STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
(-)		**1010612221010618566**
Field of study: **Mechanical Engineering**	Profile of study (general academic, practical): **(brak)**	Year /Semester: **1 / 2**
Elective path/specialty: **Motor Vehicles**	Subject offered in: **-**	Course (compulsory, elective): **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time): **full-time**	
No. of hours: Lecture: **1** Classes: **-** Laboratory: **-** Project/seminars: **-**		No. of credits: **1**
Status of the course in the study program (Basic, major, other): **(brak)**	(university-wide, from another field): **(brak)**	
Education areas and fields of science and art: **technical sciences**		ECTS distribution (number and %): **1 100%**

Responsible for subject / lecturer:

dr hab. inż. Marta Paczkowska
email: marta.paczkowska@put.poznan.pl
tel. 616475906
Wydział Inżynierii Transportu
ul. Piotrowo 3 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**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.
2	**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.
3	**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.

Assumptions and objectives of the course:

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.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. The student knows the materials used on car bodies - [K2A_W01]
2. The student knows the technologies of body elements - [K2A_W02]
3. The student knows different methods of connecting body parts - [K2A_W03]

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. - [K2A_U01]
2. Student is able to propose appropriate shaping technologies for body elements. - [K2A_U02]
3. The student can adjust the appropriate method of connecting the materials to the car bodies. - [K2A_U03]

Social competencies:

1. The student understands the need and knows the possibilities of constantly expanding knowledge and training. - [K2A_K01]
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. - [K2A_K02]

Assessment methods of study outcomes

- written verification

Course description

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

Basic bibliography:

Additional bibliography:

Result of average student's workload

Activity	Time (working hours)
1. Lecture participation	9
2. Preservation of information from the lecture	5
3. Consultations	1
4. Preparation for verification of knowledge, skills and social competences within the subject	2
5. Participation in verification of acquired knowledge, skills and social competences within the subject	1

Student's workload

Source of workload	hours	ECTS
Total workload	18	1
Contact hours	11	0
Practical activities	0	0