COURSE DESCRIPTION CARD - SYLLABUS

Course name
Welding techniques in automotive manufacturing [S1MiTPM1>TSwPM]

Course

Field of study
Materials and technologies for automotive industry

Year/Semester
2/4

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

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

To learn modern methods of bonding and changing the properties of the surface layer of automotive parts.

Course-related learning outcomes

Knowledge:
1.The student should characterize the different types of welding heat sources used in the automotive industry.
2. The student knows and understands the formation and use of electric current in welding.
3. The student should know and understand the selection of welding process parameters.
4. The student knows and understands the essence of bonding by methods used in the automotive industry.
5. The student is able to select the welding method for the type, thickness, shape and environment of

automotive parts.

Skills:
1. The student is able to operate welding equipment used in the production of automotive parts.
2. The student is able to select the initial conditions of bonding processes.
3. The student is able to interpret the results obtained based on the geometry of the welds or the quality of the surface layer produced.

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 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

Presentation the joining methods used in the automotive industry and the responsibility that welds play in terms of durability and safety of vehicle construction. Metallurgical characteristics of low-energy joining methods that introduce the least amount of heat - due to reduction the changes in properties of the base material in the immediate vicinity of the welded nodes and anti-corrosion protective coatings degradation produced before the technological welding procedure. Characteristics of welds made using modern methods and modern additional materials and explanation of the mechanism of significant extension the service life in the conditions of operational load of parts. Presentation of thermal spraying methods as a way of changing the operational properties of new and regenerated parts, through the use of dissimilar materials, for the production of coatings dedicated to a given operational environment.

Course topics

Lectures:
1. Characteristics of welding heat sources used in automotive.
2. Characteristics of the native materials used in the automotive industry.
3. Methodology of selection of process parameters and welding method as a function of the type of native material, its thickness and shape, and the working environment.
4. Basic methods of determining the selection of the right welding method and its parameters on the basis of weld geometry, surfacing and surface condition of thermal sprayed coatings.
5. Methods of welding body parts protected by anti-corrosion coatings including zinc coating.
Laboratories:
1. Construction and principle of operation of welding equipment used in the automotive industry.
2. manufacturing of joints using selected methods in welding.
3. Manufacture of protective coatings by selected methods of thermal spraying.
4. Manufacture of protective coatings by methods without the use of electric current.
5. Evaluation of the change in the geometry of head paths as a function of the method and parameters of the welding process.
6. The effect of changing thermal spraying parameters on the surface condition of coatings.
7. Use of welding methods with and without additive material in automotive production.

Teaching methods

1. Lecture: multimedia presentation, presentation illustrated with examples provided on the board, discussion of the physically presented exhibits.
2. 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

Bibliography

Basic:
1. Klimpel A.,: Spawanie, zgrzewanie i cięcie mateli, WNT Warszawa 1999,
2. Klimpel A.,: Napawanie i natryskiwanie cieplne, WNT Warszawa 2000.

Additional:
1. Global scientific literature resources like SCOPUS, Elsevier, etc. for keywords or phrases - “automotive materials and connections testing methods”.
2. Dobrzyński L.: Metaloznawstwo, WNT Warszawa 1998,
4. Prowans. S.: Struktura stopów, PWN Warszawa 2000,
5. Dobaj E.: Maszyny i urządzenia spawalnicze, WNT Warszawa 1998,
6. Pilarczyk J.: Poradnik Inżyniera. Spawalnictwo część 1. WNT, Warszawa 2003.

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