

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Biomaterials</b>		Code <b>1010702111010721551</b>
Field of study <b>Chemical and Process Engineering</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>1 / 1</b>
Elective path/specialty <b>Bioprocesses and Biomaterials Engineering</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>Second-cycle studies</b>	Form of study (full-time, part-time) <b>full-time</b>	
No. of hours Lecture: <b>2</b> Classes: <b>-</b> Laboratory: <b>2</b> Project/seminars: <b>-</b>		No. of credits <b>2</b>
Status of the course in the study program (Basic, major, other) <b>(brak)</b>		(university-wide, from another field) <b>(brak)</b>
Education areas and fields of science and art		ECTS distribution (number and %)
<b>Responsible for subject / lecturer:</b>  prof. dr hab. inż. Adam Voelkel email: Adam.Voelkel@put.poznan.pl tel. (61) 665 3687 Wydział Technologii Chemicznej ul. Piotrowo 3 60-965 Poznań		
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	solid state chemistry, physical chemistry ? properties of surface layer, instrumental chemistry
2	<b>Skills</b>	can use basic laboratory techniques in synthesis, modification, separation and cleaning of compounds and materials, can use instrumental methods in characterization of materials
3	<b>Social competencies</b>	understands the need to supplement her/his education and increasing personal and professional competences
<b>Assumptions and objectives of the course:</b> The aim of this course is to acquaint students with the biomaterials science as the fascinating field of modern engineering. This discipline from the boarder of several sciences including chemistry, physics, biology, medicine materials engineering, mechanics and ethics. Students should gain the skills in the range of modification of biomaterials as well as their characterization.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b>		
1. has the knowledge on techniques and methods of characterization of biomaterials - [K_W03,K_W08] 2. can describe methods, techniques, tools and materials used in the solution of simple problems connected with manufacturing and examination of biomaterials - [K_W04, K_W06, K_W07]		
<b>Skills:</b>		
1. can select methods for the basic ways of characterization of biomaterials - [K_U11, K_U16, K_U20] 2. can estimate usefulness and select the tools (methods) for the solution problem in the field of biomaterials application - [K_U09] 3. Student can discuss biomaterial problems in English - [K_U03]		
<b>Social competencies:</b>		
1. Student understands the need to supplement her/his education and increasing professional competences - [K_K01] 2. Student has the awareness to obey the engineer ethic rules - [K_K02, K_K05] 3. Student can act and cooperate in the group accepting different roles - [K_K03]		
<b>Assessment methods of study outcomes</b>		
final written control following lectures, permanent control during laboratory classes		

<b>Course description</b>		
<p>The following problems will be presented and discussed: general characteristic of biomaterials. Biomaterials as replacements of body parts or taking over its functions. Classification of biomaterials basing on chemical character and structure: metallic, polymers (biopolymers), composites and ceramics. Preparation of different groups of biomaterials. Criteria of the selection of biomaterials. Ceramic biomaterials including calcium phosphate based biomaterials. Methods of characterization of biomaterials. Mechanical properties of biomaterials. Physicochemical properties of biomaterials. Application of biomaterials.</p>		
<p><b>Basic bibliography:</b></p> <ol style="list-style-type: none"> <li>1. M. Nałęcz, Biocybernetyka i Inżynieria Biomedyczna, tom 4, S. Błażejewicz, L. Stoch, Biomateriały, AOW EXIT, Warszawa 2003</li> <li>2. K. H. Włodarski, P. K. Włodarski, R. Galus, Ortopedia, traumatologia, rehabilitacja, 11 (2009)</li> <li>3. R. H. Doremus, Review Bioceramics, J. Mat. Sci., 27 (1992) 293-296</li> <li>4. B.M. Culbertson, New polymeric materials for use in glass-ionomer cements, Journal of Dentistry 34 (2006) 556-565.</li> <li>5. A. Voelkel, K. Adamska, Biomateriały, WPP, Poznań 2011</li> </ol>		
<p><b>Additional bibliography:</b></p> <ol style="list-style-type: none"> <li>1. B. Czarnecka, J. Nicholson, H. Limanowska-Shaw, Aktualne poglądy na adhezyjne i przeciwpróchnicowe właściwości cementów szkło-jonomerowych, Czas. Stomat. 56 (2003) 69-74.</li> <li>2. W.A. Brantley, T. Eliades, Materiały ortodontyczne w ujęciu naukowym i klinicznym, Wyd. Czelej, Lublin, 2003, rozdz. 9, 11, 14.</li> <li>3. M. Jarczyk, J. Jakubowicz, Bionanomateriały, WPP, Poznań 2008</li> </ol>		
<b>Result of average student's workload</b>		
Activity	Time (working hours)	
1. lecture	30	
2. lecture consultations	2	
3. lab consultations	2	
4. lab preparation	5	
5. laboratory classes	30	
6. credit preparation	5	
7. credit	2	
<b>Student's workload</b>		
Source of workload	hours	ECTS
Total workload	76	2
Contact hours	64	1
Practical activities	34	1