



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Recycling of materials

		Course
Field of study		Year/Semester
Chemical Technology		II/3
Area of study (specialization)		Profile of study
Composites and Nanomaterials		general academic
Level of study		Course offered in
Second-cycle studies		English
Form of study		Requirements
full-time		compulsory

		Number of hours
Lecture	Laboratory classes	Other (e.g. online)
15	0	0
Tutorials	Projects/seminars	
0	0	
Number of credit points		
2		

		Lecturers
Responsible for the course/lecturer:		Responsible for the course/lecturer:
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Prerequisites

Structured and systematic knowledge in the field of general, organic chemistry, polymers and chemical technology, and apparatus of the chemical industry. Ability to solve elementary engineering problems based on knowledge. Ability to obtain information from the indicated sources in Polish and a foreign language. Understanding the need for further education, understanding the need to expand their competencies, readiness to cooperate within a team.

Course objective

Understanding the methods of material recycling, material recovery and energy recovery of various materials. Gaining knowledge about the impact of polymers on the environment in the context of misleading media reports.



Course-related learning outcomes

Knowledge

K_W2 - has expanded an in-depth knowledge in chemistry and other related areas of science, allowing to formulate and solve complex tasks related to chemical technology

K_W3 - has knowledge of complex chemical processes, including the appropriate selection of materials, raw materials, methods, techniques, apparatus and equipment for carrying out chemical processes and characterizing the products obtained

K_W11 - has a well-established and extensive knowledge of the selected specialty

K_W13 - has extended knowledge of advanced devices and apparatus used in chemical technology

Skills

K_U1 - has the ability to obtain and critically evaluate information from literature, databases and other sources, and formulate opinions and reports on this basis

K_U11 - is able to properly verify the concepts of engineering solutions in relation to the state of knowledge in technology and chemical engineering

K_U12 - has the ability to adapt knowledge of chemistry and related fields to solve problems in the field of chemical technology and planning new industrial processes

K_U15 - can critically analyze industrial chemical processes and introduce modifications and improvements in this area, using the acquired knowledge, including knowledge about the latest achievements of science and technology

K_U16 - has the ability to assess the technological suitability of raw materials and the selection of the technological process in relation to the quality requirements of the product

Social competences

K_K1 - is aware of the need for lifelong learning and professional development

K_K2 - is aware of the limitations of science and technology related to chemical technology, including environmental protection

K_K6 - can think and act in a creative and entrepreneurial way

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Test in an on-site system: the knowledge acquired during the lecture is verified in the form of a written test at the end of the lecture cycle. Evaluation of prepared presentations.

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

Programme content



Importance of the recycling of materials. Basics of functioning of the recycling system. 3/4 R principle. Life cycle assessment (LCA), primarily with reference to packaging materials. Recycling of materials from the automotive and electrotechnical industries. Reprocessing and recovery of tires and rubber waste. Legal aspects of material recycling and recovery of materials and energy from plastics and other materials. The problem of recycling in various countries of the world.

Identification and sorting of plastics. Agglomeration as a processing method used in material recycling. Methods of material recovery used for plastics. Energy recovery (combustion) of plastics, ecological aspects, combustion of plastics in the light of emissions of pollutants and dioxins. Material recycling, material recovery and energy recovery for specific types of polymers such as: polyethylene, polypropylene, polystyrene, polar polymers, polyurethanes, duroplastics and others.

Recycling of paper, aluminium cans, steel, precious and rare metals, non-Ferrous metals, carpeting, textiles, batteries, hazardous waste, mercury-containing devices and lamps, composite materials and other materials.

Teaching methods

Lecture - multimedia presentation

Bibliography

Basic

1. „Plastics Fabrication and Recycling”, M. Chanda, S. K. Roy, CRC Press Taylor&Francis Group, 2008
2. “Plastics and the Environment”, A. L. Andrady, Wiley-Interscience, 2003
3. “Polymers, the Environment and Sustainable Development”, A. Azapagic, A. Emsley & I. Hamerton, J. Wiley et Sohns Ltd. 2003

Additional

1. 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	40	2,0
Classes requiring direct contact with the teacher	20	1,0
Student's own work (literature studies, preparation for passing) ¹	20	1,0

¹ delete or add other activities as appropriate