COURSE DESCRIPTION CARD - SYLLABUS

Course name
Materials and technologies in the manufacture of car bodies [N2MiBP1-PS>MiTwWNS]

Course

Field of study
Mechanical and Automotive Engineering

Year/Semester
1/2

Area of study (specialization)
Motor Vehicles

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
9

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

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Lecturers

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:
Has extended knowledge in the field of computer science, concerning computer programming and engineering calculation programs in the field of computer simulation of physical systems.
Has a general knowledge of the types of research and methods of testing working machines with the use of modern measurement techniques and data acquisition.
Has extended knowledge of the standards for working machines in the field of methods of calculating and testing machines, safety, including road safety, environmental protection as well as mechanical and electrical interface.

Skills:
Can formulate and test hypotheses related to simple research problems.
Can plan and carry out experimental research of specific processes taking place in machines and routine tests of a working machine or a vehicle from a selected group of machines.
Is able to carry out basic measurements of mechanical quantities on the tested working machine with the use of modern measuring systems.

Social competences:
He is ready to critically assess his knowledge and received content.
Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in case of difficulties in solving the problem on its own.
It is ready to fulfill social obligations, inspire and organize activities for the benefit of the social environment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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

Course topics

none

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	15	1,00
Classes requiring direct contact with the teacher	9	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	6	0,50