RTU Course "Biomaterials"

31000 Faculty of Civil and Mechanical Engineering

General data

Code	BM0771
Course title	Biomaterials
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Inga Ļašenko
Volume of the course: parts and credits points	1 part, 3.0 credits
Language of instruction	LV, EN
Annotation	This course explores hard and soft tissue in Human body, Liguids in organism, Syntetic analogs of nature materials. Biomaterials are analysed using laboratory work and simulation in computer software.
Goals and objectives of the course in terms of competences and skills	The goal of the study course is to acquaint students with biomaterials, improving students' knowledge and skills in the field of mechanics and strength of materials. The tasks of the study course are: – to develop ability to evaluate performance of biomaterials, based on understanding on resistance forces and constraints; – to provide understanding on FEM calculations and develop ability to analyse mechanics of biomaterials; – to enhance the ability to apply computing in solving complex tasks.
Structure and tasks of independent studies	Independent work consists of literature review and practical part: in the literature review, part students perform research on the development of biotextiles, complex technological research, textile technology development, nanostructured 3D eco materials; in the practical part students perform calculations of geometrical properties of biomaterials and its tolerances.
Recommended literature	Obligātā/Obligatory: D.R. Buddy Biomaterials science: an introduction to materials in medicine, 2nd edition, Elsevier Academic Press, 2004. S. A. Guelcher et al. An introduction to biomaterials, CRC/Taylor & Francis, 2006. Papildu/Additional: Joyce Y. Wong. Biomaterials, CRC Press, 2007.
Course prerequisites	Physics. Calculus. Chemistry. Resistance of Materials.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Introduction: Biomaterials Science: A Multidisciplinary Endeavor.	2	2	0	0
Biocompatibility, response of the host organism to biomaterials.	2	2	0	0
Surface Properties and Surface Characterization of Biomaterials.	4	2	0	0
Hard biological tissues: Bones.	4	4	0	0
Role of Water in Biomaterials.	2	2	0	0
Metallic biomaterials.	3	4	0	0
Polymeric biomaterials.	3	4	0	0
Composite materials, Bioceramics materials.	3	4	0	0
Silicone Biomaterials, History and Chemistry.	3	4	0	0
Biomaterials calculations using FEM Software.	6	20	0	0
Total:	32	48	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Is able to distinguish different biomaterials, the technologies of their production, their use.	Presentation on laboratory work results. Criteria: student is able to answer instructor questions.
Understands the properties of biomaterials, methods of their determination, data analysis.	Laboratory work. Criteria: submitted summary contains comments and literature references.
Is able to perform calculation of the basic mechanical properties of the biomaterials.	Practical work with calculations. Criteria: maximum points for correct calculations using computer software.
Is able to select optimal geometric parameters of biomaterials for different applications.	Exam.

Evaluation criteria of study results

Criterion	%
Presentation on laboratory work results	20
Practical work with calculations	40
Exam	40
Total:	100

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	16.0	16.0	0.0		*	