



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Recycling and recovery of polymeric materials [S2TOZ1-RMiOC>RMK]

### Course

Field of study

Circular System Technologies

Year/Semester

1/1

Area of study (specialization)

Material recycling and chemical recovery

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

0

Other

0

Tutorials

0

Projects/seminars

15

### Number of credit points

2,00

### Coordinators

dr inż. Mariola Robakowska

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### Lecturers

### Prerequisites

Structured and systematic knowledge in the field of the recycling and recovery of polymeric materials. Is able to obtain information from literature, databases and other appropriately selected sources. 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 competences, readiness to cooperate within a team.

### Course objective

To acquaint students with environmentally safe techniques for recycling composite materials and recovering raw materials and energy from waste composite materials. Understanding the methods of material recycling, material recovery and energy recovery of composite materials. Principles of green chemistry in the context of recycling

### Course-related learning outcomes

Knowledge:

Has the knowledge necessary to understand environmental risk issues and how to reuse materials [k\_w08].

Has detailed knowledge of technological solutions in environmental protection [k\_w13].  
Is able to evaluate the economic aspects of engineering actions taken [k\_w14].

Skills:

Skills:

Has the ability to selectively choose recycling and recovery techniques to assess the possibility of reuse of composite materials [k\_u01]

Has the ability to prepare and deliver a presentation on the implementation of a research task and conduct a substantive discussion on the topic [k\_u01].

Has the ability to work independently and in a team [k\_u09]

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\_u15]

Social competences:

Participates in and is able to lead discussions, is open to different opinions and is ready to assertively express feelings and criticism [k\_k08].

Is aware of the negative impact of human activity on the state of the environment and actively prevents its degradation [k\_k10].

Understands the need to provide society - among others through the mass media - with full information on the benefits and challenges of implementing the concept of a circular economy closed economy concept [k\_k11].

### 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. Preparation of a multimedial presentation. Defence of the project.

### Programme content

To introduce students to environmentally safe techniques for recycling composite materials and recovering raw materials and energy from waste composite materials.

### Course topics

Lecture includes: Introduction to composite materials: polymer reinforcement methods; preparation and types of composites and their characterisation; properties and applications. Recycling and recovery processes of various composite materials. Challenges in recycling of composites: Problems of separation, costs and lack of standards. Innovations in recycling technology, new composite processing methods and their efficiency. Application of recycling in industry: Examples of companies and projects that successfully implement composites recycling. Environmental aspects of recycling (environmental benefits and impact on a circular economy), the future of composite recycling. Project: Execution of a project on the reuse of specific composite materials.

### Teaching methods

Lectures: multimedia presentation

### Bibliography

Basic:

1. „Recykling materiałów polimerowych”, A.K. Błędzki , WNT, Warszawa, 1997
2. „Podstawy recyklingu tworzyw sztucznych”, M. Kozłowski , Wydawnictwo Politechniki Wrocławskiej, Wrocław, 1998
3. Dzienniki Ustaw, Warszawa
4. „Plastics Fabrication and Recycling”, M. Chanda, S. K. Roy, CRC Press Taylor&Francis Group, 2008
5. “Plastics and the Environment”, A. L. Andrady, Wiley-Interscience, 2003
6. “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	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00