

COURSE DESCRIPTION CARD

Course name	Bio-inspired Materials				
Course type	optional	Course code	----	ECTS credits	1
Forms and number of hours	lecture: 4 h project: 6 h	Scientific discipline	all disciplines		
Course objectives	The aim of the course is to familiarize students with the most popular materials of natural origin and the manufacturing process of materials inspired by biology/nature, taking into account the relationship between the structure and properties (e.g. mechanical, optical, surface).				
Course content	<ol style="list-style-type: none"> 1. Engineering in biological materials: basic building units in natural materials 2. Principles of design materials based on solutions from nature - materials: composite, light and functional 3. Products inspired by nature 				
Teaching methods	Lecture enriched with discussion with the students; project classes will be based on the students' own studies and prepared presentations of current progress in working on projects				
Assessment method	Lecture: exam Project: evaluation of completed projects, ongoing progress in the work, discussion and active participation in classes				
Symbol of learning outcome	Learning outcomes		Reference to the learning outcomes for the field of study for the 8th level of Polish Qualification Framework (PRK)	Methods of assessing the learning outcomes	
LO1	PhD student has a basic knowledge of natural materials, knows the principles of designing synthetic materials based on inspiration from nature		SD_W1, SD_W2	Exam	
LO2	PhD student is able to define a research problem that requires the use of modern material inspired by nature		SD_U1	Project	
LO3	PhD student is able to prepare a research plan (manufacturing, characterization) that allows to solve a defined research problem and conduct a critical analysis of the presented solution		SD_U1, SD_U2	Project	
LO4	PhD student can participate in a scientific discussion		SD_U6	Project	
LO5	PhD student is able to independently plan and implement both individual and team research projects, at the same time inspiring the development of other people		SD_U8, SD_U9	Project	

Student workload (in hours)	
Lecture / project	4 / 6
Consultations	1
The unassisted student work	10
Implementation of project tasks and preparation for and participation in exams/tests	4
Total	25
ECTS credits	1

Basic references	<ol style="list-style-type: none"> 1. Meyers M.A., Chen P-Y. (2014): Biological Materials Science - Biological Materials, Bioinspired Materials and Biomaterials. Cambridge University Press 2. Fratzl P., Dunlop J.W.C., Weinkamer R. (2013): Materials Design Inspired by Nature: Function Through Inner Architecture. The Royal Society of Chemistry 3. Studart A.R., Libanori R., Erb R.M. (2014): Functional Gradients in Biological Composites in Bio- and Bioinspired Nanomaterials. Wiley-VCH Verlag GmbH & Co. KGaA, pp. 335-368.
Supplementary references	<ol style="list-style-type: none"> 1. Ripley R.L., Bhushan B. (2016): Bioarchitecture: bioinspired art and architecture— a perspective. Phil. Trans. R. Soc. A, 374: 20160192; doi.org/10.1098/rsta.2016.0192 2. Burgert I., Fratzl P. (2009): Actuation systems in plants as prototypes for bioinspired devices. Phil. Trans. R. Soc. A, 367; doi: 10.1098/rsta.2009.0003
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