COURSE DESCRIPTION CARD - SYLLABUS

Course name

Materials and technologies in the manufacture of car bodies

Course

Field of study	Year/Semester
Construction and operation of means of transport	1/1
Area of study (specialization)	Profile of study
Motor vehicles	general academic
Level of study	Course offered in
Second-cycle studies	polish
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	0	0
Tutorials	Projects/seminars	
0	0	

Number of credit points

1

Lecturers

Responsible for the course/lecturer:

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Wydział Inżynierii Lądowej i Transportu

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Responsible for the course/lecturer:

Prerequisites

Knowledge:The student should have knowledge of basic sciences, ie: physics and chemistry and knowledge of subjects pursued at the first level of study, ie: physical chemistry, thermodynamics, material engineering, mechanics, material strength, machine construction.

Skills:The student should demonstrate the general ability to identify problems, create algorithms for solving them and the ability to solve engineering tasks. The student should understand the basic phenomena occurring in solid bodies, be able to identify and characterize them.

Social competencies: The student is ready to deepen knowledge in the field of interdisciplinary subjects. The student is open to learning about new technologies and engineering solutions.

Course objective

The aim of the subject: "Materials and technologies in the manufacture of car bodies" is to familiarize students with the types of materials used in the construction of car bodies, primarily on bodies such as aluminum alloy steels, titanium alloys and technologies that enable the construction of the body, primarily with methods of shaping and joining materials.

Course-related learning outcomes

Knowledge

1. The student knows the materials used on car bodies

2. The student knows the technologies of body elements

3. The student knows different methods of connecting body parts

Skills

1. The student has the ability to use information in the field of this subject to solve problems of technical issues, in particular in the construction of the body.

2. Student is able to propose appropriate shaping technologies for body elements.

3. The student can adjust the appropriate method of connecting the materials to the car bodies.

Social competences

1. The student understands the need and knows the possibilities of constantly expanding knowledge and training.

2. The student has the ability to solve problems in the field of materials and technologies in the production of car bodies individually and in a group.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written test, which is based on answers related to the selection of given answers and open questions. Credits will be given after achieving at least 50% of points. Answers are scores from 0 to 1 point.

Programme content

1. Introduction: material characteristics in technical aspect, division (natural materials, engineering), comparison of strength and specific strength of different materials, Ashby diagrams.

2. Crystalline structure of metals, network errors, plastic deformation mechanisms, Fe-C diagram, basic phases (characteristics, conditions of formation), effect of alloying elements on CTP, hardness measurement.

3. Concept of the body, body function, definition of the body, body production technologies

4. The goal of steel development on the car bodies, body functions during the collision, the division of steel into the body

5. Comparison of incl. Mg Al. Ti Fe

6. Steel characteristics, among others: DP, CP, MS, TRIP, TWIP, IF, BH

7. Characteristics of aluminum alloys (examples)

8. Characteristics of titanium alloys (examples)

9. Characteristics of magnesium alloys (examples)

10. Protective layers in steel body plates, the role of galvanizing, parts of vehicles subjected to galvanizing

11. Ultra-light steel car body technology

12. Percentage of sheets for bodywork depending on: their thickness, material strength from which they are made. The percentage of ways of forming individual elements

13. Forming methods: description of plastic deformation (except for classical processing characteristics - hydroforming - definition, advantages, applications, process stages)

14. Tailored blanks technology

15. Methods of joining steel sheets (including welding, welding)

16. An example of calculations aimed at replacing the traditional method of roof covering of a city bus made of sheet metal to the sheath made of fiberglass reinforced polyester laminate

Teaching methods

1. Lecture with a multimedia presentation - a combination of an information and problem lecture;

Bibliography

Basic

1. Michael F. Ashby, Materials Selection in Mechanical Design, Butterworth-Heinemann, Third Edition 2005

2.Dobrzański Leszek A., Materiały inżynierskie i projektowanie materiałowe. Podstawy nauki o materiałach i metaloznawstwo, Wydawnictwo PWN-WNT, 2006

3. Hadasik E., Pater Z., Obróbka plastyczna. Podstawy teoretyczne, Wydawnictwa Politechniki Śląskiej Gliwice, 2013

4.Speer J.G., De Moor E., Findley K.O., Matlock D.K., De Cooman B.C., Edmonds D.V.: Analysis of microstructure evolution in quenching and partitioning automotive sheet steel. "Metallurgical and Materials Transactions A", vol. 42A, 2011, 3591.

5. Lis A.k., Gajda B., Modelling of the DP and TRIP microstructure in the CMnAlSi automotive steel, Jurnal of Achievements in Materials and Manufacturing Engineering, Vol. 15 Issue 1-2, 2006, 127-134.

6.Senkara J., Współczesne stale karoseryjne dla przemysłu motoryzacyjnego i wytyczne technologiczne ich zgrzewania, Przegląd Spawalnictwa, 11, 2009, 3-7

Additional

1.Hofmann H., Mattissen D., Schaumann T. W., Advanced cold rolled steels for automotive applications, Steel Research International Issue 1, 2009, 22-28

2. Adamczyk M., Hadasik E., Niewielski G., Kuc D.. Symulacja procesu walcowania na gorąco stali przeznaczonych na karoserie, Inżynieria Materiałowa 3 , 2006, 737-740

3.Gajda B., Lis A. K.. Analiza mikrostruktury stali stosowanej do produkcji cienkich blach głębokotłocznych. Inżynieria Materiałowa 3, 2006, 749-752

4. Grajcar A. Nowoczesne stale wysokowytrzymałe dla motoryzacji I generacji. Stal, metale & nowe technologie 5-6, 2013, 150-153

5. Zadpoor A.A., Sinke J, Benedictus R., Mechanics of tailor welded blanks, an overview. Key Eng Mater 344, 2007,373?382 Dohmann F., Hydroforming research and practical application. Journal of materials processing technology 174-186, 1997

6. Merklein M., Johannes M., Lechner M., Kuppert A., A review on tailored blanks - production, applications and evaluation. J Mater Process Technol 214(2) 2014,151-164

Breakdown of average student's workload

	Hours	ECTS
Total workload	30	1,0
Classes requiring direct contact with the teacher	15	0,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	15	0,5

[1] delete or add other activities as appropriate