Module/Subject Syllabus Summary
[Major name]
Master Degree Studies

Subject:	Composites Engineering
Subject type:	Major/Compulsory
Subject code:	
Year:	I
Semester:	2
Form of studies:	Full-time course
Type of classes and hours per semester:	60
Lecture	30
Exercise	-
Laboratory practice	30
Project	-
ECTS points:	
Form of credit:	Assessment
Lecture language:	English

Subject objective	
C1	Familiarize students with the structure and properties of composite materials
C2	Familiarize students with the technologies of producing composites and preparing students for shaping properties of composites required by the constructors
C3	Familiarize students with the applications of composite materials in engineering

Prerequisites in knowledge, skills and other competencies	
1	The student has a basic knowledge of materials science
2	Student has general knowledge of the processes of structural changes in materials engineering and their connection with the properties
3	Student has a general knowledge of the technologies in materials engineering and general knowledge of the strength of materials

Educational effects	
	Knowledge:
EK 1	Student defines a groups of composite materials
EK 2	Describes the structure, properties and applications of composite materials
EK 3	Student characterizes technologies of forming structure and properties of the composites
	Skills:
EK 4	Student analyzes the characteristics of composite materials

EK 5	Student compares composites in terms of structure and properties
EK 6	Student can make the selection of composite materials for specific applications
EK 7	Student draws conclusions from the experiments

Curriculum content of Subject	
Form of classes - Lecture	
	Curriculum content
W1	Introduction to composites. Definition and classification of composite materials. The matrix and reinforcing phase. The structure and basic properties of composites manufacturing technologies.
W2	Metal matrix composites.
W3	Ceramic matrix composites.
W4	Polymer matrix composites.
W5	Nanocomposites, hybrid and intelligent composites
W6	Testing of composite materials.
W7	Basics of modelling of composite materials. Elements of mechanics of composite materials. Selection of composites.
W8	Recycling of composite materials. Directions of development of composites.
Class form: laboratory practice	
	Curriculum content
L1	Structure and properties of metal and ceramic matrix composites.
L2	Structure and properties of fiber-reinforced polymer composites.
L3	The structure and properties of hybrid composites.
L4	Manufacturing of composite materials by autoclaved technology.
L5	Studies of selected mechanical properties of composites.
L6	Methods of non-destructive testing of composite materials and composite structures.

Teaching methodology	
1	Lectures with multimedia presentations.
2	Laboratory exercises - performing experiments - practical method based on the observation and analysis

Student workload	
Form of activity	Average hours to complete activity
Teacher contact hours, including:	66
- Attendance at lectures, - Attendance at laboratory practice	60

- consultation	6
Total student work time, including:	
- preparation for laboratory practice - preparation for assessment	44
Total student work time	110
Total ECTS for the subject:	
Total of ECTS for practical classes (exercise, laboratory practice, projects)	

	Basic reference literature
1	Greenhalgh, Emile S., Failure analysis and fractography of polymer composites, CRC Press, Woodhead Publishing, 2009.
2	Backman, B. F., Composite structures, Elsevier, 2008.
3	Generazio E. R., Advanced ceramic matrix composites : design approaches, testing and life prediction methods, Technomic, 1996.
4	Ashbee, K. H. G.. Lancaster, Pa, Fundamental principles of fiber reinforced composites, Technomic Publishing Company 1993.
	Complementary reference literature
5	G. C. Sih, A. M. Skudra, Failure mechanics of composites, North-Holland, 1984.
6	Voyiadjis, George Z., Advances in damage mechanics : metals and metal matrix composites, Elsevier, 1999.
7	Sierakowski R., Damage tolerance in advanced composites; Technomic Publishing Co., 1995.
8	Boczkowska A., Kapuściński J., Lindeman Z., Witemberg-Perzyk D., Wojciechowski S. Kompozyty. Wyd. II zmien. Ofic. Wyd. PW, Warszawa 2003
9	Buschow K.H., Cahn R.W., Flemings M.C., Ilschner B., Kramer E.J., Mahajan S., Veyssiere P. Encyclopedia of Materials: Science and Technology, Elsevier 2008.

Educational effect matrix					
Educational effect	Specific educational effect reference to curriculum-wide effects (PEK)	Subject objective	Curriculum content	Teaching methodology	Evaluation methods
EK 1	MBM2A_W05+++ MBM2A_W04++ MBM2A_W13++	C1	W1-W5	1	O1
EK 2	MBM2A_W05++ MBM2A_W04+++	C1, C3	W1-W5, W6, W7, L1-L3	1, 2	O1, O2
EK 3	MBM2A_W07++ MBM2A_W08+++ MBM2A_W13++	C2	W1-W5, L4	1, 2	O1, O2
EK 4	MBM2A_U01+++	C1, C2	W1-W5,	1 ,2	O1, O2

	MBM2A_U06+ MBM2A_U18++ MBM2A_U23+		W6, W7, L1-L3,L5, L6		
EK 5	MBM2A_U09+ MBM2A_U10+++	C1,C2	W1-W8, L1-L3,L5, L6	1, 2	O1, O2
EK 6	MBM2A_U01+++ MBM2A_U10+++	C1, C2, C3	W1-W8	1	O1
EK 7	MBM2A_U14+++ MBM2A_U15+ MBM2A_U19++	C1	L1-L6	2	O1

Evaluation methods and criteria		
Evaluation method symbol	Evaluation method description	Pass threshold
O1	Lecture written test	60%
O2	Laboratory exercises - partial credits for performed exercises; partial credit include partial test consists of preparatory training and the quality of the report	100%

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