

COURSE DESCRIPTION

Academic year: 2024/2025	
University: Comenius University Bratislava	
Faculty: Faculty of Mathematics, Physics and Informatics	
Course ID: FMFI.KAFZM/2-FBM-151/22	Course title: Uses of Plasmas and Electric Fields in Biomedicine
Educational activities: Type of activities: lecture Number of hours: per week: 2 per level/semester: 26 Form of the course: on-site learning	
Number of credits: 3	
Recommended semester: 4.	
Educational level: II.	
Prerequisites:	
Course requirements: Preliminary evaluation: processing of literature on selected topic and its presentation Final exam: oral Indicative evaluation scale: A 90%, B 80%, C 70%, D 60%, E 50% Scale of assessment (preliminary/final): 30/70	
Learning outcomes: By completing the course the student will gain a comprehensive overview of the use of plasma and electric discharges, and pulsed electric fields in selected biomedical applications and therapeutic methods and an understanding of their basic principles.	
Class syllabus: Basic concepts of plasma physics, the formation of low-temperature plasma in electric discharges. Low-temperature plasma and pulsed electric fields for biological decontamination and sterilization of microorganisms (bacteria, spores, yeasts, biofilms) in air, water, surfaces, medical instruments, in living organisms. Thermal and chemical methods of disinfection/sterilization. Food spoilage prevention. Medical in-vivo, ex-vivo and in-vitro applications of plasma, plasma surgery, treatment of skin diseases, disinfection and wound healing, tooth decay and root canals. Selective induction of apoptosis and cancer treatment, cell manipulation. Interaction of liquids with plasma and plasma activated fluids. Cell interaction with plasma, plasma activated liquids and pulsed electric field. Induced cellular and systemic processes in organisms. Importance of reactive oxygen and nitrogen forms, electroporation and electropermeabilization of cell membranes. Bio-compatible and antimicrobial plasma surface treatment.	
Recommended literature: · M. Laroussi et al. (eds.): Plasma medicine: applications of low-temperature gas plasmas in medicine and biology. Cambridge University Press, 2012 · A. Fridman and G. Friedman: Plasma medicine, Wiley 2013 · Z. Machala; K. Hensel; Y. Akishev (Eds.): Plasma for Bio-Decontamination, Medicine and Food Security, NATO Science for Peace and Security Series A: Chemistry and Biology, Springer 2012	

· H-R. Metelmann, T. von Woedtke, K-D. Weltmann: Comprehensive Clinical Plasma Medicine, Springer 2018
Electronic texts available on the subject website

Languages necessary to complete the course:

Slovak in combination with English (some of the suggested readings are in English).

Notes:

Past grade distribution

Total number of evaluated students: 2

A	B	C	D	E	FX
50,0	50,0	0,0	0,0	0,0	0,0

Lecturers: prof. RNDr. Zdenko Machala, DrSc.

Last change: 14.03.2022

Approved by: prof. RNDr. Libuša Šikurová, CSc.