Polish course name	**KOMPOZYTY**
English course name	**COMPOSITES**
Course code	**WIP-MDL-D1-COM-04**
Field of study	**Materials design and logistics**
Level of qualification	**First degree**
Form of study	**Full-time**
Semester	**4**
Number of ECTS points	**3**
Ways of assessment	**Test**

Number of hours per semester

Lecture	Seminar	Classes	Laboratory	Project
30			30	

TEACHERS:

Prof. dr hab. inż. Katarzyna Braszczyńska-Malik.

COURSE OBJECTIVES:

- **C1** Provide students with basic knowledge about composite materials and technologies of their production.
- **C2** Introducing the issues of shaping the structure and properties through both the selection of components and various technological processes.

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES:

1. Basic knowledge of mathematics, physics and general chemistry. Basic knowledge in the field of metal, ceramic and polymer materials as well as basic issues of materials engineering and selection of measurement methods.
2. Ability to work independently and in a group.

3. Ability to use literature sources and internet resources.

COURSE CONTENT

LECTURE

- **L1** Outline of the development of composite materials, basic concepts and definitions.
- **L2** Components and their characteristics.
- **L3** Basics of designing composites reinforced with particles, continuous and short fibers.
- **L4** Types of interfaces between components, their role and test methods.
- **L5** Technologies for the production of polymer, metal and ceramic matrix composites.
- **L6** Selected structural aspects of composites and their influence on the properties of the final elements.
- **L7** Forecasts of the directions of development of composites (taking into account economic and ecological aspects).
- **L8** Test.

LABORATORY

- **Lab1** Composite density and component volumetric fractions.
- **Lab2** Analysis of selected reinforcement materials.
- **Lab3** Designing composites with a variable volume fraction of the reinforcing phase.
- **Lab4** Structural analyzes of selected composites.
- **Lab5** Investigation of selected properties of composites.
- **Lab6** Test.

BASIC REFERENCES

1. Hyla I.: Elementy mechaniki kompozytów, Politechnika Śląska, Gliwice, 1995.
2. Nowicki J: Materiały kompozytowe, Wyd. Pol. Łódzkiej, 1993 r.
3. Konsztowicz K.: Kompozyty wzmacniane włóknami. Podstawy technologii, Skrypt AGH, Nr 870, Kraków 1983 r.

4. Śleziona J.: Podstawy technologii kompozytów, Wyd. Pol. Śląskiej, Gliwice 1998 r.
5. Boczkowski A., Kapuściński J., Puciłowski K., Wojciechowski S.: Kompozyty, Wyd. Pol. Warszawskiej, Warszawa 2000 r.
6. Leda H.: Kompozyty polimerowe z włóknami ciągłymi, Wyd. Pol. Poznańskiej, Poznańska 2000 r.
7. Wilczyński A.P.: Polimerowe kompozyty włókniste, WNT, Warszawa 1996 r.
8. Kapuściński J., Puciłowski K., Wojciechowski S.: Kompozyty: podstawy projektowania i wytwarzania, Oficyna Wydaw. Politechniki Warszawskiej, Warszawa, 1993 r.
9. Boczkowska A.: Kompozyty, Oficyna Wydaw. Politechniki Warszawskiej, Warszawa, 2003 r.
10. Koszkul J.: Polipropylen i jego kompozyty, Wyd. Politechniki Częstochowskiej, Częstochowa, 1997 r.
11. Konopka Z.: Metalowe kompozyty odlewane, Wyd. Politechniki Częstochowskiej, Częstochowa, 2011 r.

LEARNING OUTCOMES

› **EU1** The student has mastered the theoretical knowledge of composites.
› **EU2** The student is able to prepare a report on the course of the exercise as well as present and discuss the results of their own activities.

TEACHING TOOLS

› Lecture with the use of audiovisual aids.
› Laboratory - examples of finished products and semi - finished products manufactured using various techniques.
› Exercise stands equipped with apparatus and tools for testing properties and structure.

WAYS OF ASSESSMENT (F – FORMATIVE, P – SUMMATIVE)

› **F1**. Assessment of the implementation of tasks included in the study program.
› **F2**. Assessment of the mastery of the teaching material being the subject of laboratory tasks - final test.

P1. Assessment of the mastery of the teaching material within the lecture - final test.

STUDENT WORKLOAD

Form of activity	Number of hours	ECTS
Contact hours with the teacher		
Lectures	30	1,2
Seminar		
Classes		
Laboratory	30	1,2
Project		
Test		
Exam		
Total contact hours	60	2,4
Student's own work		
Getting acquainted with the indicated literature	5	0,2
Preparation for seminar		0
Preparation for classes		0
Preparation for lab	6	0,24
Project preparation		0
Consultation	2	0,08
Preparation for the test	2	0,08
Total student's own work	**15**	**0,6**
Total number of hours/ ECTS points for the course	**75**	**3,0**

ADDITIONAL INFORMATION

Timetable of classes	https://wip.pcz.pl/dla-studentow/plan-zajec/studia-stacjonarne
Information about the consultation (time + place)	https://wip.pcz.pl/dla-studentow/konsultacje-dla-studentow

MATRIX OF LEARNING OUTCOMES REALISATION

Learning outcome	**Reference of given outcome to outcomes defined for whole program**	**Course objectives**	**Course content**	**Ways of assessment**
EU 1	K_W04, K_U03,	C1-C2	L1 - L8	P1
EU 2	K_U03, K_K02,	C1-C2	Lab1 - Lab6	F1, F2

FORM OF ASSESSMENT - DETAILS

EU1 The student has mastered the knowledge of composite materials.

- 2,0 The student has not mastered the basic knowledge of composites.
- 3,0 The student has mastered the knowledge of composites sufficiently.
- 3,5 The student has mastered the knowledge of composites sufficiently plus.
- 4,0 The student has mastered the knowledge of composites to a good degree.
- 4,5 The student has mastered the knowledge of composites to a good plus degree.
- 5,0 The student has mastered the knowledge of the material included in the curriculum very well, independently acquires and extends knowledge using various sources.

EU2 The student is able to prepare a report on the course of the exercise as well as present and discuss the results of their own activities.

- 2,0 The student is not able to prepare a report, is not able to present the results of his research.

- 3,0 The student is able to sufficiently prepare a report on the course of the exercise and effectively present and discuss the results of their own activities.
- 3,5 The student is able to sufficiently plus prepare a report on the course of the exercise and present and discuss the results of their own activities.
- 4,0 The student is able to prepare a good report on the course of the exercises and present and discuss the results of their own activities.
- 4,5 The student is able to prepare a report on the course of the exercises and present and discuss the results of their own activities.
- 5,0 The student is able to very well make a report on the implementation of exercises and effectively present and discuss the results of his own activities.