MEDBIOT-08:	***IN VIVO* AND *IN VITRO* EXPERIMENTAL MODELS**
GENERAL INFORMATION	
Course Coordinator(s)	Nikola Bijelić, MD, PhD, Assist. prof.
Associate(s)	Katarina Mišković Špoljarić, PhD, Assist. prof. Barbara Viljetić, PhD, Assist. prof. Marijana Jukić, PhD Edi Rođak, MSc
Study Program	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	30
COURSE DESCRIPTION	
Course Aims	
The objective of this course is to introduce students to the most important *in vivo* and *in vitro* experimental models, explain the reasons and means of using certain experimental models and legal and ethical issues related to using them in biomedicine and biotechnology. The objective is also to make students capable of planning and participating in research conducted on experimental models.	
Prerequisites for Enrolment and the Entry Competencies Required for the Course	
Completed and passed courses from 1st year of study.	
Learning Outcomes at the Programme Level Contributed by the Course	
BIOTECH-1; BIOTECH-6; MEDBIOT-1; MEDBIOT-2; MEDBIOT-5	
Learning Outcomes at the Course Level	
After completing the course, the student will be able to: 1. Compare the most important *in vivo* and *in vitro* experimental models 2. Explain the importance and need for experimental models in biomedical research 3. Apply the principles pf management and safety while working with experimental models 4. Evaluate legal and ethical issues related to working with experimental models 5. Apply the principles for choosing a model and make a plan of research on experimental models	
Course Content	
Lectures. Bacterial culture, growing and application. Bacteriophages and bacteriophage infections. Yeast as a model organism. Plant cell and tissue culture. Animal cell and tissue culture: primary and continuous cell cultures. Transgenic cell lines. TERT cells. *In vivo* models in biomedical and biotechnology research. Types, properties, advantages, drawbacks and choice of *in vivo* models. Types of research on *in vivo* models. Research planning, concept and/or choice of experimental model. Genetically altered animals (transgenic and knock-out animals). Collection, processing and analysis of tissues and body liquids. Care, management and safety while working with experimental animals. Legal regulations and ethical aspects of animal experiments. **Seminars.** Practical application of experimental models *in vivo* and *in vitro*. **Exercises.** Isolation, culture and application of cells *in vitro*.	
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	0.2	1-5	Attendance	Keeping records	3	10
Seminars	0.6	1-5	Seminar drafting and presentation	Seminar presentation	2	10
Laboratory exercises	0.8	3, 5	Practical exercises	Laboratory exercises	5	20
Final exam	2.4	1-5	Studying for the final exam	Written exam	40	60
Total	**4**				**50**	**100**

Evaluation of the written part of the final exam

Percentage of correct answers (%)	Grade points
>95.00	60
90.00-94.99	58
85.00-89.99	55
80.00-84.99	52
75.00-79.99	49
70.00-74.99	46
65.00-69.99	43
60.00-64.99	40

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
McInnes EF: Background Lesions in Laboratory Animals. 1st Ed., Saunders Ltd, 2011.		
Freshny R. Culture of Animal Cells: A Manual of Basic Techni-que and Specialized Applications. 7th Ed., Wiley-Blackwell, 2016.	7	

Additional Literature

Scientific and professional papers related to certain chapters (available on-line).

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.