practical classes.

Bibliography

Basic:
1. R.J. Crawford : „Plastics Engineering”, Butterworth-Heinemann 1998.
2. A. Ram : “Fundamentals of Polymer Engineering”, Plenum Press, New York 1997.
3. K. Cantor : “Blow Film Extrusion”, Carl Hanser Verlag, Munich 2011.
4. H. F. Giles Jr., E. M. Mount III, J. R. Wagner Jr.: “Extrusion: The Definitive Processing Guide and Handbook”, William Andrew, Inc. 2005.
5. A. Azapagic, A. Emsley, I. Hamerton : “Polymers, the Environment and Sustainable Development”, John Wiley Et Sons Ltd, Chichester 2003, England.
6. A.K. Vegt : “From polymers to plastics”, DUP Blue Print, Delf 2002.
7. D. Rosato: “Injection Molding Handbook”, Kluwer Academic Publishers, Massachusetts 2000.
8. M Reyne: “Plastic Forming Processes”, John Wiley & Sons, Inc., Hoboken 2008.

Additional:
1. W. Andrew : “Handbook of Plastics Joining. A Practical Guide”, Plastics Design Library, New York 1997.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	64	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	61	3,00