COURSE DESCRIPTION CARD - SYLLABUS

Course name
Polymers and plastics materials

Course

Field of study
Environmental Protection Technologies
Year/Semester
II/5
Area of study (specialization)
-
Profile of study
general academic
Level of study
First-cycle studies
Course offered in
polish
Form of study
full-time
Requirements
compulsory

Number of hours

Lecture
30
Laboratory classes
60
Other (e.g. online)
0
Tutorials
0
Projects/seminars
0

Number of credit points

6

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Dominik Paukszta

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of organic chemistry.

Student is able to carry out laboratory work and use scientific equipment.

Student understands the need for further development and for improving their professional competences.

Course objective

Acquiring knowledge of the polymers and plastics materials and polymeric composites. Learning about how polymers are obtained, processed and recycled.

Course-related learning outcomes

Knowledge

The graduate knows the rules for defining and characterizing raw materials, products and processes used in the chemical industry; the graduate has a knowledge of the current trends in development of the chemical industry nationally and worldwide [K_W06]

The student has knowledge of chemical engineering, science of mechanics, apparatus of the chemical industry and similar areas [K_W10]

The graduate has a general knowledge necessary to understand the social, economic, legal and other non-technical conditions of the engineering activity [K_W14]

Skills

The graduate is able to obtain information from literature, databases and other sources related to chemical sciences, integrates, interprets and draws conclusions and formulates opinions [K_U01]

The graduate works individually and works effectively in a team [K_U02]

The graduate has the ability to self-study [K_U06]

Social competences

The graduate understands the need to develop and improve his/her professional and personal competencies [K_K01]

The graduate can interact and work in group, taking different roles in the group [K_K03]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1.

Exam in an on-site system: the knowledge acquired during the lecture is verified in the form of a written exam at the end of the lecture cycle.

Remote exam: closed-ended question test with twenty questions at the end of the lecture cycle.

2.

Evaluation of laboratory exercises and reports

Programme content

Basic informations about the science of polymers. Reactions leading to the formation of polymers. Polymerisation reactions: radical, ionic, coordination, polycondensation and polyaddition. Structure and properties of most commonly used polymers. Polymers versus plastics materials. Composites with polymeric matrix. Industrial polymerisation methods. Physical states and characteristic temperatures of polymers. Degradation and ageing in polymers.

Processing of polymers - basic definition. Methods of polymer processing: extrusion, injection moulding, calendering, rotational moulding, thermoforming. Other methods: continuous winding method, sheet moulding compounds, bulk moulding compounds. Polymer processing of composites with resin matrix.

Recycling and recovery of polymeric materials. Principle 3/4 R. Method of identification and segregation of polymers. Recycling polymers form automotive industry and WEEE (waste electrotechnical and electronic equipment) Recycling of rubber. Selected technological lines in material recycling: PE foils, PET bottles, other. Partial recycling. Life cycle assessment. Legislation in recycling and recovery area.

Laboratory exercises

1.Identification of plastic materials

2. Viscometric method for examination molecular weight of polymers

3. Polymer composites - preparation and properties of polyester laminates

4. Polycondensation - preparation of an alkyl resin from glycerin and phthalic anhydride

5 Radical block polymerization

6. Cellular materials - chemistry and technology

7. Preparation of polymeric materials and their applications

8. Extrusion techniques

9. Recycling of thermoplastic polymers

Teaching methods

Lectures, laboratory classes

Bibliography

Basic

1. J. Pielichowski, A. Puszyński - "Chemia polimerów", TEZA, Kraków 2004

2. L. Gradoń - ,,Wybrane procesy przetwórstwa i modyfikacji tworzyw sztucznych'', Oficyna Wydawnicza Politechniki Warszawskiej 2005.

3. „Recykling materiałów polimerowych”, A.K. Błędzki , WNT, Warszawa, 1997.

Additional

1. W. Szlezyngier - "Tworzywa sztuczne", tom I - III, Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów 1996.

2. A. Boczkowska, J. Kapuściński, K. Puciłowski, S. Wojciechowski - ,,Kompozyty'', Wydawnictwo Politechniki Warszawskiej 2000.

3. Proceedings of the Central-European Conferences RECYCLING AND RECOVERY OF THE POLYMER MATERIALS, SCIENCE - INDUSTRY, Wrocław/Szczecin, 2000-2018.

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	90	3,6
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exams, lab report preparation) [1]	60	2,4

[1] delete or add other activities as appropriate