COURSE DESCRIPTION CARD – SPECIMEN

<table>
<tr><td colspan="10">Faculty of Mechanical Engineering</td></tr>
<tr><td>Field of study</td><td colspan="6">Biomedical Engineering</td><td colspan="2">Degree level and program type</td><td>MSc degree</td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="6"></td><td colspan="2">Study profile</td><td>General academic</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Advanced biomaterials and research methods</td><td colspan="2">Course code</td><td>MYIB2S0106</td></tr>
<tr><td colspan="2">Course type</td><td>obligatory</td></tr>
<tr><td rowspan="2">Forms and number of hours of tuition</td><td>L</td><td>C</td><td>LC</td><td>P</td><td>SW</td><td>FW</td><td>S</td><td>Semester</td><td>1</td></tr>
<tr><td>30</td><td></td><td>30</td><td></td><td></td><td></td><td></td><td>No. of ECTS credits</td><td>5</td></tr>
<tr><td>Entry requirements</td><td colspan="9">Basic knowledge of biomaterials</td></tr>
<tr><td>Course objectives</td><td colspan="9">Familiarizing students with the contemporary achievements in biomaterials engineering and their development trends. Teaching a strategy for the selection of biomaterials. Developing the principles and skills of planning biomaterials research.</td></tr>
<tr><td>Course content</td><td colspan="9">Lecture: Classification and requirements for biomaterials. Contemporary achievements in biomaterials engineering: biomimetics, nanotechnology, intelligent materials, biomaterials for tissue and genetic engineering, biomaterials used in the construction of artificial heart, stents for minimally invasive surgery, and plastic surgery. Review of modern biomaterials used in medicine (orthopedics, dentistry, cardiac surgery, laryngology, ophthalmology, and neuroprosthetics). Formation and role of biofilm. Advanced methods of biomaterials research (In vivo and in vitro biocompatibility studies. Methods of structural research: scanning, transmission and atomic force microscopy, photoelectron spectroscopy, X-ray structural studies, computed microtomography. Research on physicochemical and rheological properties of biomaterials.) Trends in the development of biomaterials. Laboratory: Health and Safety Rules. Preparation of model biological fluids. Chemical synthesis of silver nanoparticles, Investigation of biofilm on the surface of selected biomaterials. Research on the shape memory alloys. Contact angle analysis for hydrophobic and hydrophilic biomaterials. SEM and computed microtomography investigations, Electrolytic oxidation of titanium implantation alloys.</td></tr>
<tr><td>Teaching methods</td><td colspan="9">Presentations, laboratory classes, and self-learning</td></tr>
<tr><td>Assessment method</td><td colspan="9">Lecture – written test, Laboratory classes – evaluation of reports/test</td></tr>
<tr><td>Symbol of learning</td><td colspan="7">Learning outcomes</td><td colspan="2">Reference to the learning outcomes for</td></tr>
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outcome		the field of study
	The student knows and understands:	
LO1	classifies and characterizes the basic groups of biomaterials	IB2_W02
LO2	describes contemporary achievements in biomaterials engineering	IB2_W02, IB2_W07
LO3	physical bases of advanced research methods	IB2_W01, IB2_W02
	Student can:	
LO4	present examples of advanced biomaterials in medical applications	IB2_U04
LO5	plan and conduct biomaterials research and interpret measurement results	IB2_U06
LO6	The student is prepared to**:**	
LO6	analyze and critically evaluate the substantive content of advanced biomaterials and their research methods	IB2_K01
Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	test	L
LO2	test	L
LO3	Test, evaluation of reports, discussion, and observation of work during laboratory classes	L, LC
LO4	evaluation of reports, discussion, and observation of work during laboratory classes	LC
LO5	evaluation of reports, discussion/test, and observation of work during laboratory classes	LC
LO6	evaluation of reports, discussion/test, and observation of work during laboratory classes	L, LC
Student workload (in hours)		**No. of hours**
Calculation	lecture attendance	30
	participation in laboratory classes	30
	preparation for passing the lecture test	30
	Test attendance	2
	preparation for laboratoratory classes	13
	working on projects, reports, etc.	15
	participation in student-teacher sessions related to the project	5
	TOTAL:	125
Quantitative indicators		**HOURS** / **No. of ECTS credits**
Student workload – activities that require direct teacher participation		**65** / **2,6**
Student workload – practical activities		**63** / **2,5**
Basic references	1. Leo D.J., Engineering analysis of smart material systems. John Wiley & Sons, Inc., Hoboken, New Jersey, 2007. 2. Ma P.X., Elisseeff J., Scaffolding in tissue engineering. Taylor & Francis Group, Boca	

	Raton-London-New York, 2006. 3. Venina dos Santos, Rosmary Nichele Brandalise, Michele Savaris, Engineering of Biomaterials, Springer, 2017 4. Brahim Attaf. Advances in composite materials for medicine and nanotechnology. InTech, Rijeka, 2011	
Supplementary references	1. Schulz M.J., Kelkar A.D., Sundaresan M.J., Nanoengineering of structural, functional and smart materials. Taylor & Francis Group, Boca Raton-London-New York, 2006. 2. Gzik M., Tkacz E., Paszenda Z., Piętka E., Innovation in Biomedical Engineering. Springer Int. Publ., 2017.	
Organisational unit conducting the course	**Institute of Biomedical Engineering**	**Date of issuing the programme**
Author of the programme	**Prof. Jan R. Dąbrowski**	**12.07.2022**

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work, S – seminar