Course code	Course group	Volume in ECTS credits	Course hours
BTC 6031	C	6	160

Course type (compulsory or optional)	**Compulsory for specialization *Medical Biotechnologies*, optional for the rest specializations**
Course level (study cycle)	**Master**
Semester the course is delivered	**3rd, Fall**
Study form (face-to-face or distant)	**Face-to-face**

Course title in Lithuanian

REGENERACINĖS MEDICINOS TECHNOLOGIJOS

Course title in English

REGENERATIVE MEDICINE TECHNOLOGIES

Short course annotation in Lithuanian

Kurso metu susipažįstama regeneracinės medicinos principais. Regeneracinė medicina ir audinių inžinerija-tarpdisciplininės mokslo šakos, integruojančios įvairias fundamentinio ir taikomojo mokslo kryptis. Žaizdų gijimo patofiziologija. Eksperimentiniai regeneracijos modeliai. Audinių senėjimas. Audinių inžinerijos technologijų taikymas odos regeneracijai ir kremzlės, bei kaulų defektų reparacijai (šiuo metu taikomos gydymo strategijos). Akies audinių regeneracija. Periferinių nervų regeneravimas, eksperimentinės strategijos centrinės nervų sistemos (CNS) pažaidų gydymui. Žvilgsnis į ateitį, prototipavimo technologijos, organų spausdinimas. Bioreaktoriai, reikšmė, veikimo principai, bioreaktorių tipai. Organų konstruktų vaskuliarizavimo problema. Ateities perspektyvos.

Short course annotation in English

Introduction into the principles of regenerative medicine. Regenerative medicine and tissue engineering as emerging multidisciplinary fields integrating both fundamental and applied scientific research. Pathophysiology of wound healing. Experimental models of regeneration. Current understanding of tissue ageing processes. The use of tissue engineering technologies for skin, cartilage and bone regeneration (current therapeutic strategies). Regeneration of ocular tissues. Current strategies for regeneration and reparation of peripheral nerves and central nervous system. *In vitro* construction of functional vascular and cardiac tissues. Prototyping technologies, organ printing. Bioreactors, operation principles, classification. Vascularization of engineered tissue constructs. Future perspectives.

Prerequisites for entering the course

Molecular Biology, Molecular Biotechnology, Cell and Tissue Culture Technology

Course aim

The aim of the course is to familiarize students with principles of regenerative medicine and present up to date information about modern tissue engineering technologies.

Links between course outcomes and criteria of learning achievement evaluation

Course outcomes	Criteria of learning achievement evaluation
Knowing and understanding the principles of regenerative medicine	Familiarization with experimental models of regeneration, fundamental mechanisms of tissue ageing and regeneration, modern tissue engineering technologies and principles of regenerative medicine.
Knowing and understanding current experimental strategies for regeneration and reconstruction of different tissues and organs.	Understanding basic concepts of the various diseases and current experimental treatment strategies.

Content (topics)

1. Introduction into basic principles of regenerative medicine.
2. General principles of tissue organization. Extracellular matrix.
3. Inflammation. Pathophysiology of wound healing.
4. Mechanisms of tissue regeneration. What can we learn from amphibian models of regeneration?
5. Mechanisms of tissue aging. Can we prevent, or slow down aging processes ?
6. Technologies for skin regeneration.
7. Regeneration of ocular tissues.
8. Current strategies for regeneration of bones and cartilage.
9. The strategies for regeneration and reparation of peripheral nerves.
10. Regeneration of the central nervous system. New therapeutic strategies against neurodegenerative disorders.
11. Regeneration of cardiac tissue.
12. Creating artificial organs (trachea, urine bladder, etc.).
13. Introduction into spheroids, organoids and tissue decellularization technologies.
14. The problem of artificial tissue vascularization.
15. What will future of medicine look like? A futuristic outlook.
Practical work (contents):

Distribution of workload for students (contact and independent work hours)

Lectures – 45 hours, laboratory work – 15 hours, individual work – 94 hours, examinations– 6 hours. Total 160 h.

Structure of cumulative score and value of its constituent parts

Final assessment sums the assessments of written final examination (50%), assessment of laboratory work (30%), and written mid-term examination (20%).

Recommended reference materials

No.	Publication year	Authors of publication and title	Publishing house	Number of copies in		
				University library	*Self-study rooms*	*Other libraries*
Basic materials						
1.	2014	Daniel Eberli (Ed.), Cells and Biomaterials in Regenerative Medicine	InTech	Open access https://www.intechopen.com/books/cells-and-biomaterials-in-regenerative-medicine		
2.	2013	Jose A. Andrades (Ed.), Regenerative Medicine and Tissue Engineering	InTech	Open access https://www.intechopen.com/books/regenerative-medicine-and-tissue-engineering		
3.	2012	Jamie Davies (Ed.) Tissue Regeneration - From Basic Biology to Clinical Application	InTech	Open access: https://www.intechopen.com/books/tissue-regeneration-from-basic-biology-to-clinical-application		
Supplementary materials						
1.	2011	A. Atala, R. Lanza, J. A. Thomson, R. Nerem, Principles of Regenerative Medicine (2nd edition)	Academic Press (imprint of Elsevier), London			
2	2013	Steinhoff, Gustav (Ed.) Regenerative Medicine: From Protocol to Patient	Springer Science + Business Media,			

		(2nd edition)	Dordrecht			

Course programme designed by

Dr. Augustas Pivoriūnas, Department of Stem Cell Biology, State Research Institute Centre for Innovative Medicine.