

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Biomaterials		Code 1010702221010701551
Field of study Chemical Technology	Profile of study (general academic, practical) general academic	Year /Semester 1 / 2
Elective path/specialty Composites and Nanomaterials	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 15 Classes: - Laboratory: 1 Project/seminars: -		No. of credits 3
Status of the course in the study program (Basic, major, other) other		(university-wide, from another field) university-wide
Education areas and fields of science and art technical sciences Technical sciences		ECTS distribution (number and %) 3 100% 3 100%
Responsible for subject / lecturer: prof. dr hab. inż. Adam Voelkel email: Adam.Voelkel@put.poznan.pl tel. 61 665-3687 Faculty of Chemical Technology ul. Berdychowo 4 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	solid state chemistry, physical chemistry ? properties of surface layer, instrumental chemistry
2	Skills	can use basic laboratory techniques in synthesis, modification, separation and cleaning of compounds and materials, can use instrumental methods in characterization of materials
3	Social competencies	understands the need to supplement her/his education and increasing personal and professional competences
Assumptions and objectives of the course: 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.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
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]		
Skills:		
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]		
Social competencies:		
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]		
Assessment methods of study outcomes		

final written control following lectures, permanent control during laboratory classes		
Course description		
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.		
Basic bibliography:		
1. R. H. Doremus, Review Bioceramics, J. Mat. Sci., 27 (1992) 293-296		
2. B.M. Culbertson, New polymeric materials for use in glass-ionomer cements, Journal of Dentistry 34 (2006) 556-565.		
3. An Y. H., Friedman R. J., Concise review of mechanisms of bacterial adhesion to biomaterial surfaces, J. Biomed. Mater. Res., 43 (1998) 338-348.		
4. D. Shi, Biomaterials and tissue engineering, Springer Berlin Heidelberg, Niemcy, 2004.		
Additional bibliography:		
1. Williams D.F., Biomedical and dental materials: introduction. w: Encyclopedia of materials?science and technology, vol 1., ed. K. H. Buschow, K. H. Jürgen, R. W. Cahn, M. C. Flemings, B. Ilshner, E. J. Kramer, S. Mahajan, Amsterdam, Elsevier 2001, s. 584-592.		
Result of average student's workload		
Activity	Time (working hours)	
1. lecture	15	
2. lecture consultations	3	
3. lab consultations	10	
4. lab preparation	20	
5. laboratory classes	15	
6. credit preparation	10	
7. credit	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	75	3
Contact hours	45	0
Practical activities	15	0