COURSE DESCRIPTION CARD - SYLLABUS

Course name
Composite materials and their manufacturing technologies [S2FT2>MKiTW]

Course

Field of study
Technical Physics

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

A student entering this subject should have a basic knowledge of physics and chemistry. He or she should also have the ability to obtain information from the indicated sources and show a willingness to cooperate as part of a team.

Course objective

To provide students with basic knowledge of the issues of composites and biocomposites including: Classification and characterization of materials divided into basic groups in the relations of reinforcement and matrix phase and other categories of division. Structures of materials on a macro, micro and nano scale, including the relationships present in the interlayer matrix and reinforcement. The most important properties of materials: physical, chemical, mechanical, technological, operational. Basic methods of their manufacture and aspects of designing technical and engineering solutions using composite materials. Distinction of special subgroups including biocomposites or unconventional composites with their characteristics.

Course-related learning outcomes

Knowledge:

The student has knowledge of the issues of composite structures their classification as well as methods of their manufacture and engineering design using composite materials.

Skills:
The student is able to select appropriate methods of manufacturing and testing of classified groups of composite materials.
The student is able to select an appropriate composite solution as an alternative in terms of design perspective on the context of various engineering material solutions making its classification and economic evaluation in the scope appropriate in the area of operation.

Social competences:
The student is aware of the need for continuous training and improvement of his/her professional competence, including in the field of composite materials for their further use in the area of engineering tasks dedicated.
The student is aware of the possibility of using the knowledge of composite materials, understands their importance and roles in the conscious design of modern engineering solutions taking into account the entrepreneurial aspect.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

In terms of the methods used to verify the achieved learning outcomes, the following assessment thresholds are used:
50.1-60% dst;
60.1-70% dst+;
70.1-80% db;
80.1-90% db+;
90.1% bdb and above.
The grade is based on individual written work and/or oral response

Programme content

Methods of manufacturing composite structures, powder metallurgy, characteristics of sinters, interface reactions, biocomposites

Course topics

Lecture:
1. Definition of composites, classification and division
2. Types of matrix and reinforcement phases and their role
3. Between matrix and reinforcement, reactions at the interlayer section
4. The methods of manufacturing oh the composite structures
5. Powder metallurgy
6. Intrinsic characteristics of sinters
7. Biocomposites
Design laboratory:
1. Introduction to the subject of manufacturing composite structures using powder metallurgy methods
2. Definition of the issue of design work - in working subgroups (compositional, size, morphological, technological or other relations having a research and verification aspect)
3. Planning the schedule of the technological process of manufacturing sintered composite materials with the necessary control of manufacturing effects and testing of functional properties.
4. Implementation of the manufacturing process using powder metallurgy methods
5. Analysis of the basic properties of the produced sintered products (density, porosity, homogeneity, structural features and phase distribution)
6 Phase XRD structural analysis qualitative and quantitative in assessing the impact on the final properties of the system
7. Microstructural analysis and X-ray microanalysis in assessing the impact on the final properties of the system

Teaching methods

Multimedia presentation, online lecture, work in project subgroups, brain-storming, work with English-language sources,practical exercises, discussion and elaboration of results in the form of a report, formulation of conclusions on the issues raised in class.

Bibliography

Basic:
1. Blicharski M. Wstęp do inżynierii materiałowej. WNT, Warszawa, 2003.
2. Dobrzański L. Podstawy nauki o materiałach i metaloznawstwo. WTN, Warszawa, 2002

Additional:
1. Advanced Composite Materials: Properties and Applications ISBN: 978-3-11-057440-1 Ehsan Bafekrpour (Ed.) (2017)
2. ENGINEERING COMPOSITE MATERIALS Bryan Harris The Institute of Materials, London (1999)
3. Composite Materials Science and Engineering Third Edition Krishan K. Chawla ISBN 978-0-387-74365-3 (eBook) DOI 10.1007/978-0-387-74365-3 (2013)

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	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)	20	1,00