COURSE DESCRIPTION CARD - SYLLABUS

Course name
Materials in special road vehicles [S1MiTPM1>MwSPD]

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
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

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

Course objective

Presentation of modern materials used in the production of special vehicles with exceptionally high payload and the possibilities of their use in environmental load conditions previously unavailable to them. Indication of the need to search for new materials and the method of their use in the construction of special road vehicles.

Course-related learning outcomes

Knowledge:
1. The graduate knows and understands the methods of producing additional materials for welding in the form of solid wires, cored wires and powders.
2. The graduate knows and understands the morphology of powder welding materials in terms of chemical composition, type and size of powder particles, method of their production and metallurgy of

welding application processes.
3. The graduate knows and understands the construction of welding equipment for surfacing and thermal spraying in a basic scope.
4. The graduate knows and understands the impact of the operating environment and the degrading effects of this impact on the structures of special road vehicles.
5. The graduate understands the need to search for new materials, the need to increase the operational durability of special road vehicles and the concern for a favorable economic factor in production.

Skills:
1. The graduate is able to define the term "special road vehicle" and characterize the degrading impact of the operating environment on a given group of special vehicles.
2. Knowing the operating environment, the graduate is able to select the appropriate method and additional material in the manufacturing process.
3. The graduate is able to recognize the type of native material and propose technological parameters of production with regard to reducing the amount of heat input and obtaining welds, padding welds and thermally sprayed coatings free from welding defects and inconsistencies.

Social competences:
1. The graduate is able to work in a group.
2. The graduate is ready to characterize materials dedicated to special road vehicles due to the nature of their work in the aspect of the modern economy and society.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: credit on the basis of an exam 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).
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

Characteristics of the degree of wear of special road vehicles due to their environmental operating conditions in terms of the load of repair, construction, military and agricultural vehicles using conventional drive with a combustion engine, electric motor, hydrogen powered and using hydraulic systems. Selection of appropriate engineering materials aimed at ensuring the greatest possible operational durability in this environment. Characteristics of modern additional materials applied by welding methods and the possibility of their use in the construction of new vehicles and in regeneration.

Course topics

Lectures:
1. Characteristics of the burdening operating environment typical for special road vehicles.
2. Characteristics of the effects of operational wear of special road vehicles typical for given working conditions.
3. Characteristics of engineering materials used in the automotive industry.
4. Classification of welding materials according to the material groups used in the automotive industry.
5. Methods of manufacturing special road vehicle parts using the discussed construction materials.
6. Characteristics of methods of manufacturing special road vehicle elements using welding, plastic processing and coating protection techniques.
7. Justification of the need to search for and use modern construction materials in the construction of special road vehicles due to their operational durability, purpose and the possibility of working in an increasingly wide range of applications.
Laboratories:
1. Visual and microscopic analysis of selected materials used in special road vehicles.
2. Assessment the degree of degradation of selected parts of special road vehicles.
3. Selection of methods and materials ensuring a significant increase in the operational durability of special road vehicles.

4. Production of test samples using selected welding methods and performance of operational durability tests in a selected loading environment.
5. Based on the analysis of the obtained operational test results, justification for the use of modern materials in the construction of special road vehicles.

Teaching methods

Lecture: multimedia presentation, presentation illustrated by examples given on the blackboard, discussion of physical exhibits presented.
Laboratory: discussion of the issue by the instructor in order to substantively prepare students for the course of the classes. Preparation of equipment, materials and details for analysis / technological process / laboratory operational tests. Registration of analysis and measurement results constituting the basis for preparing a report on the classes.

Bibliography

Basic:
1. Dobrzański L., Materiały inżynierskie i projektowanie materiałowe, WNT, 2006
2. Głowacka M., Landowski M., Łabanowski J., Współczesne materiały inżynierskie, WPGd, 2021
3. Krzyńska A., Kaczorowski M., Konstrukcyjne materiały metalowe, ceramiczne i kompozytowe, OWPWa, 2019

Additional:
1. Stilwell A., Pojazdy wojsk specjalnych, Wozy terenowe, MRAP-y, Motocykle, Quady, Almapress, 2022
2. Global scientific literature resources like SCOPUS, Elsevier, etc. for keywords or phrases - " materials in vehicle construction, modern materials, automotive ".

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	32	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	43	1,50