COURSE DESCRIPTION CARD - SYLLABUS

Course name
Production waste management [N1MiBM2>GOP]

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 them 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 manufacturing processes and the environment (places of forming the waste). Allowing indication of actions limiting quantities of wastes in production processes used in mechanical engineering.He has advanced knowledge of technological technologies in mechanics and machine construction, as well as their robotization and automation. Knows the basic processes related to the life cycles of machines, devices and technical systems. He has detailed information about the fundamental dilemmas of modern civilization.

Skills:

Organization of segregation of industrial waste (plastics and metals/metals alloys). Conducting recycling processes for waste of metals and plastics. Critical evaluation of technical and manufacturing process activities on the environment; can propose actions (processes) reducing quantities of wastes formed during production. Self-education in field of recycling (knowledge of processes and laws). Is able to use analytical, simulation and experimental methods to identify, formulate and solve engineering problems characteristic of mechanics and machine construction. Is able to take into account systemic and non-technical aspects, including ethical, ecological and environmental protection. Is able to critically analyze and evaluate the functioning of existing technical solutions. Is able to cooperate with other people as part of team work (also of an interdisciplinary nature).

Social competences:
Awareness of the influence of manufacturing processes in mechanical engineering on the natural environment. Awareness of the necessity of cooperation between specialists in different fields. Can think and act in an initiative manner. Understands the need of lifetime education. Is able to determine the importance of knowledge in solving cognitive and practical problems and to seek the opinion of experts in case of difficulties in solving the problem independently. Able to cooperate and work in a team, taking on various roles, including group leader. He can act as an advisor and inspire team members. Is aware of the need to cooperate with the social environment and work for it. Is aware of the importance of non-technical aspects and ethical consequences of engineering activities in social relations.

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. 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 in circular economy.

Bibliography

Basic:
1. Czarnecka-Komorowska Dorota, Przetwórstwo tworzyw i kompozytów polimerowych w obiegu zamkniętym, Wyd. Politechniki Poznańskiej, Poznań 2023. ISBN 978-83-7775-725-3.
2. Allen Alexander , Stefano Pascucci and Fiona Charnley, Handbook of the Circular Economy Transitions and Transformation, De Gruyer 2023, https://doi.org/10.1515/9783110723373.

3. Wilczyński K. Reologia w przetwórstwie tworzyw sztucznych, Wyd. Naukowo-Techniczne, W-wa 2001.
4. Ulewicz M., Procesy odzysku i recyklingu metali nieżelaznych i stali, Wyd. Politechniki Częstochowskiej 2015. ISBN 978-83-7193-636-4.
5. Ulewicz M., Siwka J., Procesy odzysku i recyklingu wybranych materiałów, Wyd. Wydziału Inż. Proc., Mat. i Fizyki Stosowanej Politechniki Częstochowskiej, Częstochowa 2010.

Additional:
1. Lerwen Liu, Seeram Ramakrishna, An Introduction to Circular Economy, Springer 2021.
2. Stijn van Ewijk and Julia Stegemann, An Introduction to Waste Management and Circular Economy, UCLPRESS 2023.
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.
5. Brandrup, J., Bittner, M., Menges, G., and Michaeli, W. (1996) Recycling and recovery of plastics, Carl Hanser Verlag, Germany. ISBN: 9781800084650.

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