MEDBIOT-10:	**TISSUE ENGINEERING**
GENERAL INFORMATION	
Course Coordinator(s)	Teuta Opačak-Bernardi, PhD, assist. prof.
Associate(s)	Ljubica Glavaš-Obrovac, PhD, full prof. with tenure Katarina Mišković Špoljarić, PhD, assist. prof. Barbara Viljetić, PhD, assist. prof. Nikola Bijelić, PhD, assist. prof. Marijana Jukić, PhD
Study Programme	Interdisciplinary Graduate Study Programme in English: Biotechnology
Course Status	Obligatory
Year of Study, Semester	2nd year / 4th Semester
Credits (ECTS)	**4**
Teaching Method (number of classes)	Lectures: 30; Seminars: 5; Exercises: 20
Expected Number of Students in the Course	25-30
COURSE DESCRIPTION	
Course Aims	
The aim of this course is to introduce students with the principles and applications of tissue engineering in biomedicine, as well as ways to model tissue transcripts. Introduce them to the process of development and classification of tissue and the basis of cell culturing for tissue engineering.	
Prerequisites for Enrolment and the Entry Competencies Required for the Course	
Completed and passed courses from the first year of this graduate study.	
Learning Outcomes at the Programme Level Contributed by the Course	
BIOTECH-2; BIOTECH-7; BIOTECH-10; MEDBIOT-1; MEDBIOT-2; MEDBIOT-5	
Learning Outcomes at the Course Level	
After completing the course, the student will be able to: 1. Explain how cells are grown and selected for tissue engineering. 2. Classify types of support materials for growing tissue constructs 3. Explain the use of tissue constructs in practical applications 4. Differentiate between tissue samples 5. Apply tissue engineering methods in preparation of spheroids in vitro 6. Critically evaluate laboratory experiments and statistical analysis in bioscience literature	
Course Content	
Lectures: Basic principles and ethical aspects of tissues engineering. Tissue morphology: epithelial, muscle and nerve tissue. Cellular dynamics: intercellular communications, nutrient distribution. Cell culture. Bases of cell culturing. Cell culture selection. Stem cells in tissue engineering. Basic approaches to organ engineering: organ culture, organ-type culture, tissue-type culture. Support materials: natural, synthetic, alternatives. The role of extracellular matrix in cell communications. Systems for growing cells and developing tissues. Maturation and tissue quality control. Making and applying 3D support. 3D printers in biomedicine. Engineering in tissue biomedicine. Bioreactors. Microcarriers. Nanotechnology in tissue engineering. Implementing tissue constructs in regenerative medicine. Application of artificial organ culture in clinical practice. Challenges in tissue engineering. **Problem seminari**: Use of tissue engineering in: gene therapy, transplant medicine, drug development, cosmetics, etc. Histology sample analysis. Culturing spheroids using various methods. **Exercises:** Microscopy of histological preparations. Cultivation and cultivation of cellular spheroids by different cultivation methods.	

Teaching Methods

Lectures; Seminars; Laboratory exercises

Students' Obligations

Attendance at all forms of classes is mandatory and the students are obligated to attend all knowledge tests. The students may be absent from 30% (full-time students) and 50% (part-time students) of each of the forms of classes, provided that the absence is justified. An exercise or a seminar which has not been completed must be made up through a midterm exam.

Monitoring the Activity of the Students *(Connecting Learning Outcomes, Teaching Methods, and Grading)*

Class-related activity	ECTS	Learning outcome	Student activity	Evaluation method	Grade points	
					Min.	Max.
Attending classes	0.25	1-6	Attendance	Attendance records	2	10
Seminar	0.75	1-6	Seminar	Seminar presentation	10	20
Laboratory practice	1	5	Practical work	Laboratory exercises	8	20
Final exam	2	1-6	Studying for the final exam	Written exam	30	50
Total	**4**				**50**	**100**

Evaluation of the written part of the final exam:

Percentage of correct answers (%)	Grade
>95.00	50
90.00-94.99	47
85.00-89.99	45
80.00-84.99	40
75.00-79.99	38
70.00-74.99	35
65.00-69.99	33
60.00-64.99	30

Forming the final grade:

The points granted for the final exam are added to the grade points awarded during class attendance. The grading process is conducted by absolute distribution, i.e. based on total achievements, and compared to the numerical system in the following manner:

A – Excellent (5): 90-100 grade points; B – Very Good (4): 80-89.99 grade points; C – Good (3): 65-79.99 grade points; D – sufficient (2): 50-64.99 grade points

Mandatory Literature (available in the library and via other media)

Title	Number of copies in the library	Availability via other media
Blitterswijk CV, Boer JD: Tissue Engineering, 2nd Ed., Academic Press, 2014.		yes
Mescher A: Junqueira's Basic Histology: Text and Atlas. 15th		yes

Ed., McGraw-Hill , 2018.		
Additional Literature		
R. Pignatello. Biomaterials Science and Engineering. ISBN 978-953-307-609-6. (E-book) D. Eberli. Tissue Engineering of Tissue and Organ Regeneration. ISBN 978-953-307-688-1 (E-book) S. Li, N. L'Heureux, J. Elisseeff. Stem cell and Tissue Engineering. ISBN-13 978-981-4317-05-4, ISBN-10 981-4317-05-5. (E-book)		
Quality Assurance Procedures Designed to Ensure the Acquisition of Outcomes and Competencies		
Anonymous, quantitative, standardised student survey on the course and the teacher's work implemented by the Quality improvement office of the Faculty of Medicine Osijek and/or the Faculty of Food Technology Osijek.		
Note		
E-learning is not included in the class quota, but it is used in teaching and it contains links to various sites and video and audio materials available on websites.		