



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Recycling [N1MiBM2>REC]

Course

Field of study

Mechanical Engineering

Year/Semester

4/7

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

part-time

Requirements

elective

Number of hours

Lecture

8

Laboratory classes

8

Other

0

Tutorials

0

Projects/seminars

8

Number of credit points

3,00

Coordinators

Lecturers

Prerequisites

Basic knowledge in the field of materials technology, chemistry, and material processing (plastics and metals and their alloys).

Course objective

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

Course-related learning outcomes

Knowledge:

Allowing identification of waste regarding materials for their further re-processing (recycling). Allowing identification of relations between technology and the environment (places of forming the waste).

Allowing indication of actions limiting quantities of wastes in production used in mechanical engineering.

Skills:

Organization of segregation of industrial waste (plastics and metals). Conducting recycling processes for waste of metals and plastics. Critical evaluation of technical process activities on the environment; can propose actions (processes) reducing quantity of wastes formed during production.

Social competences:

Awareness of the influence of technology in mechanical engineering on the natural environment.
Awareness of the necessity of cooperation between specialists in different fields (technology, management).

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The learninLecture: Written a test (10 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 reports and answers for questions asked by a teacher.

Project: Design a recycling line for selected automotive, electronic and packaging products.

Programme content

Lecture: Waste and environmental protection. Hazardous waste. After-production and after-use waste. Reclaiming and recycling of materials. Recycling of metal and non-metal materials (plastics, paper). Techniques and machines for recycling metals, plastics, rubber, etc. The course of processing processes and their effects. Material testing: regranulated plastics and second metal (grain size and rheology properties).

Laboratory: Classification and segregation of plastics, and metals and them alloys waste, alloys. Examples of processing waste out of selected plastics. Re-melting of metal scrap and plastics reprocessing.

Project: Development of a line for disassembling end-of-life vehicles focused on metal recovery and recycling of post-production or post-consumer polymer waste.

Course topics

none

Teaching methods

Project: Development of a line for disassembling end-of-life vehicles focused on metal recovery and recycling of post-production or post-consumer polymer waste. Lecture: multimedia presentation.

Laboratory exercises: performing exercises, discussion, teamwork.

Project: practical classes, the use of IT tools supporting the design of production and environmental processes.

Bibliography

Basic:

1. Czarna-Komorowska Dorota, Przetwórstwo tworzyw i kompozytów polimerowych w obiegu zamkniętym, Wyd. Politechniki Poznańskiej, Poznań 2023. ISBN 978-83-7775-725-3.
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. Brandrup, J., Bittner, M., Menges, G., and Michaeli, W. (1996) Recycling and recovery of plastics, Carl Hanser Verlag, Germany.
2. Letcher T., Plastic Waste and Recycling: Environmental Impact, Societal Issues, Prevention, and Solutions, 1st Edition, Academic Press 2020.
3. Oprzędkiewicz J., Technologie i systemy recyklingu samochodów, WNT Warszawa 2003.
4. 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.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	24	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	51	2,00