COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mechanical vehicle recycling [S1MiTPM1>RPM]

Course

Field of study
Materials and technologies for automotive industry

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-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

3,00

Coordinators

dr inż. Artur Wypych
artur.wypych@put.poznan.pl

Lecturers

Prerequisites

The student has basic knowledge of physics, material science, chemistry, environmental protection, mechanics. Has the ability to think logically, use information obtained from the library and the Internet. Understand the need to learn and acquire new knowledge.

Course objective

Learning about the service life of vehicles and how to recycle raw materials in accordance with the idea of closed-loop resource management.

Course-related learning outcomes

Knowledge:
1. The student knows and understands the concept of mechanical durability of vehicles.
2. Student zna i rozumie procesy przetwarzania materiałów konstrukcyjnych pojazdów w celu ich ponownego wykorzystania.
3. The student should know and understand the processing of vehicle construction materials in terms of environmental protection and ecology.
4. The student knows and understands the statistics explaining the percentage of use of recycled

automotive construction materials.
5. The student knows and understands the concern for good technical condition of machinery and automotive waste treatment systems.

Skills:
1. Students can classify the material group of automotive waste.
2. Graduates are able to select the appropriate method and parameters for automotive waste processing.
3. Graduates are able to determine the nature of the load on automotive waste processing machinery and propose a method of regeneration.
4. The graduate is able to identify the groups of recipients of substrates obtained from the processing of automotive waste.

Social competences:
1. The student is able to cooperate in a group.
2. The student is aware of the role of automotive welded joint testing and inspection processes in the modern economy and for society.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: credit on the basis of a colloquium consisting of 5 general questions (credit in case of correct answers to min. 3 questions: <3 = ndst, 3 = dst, 3.5 = dst+, 4 = db, 4.5 = db+, 5 = bdb) conducted at the end of the semester.
Laboratory: Credit on the basis of an oral or written answer on the content of each laboratory exercise performed, a report on each laboratory exercise as indicated by the instructor of laboratory exercises. In order to receive credit for the laboratory exercises, all exercises must be passed (a passing grade on the answer and a passing grade on the report).

Programme content

Presentation the need to use a closed-loop raw materials economy due to the number of vehicles, aircraft and watercraft produced on a global scale. Characterization of materials used in vehicle production and explanation the need to search for new materials in the aspect of the development of electromobility. Presentation the possibilities of reusing modern materials intended for the production of vehicles powered by alternative fuels - including hydrogen. Presentation of the possibilities of changing the parameters of the bonding and thermal spraying process in the aspect of the use of additional materials from recycling. Directing the way of thinking a modern engineer towards searching for production solutions using recyclates, caring for the environment and the economy of the region.

Course topics

Lectures:
1. Quantitative characteristics of vehicles and material requirements for their production on a global scale.
2. Classification of material groups and quantities of engineering materials used in automotive production.
3. Identification of methods of automotive waste processing and disposal, along with the determination of parameters defining their suitability in a closed loop economy.
4. Identification of market branches with high production potential using automotive recyclates.
5. The ecological aspect explaining the absolute necessity of recycling in the automotive industry.
Project:
In the individual mode, the selection of the project topic with the specification of the material group to be recycled, the method of processing, to scale in mass units or quantities of pieces. On this basis, characterize with justification the application of the recycling method for this group of parts. Determine the operating parameters of the processing equipment and the parameters of the obtained recycle top, such as the size and shape of the particles, cleanliness, material segregation if necessary, the capacity of over-creation in mass units and other parameters determined by the type of processed materials. In the next step, it is necessary to determine the proposal for the use of the countertop recycle giving the field of industrial production or specific groups of details and the expected operating parameters in relation

to the original parameters of the detail in the state before recycling - in this aspect, technical solutions, economic effects, performance characteristics, demand are taken into account. Recycling technology should be designed based on the applicable standards related to the project topic attached to the documentation, which also includes comments, final conclusions, sources of knowledge and drawing documentation.

Teaching methods

1. lecture: multimedia presentation, presentation illustrated by examples given on the blackboard, discussion of physical exhibits presented.
2. project: individual determination of the topic, systematic creation of the project based on consultations with the instructor, individual presentation of design issues by the student, preparation of project documentation including descriptions, comments and conclusions.

Bibliography

Basic:
1.Osiński J., Żach P., Wybrane Zagadnienia Recyklingu Samochodów, WKiL Warszawa 2009

Additional:
1. Global scientific literature resources like SCOPUS, Elsevier, etc. for keywords or phrases - “recycling in automotive”,
2. Klugmann Radziemska E., Haponiuk J.T., Datta J., Formela k., Sienkiewicz M., Włoch M., Nowoczesne Technologie Recyklingu Materiałwowego, Gdańsk 2017.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	30	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	1,50