COURSE DESCRIPTION CARD - SYLLABUS

Course name
Metal matrix composites in automotive aplication [S1MiTPM1>KwOMwM]

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

2,00

Coordinators

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Lecturers

Prerequisites

A student entering this course should have a basic knowledge of physics and chemistry as well as materials science with a special focus on composite materials. He or she should also have the ability to obtain information from the indicated sources and have a willingness to cooperate as part of a team.

Course objective

To provide students with knowledge on metallic matrix based comoposites taking into account their :classification and basic characterization with division by the applied metallic phases of the matrix and the relation of reinforcing phases as well as other categories of division. The most important technologies for the manufacture of metal matrix composites along with their limitations and application examples. The life cycle of the composite product and the problems associated with its post- processing.

Course-related learning outcomes

Knowledge:
1. Students have knowledge of the field of composite materials on metallic matrices , they understand the functional significance of the material group and can characterize their manufacturing technology.
2. Students have knowledge of the application area of composite materials on metallic matrices they

also understand the conditions of their wear with appropriate reference to traditional materials.
3. Students have knowledge of the life cycle and potential recycling conditions of composite materials.
4. Students have knowledge of the study of properties and structure of composite materials.

Skills:
1. The student is able to apply powder metallurgy technologies for the production of composite structures on metallic matrices.
2. The student is able to plan and carry out measurements, interpret the obtained results and draw conclusions.The student is able to apply the methods of materials testing and operate specialized measurement apparatus.

Social competences:
1. The student understands the importance of knowledge in the field of composite materials on metallic matrices ii is aware of its impact on the possible decision-making process, and thus on the formulation and communication of related content in a commonly understood manner.
2. The student is able to cooperate in a group by taking actions occluding his/her roles.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired in the lecture is verified by a credit in the form of a test. The test consists of 20-35 questions (open and closed), variously scored. The threshold for passing: 50% of the points. The credit issues on the basis of which the questions are developed are presented at the lectures and discussed in detail during the lectures.

Programme content

Lecture: Input characteristics of a group of metallic matrix composites, metallic matrix manifolds used along with application preference, reinforcing phase types used along with application preference, metallic matrix composite manufacturing technologies, limitations and problems in the application of metallic matrix composite solutions, application examples of the use of composite technologies in automotive solutions, life cycle problems of metallic matrix composites
Laboratory : Introduction to composite systems on metallic matrices based on application reconnaissance, powder metallurgy technologies applied to the manufacture of composites on metallic matrix, introduction to the design of the technological process of manufacturing composite structures on metallic matrices using powder metallurgy technologies, application of powder metallurgy manufacturing technologies to the manufacture of finished composite products, analysis and study of manufacturing characteristics of sintered products and their application properties, microstructural and qualitative evaluation of manufactured sintered products, control verification of characterized features and properties with prediction of the life cycle of the composite product.

Course topics

Lecture
1 Input characteristics of a group of metallic matrix composites
2. The types of metallic matrix used along with application preference
3.Applied types of reinforcing phases together with application preference
4.Manufacturing technologies of metal matrix composites
5.Limitations and problems in the application of solutions of composites on metallic matrix
6.Application examples of the use of composite technologies in automotive solutions
7.Life cycle problems of composites on metallic matrix
Laboratory
1 Introduction to metallic matrix composite systems based on application recognition
2.Powder metallurgy technologies used to produce composites on metallic matrix
3.Introduction to process design for manufacturing composite structures on metallic matrix using powder metallurgy technologies
4.Application of powder metallurgy manufacturing technologies to the manufacture of finished composite products
5. Analysis and study of manufacturing characteristics of sinters and their application properties
6. Microstructural and qualitative evaluation of manufactured sintered products

7. Control verification of the characterized features and properties with prediction of the life cycle of the composite product.

Teaching methods

multimedia presentation, on-line lecture

Bibliography

Basic:
1. Spiekane metale i kompozyty z osnową metaliczną 2005, Autor:Jerzy Nowacki, Wydawca:Wydawnictwo WNT, ISBN-13 978-83-2042-998-5
2. A. Boczkowska, Kompozyty, Wydawnictwo Politechniki Warszawskiej 2000.
3. J. Śleziona, Podstawy technologii kompozytów, Wydawnictwo Politechniki Śląskiej 1998.

Additional:
1. T. W. Clyne, P.J. Withers: An introduction to metal matrix composites, Cambridge Solid State Science series, Cambridge University Press, Cambridge,1993, 509 p.
2. Shasiro Ochiai (editor): Mechanical Properties of Metallic Composites, Marcel Dekker Inc., New York, 1994, 808
3. Nikhilesh Chawla, Krishan K: Metal Matrix Composites. 2006 Chawlahttps://www.google.pl/books/edition/Metal_Matrix_Composites/ErKnTM-_11gC?hl=en&gbpv=1&dq=metal+matrix+composites&printsec=frontcover
4. T. W. Clyne, P. J.: An Introduction to Metal Matrix Composites. 1993 Withersphttps://www.google.pl/books/edition/An_Introduction_to_Metal_Matrix_Composit/8Yv8Mf1UkR0C?hl=en&gbpv=1&dq=metal+matrix+composites&printsec=frontcover

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00