



COURSE DESCRIPTION CARD - SYLLABUS

Course name

PLASTICS AND ENVIRONMENTAL PROTECTION

Course

Proposed by Discipline

Chemical sciences

Type of studies

Doctoral School

Form of study

full-time

Year/Semester

II/3, III/5

Course offered in

English

Requirements

elective

Number of hours

Lecture

4

Tutorials

Projects/seminars

Number of credit points

1

Lecturers

Responsible for the course/lecturer:

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Poznan University of Technology

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Responsible for the course/lecturer:

Prerequisites

Knowledge: basic knowledge of chemistry and polymer processing. Student can obtain information from the literature, databases and other properly selected sources. Student is aware of the importance of the effects of engineering activities.

Skills: student is able to obtain information from literature, databases and other sources related to circular system technologies, also in a foreign language to integrate them, interpret them, draw conclusions and formulate opinions.

Social competencies: student participates in discussions and is able to lead discussions, is open to different opinions and ready to assertively express thoughts and criticisms.

Course objective

Teaching students environmentally safe techniques for plastic recycling, recovery of chemicals and recovery of energy from waste plastics or end-of-life plastics.



Course-related learning outcomes

Knowledge

A PhD student who graduated from doctoral school knows and understands:

- 1) key developmental trends of disciplines of science in which education at the doctoral school takes place, [P8S_WG/SzD_W02]
- 2) fundamental dilemmas of the contemporary civilization. [P8S_WK/SzD_W05]

Skills

A PhD student who graduated from doctoral school can:

- 1) take part in scientific discourse, [P8S_UK/SzD_U07]
- 2) independently plan and act for their self-development as well as inspire and organize development of others. [P8S_UU/SzD_U010]

Social competences

A PhD student who graduated from doctoral school is ready to:

- 1) initiate actions in the public interests. [P8S_KO/SzD_K05]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

PQF code	Methods for verification of learning outcomes	Assessment criteria
W02, W05	Test	50%
U07, U010	Team preparation of a presentation	25%
K05	Team preparation of a presentation	25%

Programme content

1. Basics of functioning of the recycling system. 3/4 R principle. Life cycle assessment (LCA), primarily with reference to packaging materials.

Identification and sorting of plastics. The methods of identification and sorting of polymers.

Material recycling, chemical and energy recovery.

2. Recycling of materials from the automotive and electrotechnical industries. Reprocessing and recovery of tires and rubber waste. Agglomeration as a processing method used in material recycling. Technology of material recycling of polyethylene foils and PET bottles. Partial recycling of duroplasts and composites (Sheet moulding compounds - SMC and Bulk moulding compounds - BMC).

3. The methods of material recovery - pyrolysis process, depolymerisation and other. Technologies of pyrolysis process for the mixture of polymers and for selected plastics, for example for pure polymers. Glycolysis, hydrolysis, phenolysis, alcoholysis and other technologies.

Energy recovery (combustion) of plastics, ecological aspects, combustion of plastics in the light of emissions of pollutants and dioxins.

Material recycling, raw material recovery and energy recovery for specific types of polymers such as: polyethylene, polypropylene, polystyrene, carbonates, polar polymers, polyurethanes, duroplastics and others.



Recycling of carpets, metallized foils, composites, laminates and other materials.

4. Legal aspects of material recycling and recovery of materials and energy from plastics. Tasks related to the design of technological lines for polymer processing and recycling. Recycling and recovery of polymers in other countries in the world.

Teaching methods

Lecture: multimedia presentation including illustrations and examples.

Bibliography

Basic

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

2. „Plastics Fabrication and Recycling”, M. Chanda, S. K. Roy, CRC Press Taylor&Francis Group, 2008

Additional

1. “Polymers, the Environment and Sustainable Development”, A. Azapagic, A. Emsley & I. Hamerton, J. Wiley et Sohns Ltd. 2003

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,0
Classes requiring direct contact with the teacher	4	0,2
Student's own work (literature studies, preparation for tutorials, project preparation, consultations with the teacher) ¹	21	0,8

¹ delete or add other activities as appropriate