COURSE DESCRIPTION CARD

Course name	**Numerical modelling of tissue engineering processes**				
Course type	**optional**	**Course code**	**SDPB0016**	**ECTS credits**	**2**
Forms and number of hours	**lecture: 10 h** **project: 10 h**	**Scientific discipline**	**biomedical engineering**		
Course objectives	Explaining the processes taking place in tissue implants under the influence of stimuli. Preparation in the field of modelling these phenomena.				
Course content	Lecture: Methodology of numerical models' preparation to describe phenomena occurring in tissue engineering. Types and methods of numerical description of stimulus causing cells differentiation and adaptation. Stem cells and models of their diffusion. Mathematical description of the processes taking place in tissue bioreactors. Modelling of structural and material features of scaffolds. Project: Numerical determination of the influence of changes in selected structural and material features of the implant on the efficiency of biological processes taking place in tissue bioreactors and in human body. Numerical modelling of the diffusion process, culture medium flow and heat transport.				
Teaching methods	Lecture: multimedia presentations including discussion with students and their own short presentations on selected issues in the field of numerical modelling of tissue engineering processes. Project: exercises with the use of ANSYS software, necessary for the implementation of an individual research problem.				
Assessment method	Lecture: written exam (for the final grade, the activity during lectures as well as the quality of performance of the final presentation are also taken into account). Project: final report (activity during project exercises is also taken into account for the final evaluation).				

Symbol of learning outcome	**Learning outcomes**	**Reference to the learning outcomes for the field of study for the 8th level of Polish Qualification Framework (PRK)**	**Methods of assessing the learning outcomes**
LO1	Knows the basic numerical models used in tissue engineering and the methodology of their preparation	SzD_W1, SD_U4	Exam
LO2	Is able to develop a selected numerical model for the assessment of biological phenomena occurring in tissue implants	SD_U1	Final report
LO3	Is able to properly use advanced numerical modelling software	SD_U1	Final report
LO4	Is able to relate the results of own research to the current state of knowledge	SD_U1, SD_U2	Final report

Student workload (in hours)	
Lecture / project	10 / 10
Consultations	2
The unassisted student work	15
Implementation of project tasks and preparation for and participation in exams/tests	10
Total	**47**
ECTS credits	**2**

Basic references	1. Lanza, R., Langer, R., Vacanti, J. P., & Atala, A. (Eds.). (2020). Principles of tissue engineering. Academic Press. 2. Yang, Z. C. (2019). Finite Element Analysis for Biomedical Engineering Applications. CRC Press. 3. Patrick, C. W., Mikos, A. G., & McIntire, L. V. (Eds.). (1998). Frontiers in tissue engineering. Elsevier.
Supplementary references	1. Lanza, R., Langer, R., Vacanti, J. P., & Atala, A. (Eds.). (2020). Principles of tissue engineering. Academic Press. 2. Yang, Z. C. (2019). Finite Element Analysis for Biomedical Engineering Applications. CRC Press. 3. Patrick, C. W., Mikos, A. G., & McIntire, L. V. (Eds.). (1998). Frontiers in tissue engineering. Elsevier.
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