COURSE DESCRIPTION CARD - SYLLABUS

Course name
Recycling

Course

Field of study
Materials Engineering

Year/Semester
III/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	Laboratory classes	Other (e.g. online)
15	15	
Tutorials	Projects/seminars	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Prerequisites

Basic knowledge in field of materials technology, chemistry, and management (both metal and non-metal-plastics).

Course objective

Learning basic problems related to waste management and their importance for sustainable civilization development.

Course-related learning outcomes

Knowledge

1. The student identifies basic concepts and definitions, logistical and technical activities concerning waste treatment processes (collection, segregation, transport, etc.) [K_W02, K_W010, K_W016] .

2. The student is able to indicate the ecological aspects of recycling of plastics (metals and their alloys, plastics, etc.) [K_W014].
3. The student knows the general principles of creation and development of forms of individual entrepreneurship. To this end, he/she can apply knowledge of materials engineering, materials processing technology, economics and management [K_W020].

Skills

1. The student is able to prepare, in Polish and English, well-documented problems of materials engineering, in particular concerning the selection of materials, manufacturing technology, methods of materials testing [K_U04].
2. The student has the ability of self-education [K_U05].
3. The student is able to identify and classify waste (especially hazardous) and select the most appropriate way of its disposal [K_U21].
4. The student is able to design activities related to rational waste management [K_U20].

Social competences

1. The student is aware of the importance and understanding of non-technical aspects and effects of engineering activity, including its impact on the environment, and the related responsibility for making decisions [K_K02].
2. The student is able to cooperate in a group, taking various roles [K_K03].
3. The student is able to think and act in an entrepreneurial way [K_K06].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Written a test (20 questions), criterion: 3 from 50.1 to 60%, 3.5 from 60.1 to 70%, 4 from 70.1 to 80%, 4.5 from 80.1 to 90.0% and 5 above 90.1% .

Laboratory: Attendance to all classes. Positive assessments from raports and answers for questions asked by a teacher.

Programme content

Lecture: World consumption of materials and energy. Resources of raw materials. Primary and secondary, renewable and non-renewable raw materials. Waste and environmental protection. Administrative and law conditioning of waste management. Classification of waste. Hazardous waste. After-production and after-use waste. Reclaiming and recycling of materials. Recycling of metal and non-metal materials (plastics, paper). Ecological aspects of recycling. Logistical problems in recycling processes. Techniques of recycling of metals, plastics, rubber, etc. Preparation of materials (waste) for manufacturing processes. Course of processing processes and their effects. Studies of polymer regranulated and metal.

Laboratory: Systems of waste segregation. Classification and segregation of metals waste, alloys and plastics. Examples of processing waste out of selected plastics. Processing complex waste on a selected example. Re-melting of metal scrap and plastics reprocessing.

Teaching methods

Lecture: multimedia presentation. Laboratory exercises: performing exercises, discussion, team work.

Bibliography

Basic

1. Kozłowski M., Plastics Recycling in Europe, Wyd. Politechniki Wrocławskiej 2006.
2. Tim A. Osswald Natalie Rudolph, Polymer Rheology Fundamentals and Applications, Hanser Publishers, Munich 2015. Book ISBN978-1-56990-517-3.
3. Mark E. Schlesinger, Aluminum Recycling, Second Edition, CRC Press 2013.
4. Ulewicz M., Siwka J., Procesy odzysku i recyklingu wybranych materiałów, Wyd. Wydziału Inż. Proc., Mat. i Fizyki Stosowanej Politechniki Częstochowskiej, Częstochowa 2010.

Additional

1. Hong Hocheng, Mital Chakankar, Umesh Jadhavt, 1st Edition, Biohydrometallurgical Recycling of Metals from Industrial Wastes, CRC Press 2018.
2. Praca zbiorowa pod red. Jerzego J. Sobczaka, Odlewnictwo Współczesne. Poradnik Odlewnika, Wyd. Stowarzyszenia Technicznego Odlewników Polskich, Tom 1. Materiały, Kraków 2013. ISBN: 878-83-904306-9-0.
3. Brandrup, J., Bittner, M., Menges, G., and Michaeli, W. (1996) Recycling and recovery of plastics, Carl Hanser Verlag, Germany.
4. Letcher T., Plastic Waste and Recycling: Environmental Impact, Societal Issues, Prevention, and Solutions, 1st Edition, Academic Press 2020.
5.Pascoe, R. D. (2000) Sorting of Waste Plastic for Recycling, Rapra Review Reports, 11, 4.

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	25	1,0

[1] delete or add other activities as appropriate