Course Syllabus

I. General Information

Course name in Polish	Biofotonika
Course name in English	Biophotonics
Programme	Bioanalytical technologies
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	MSc
Form of studies (full-time, part-time)	Full-time
Discipline	Biological sciences
Language of instruction	English

Course coordinator/person responsible	Assoc. Prof. Emir Karamehmedovic

Type of class *(use only the types mentioned below)*	Number of teaching hours	Semester	ECTS
Lecture	15	III	6
Tutorial	15	III	
Classes			
Laboratory classes	30	III	

Course pre-requisites	Knowledge in general physics and basic mathematics/calculus.

II. Course Objectives

C1 – To introduce the concepts of generation of monochromatic and polychromatic light, light propagation and general optics and passive components
C2 – To study light-matter interaction with focus on light-tissue interaction, propagation, scattering
C3 – To understand and use basic methods and instruments used in biological systems, in particular spectroscopic and imaging techniques
C4 – To understand recent literature in the field of bio-photonics
C5 – To bring together students with engineering or natural sciences background in multidisciplinary teamwork

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	The students understand the basic principles and specificities of different light sources used in biomedical applications, including lasers and various polychromatic sources	K_W02
W_02	The student explains different light-tissue interactions including thermal, ablative, and photochemical interaction, and is able to relate the interactions to the specific characteristics of the light source	K_W01

W_03	The student discusses optical properties, including absorption and scattering of tissues, and understands the wavelength dependency of these processes	K_W01
W_04	The student describes different imaging or diagnostic techniques such as fluorescence, OCT, Raman spectroscopy, and understands limitations of different techniques or methods	K_W02, K_W05
	SKILLS	
U_01	The student applies bio-photonic techniques such as OCT, ITP spectroscopy for sample imaging and diagnostics, is able to work in a team	K_U01, K_U18
U_02	The student operates basic optical laboratory equipment	K_U01
U_03	The student chooses appropriate literature to support analyses the final product is open-minded to modern research techniques	K_U02, K_U17
U_04	The student reports obtained experimental results, analyses and draws conclusions and interpretations	K_U14
	COMPETENCIES	
K_01	The student proceeds according to good practice regulations in the production of pharmaceutical substances and applies H&S procedures	K_K05, K_K04

IV. Course Content

Lecture: Geometric optics, Light sources, Light–matter and light-tissue interactions, spectroscopy with its applications, lasers in biology, eye-optics, bio imaging, fluorescence microscopy, optical biosensors, emerging bio-photonic technologies.
Lab classes:, Beer-Lambert's law, Measurement of scattering and absorption properties of tissue, Fluorescence microscope, Grating Spectrometer, Isotachophoresis

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods *(choose from the list)*	Forms of assessment *(choose from the list)*	Documentation type *(choose from the list)*
	KNOWLEDGE		
W_01	Conventional lecture Discussion	Written test	Evaluated written test/test
W_02	Conventional lecture Discussion	Written test	Evaluated written test/test
W_03	Conventional lecture Discussion	Written test	Evaluated written test/test
W_04	Laboratory analysis	Observation	Observation report
	SKILLS		
U_01	Laboratory classes	Report	Report printout
U_02	Laboratory classes	Observation	Observation report
U_03	Practical classes	Test of practical skills	Rating card
U_04	Laboratory classes	Report	Report printout
	COMPETENCIES		
K_01	Laboratory classes	Observation	Observation report

VI. Grading criteria, weighting factors

Midterm Exam - 25 %
Final Exam- 35 %
Final project and Presentation - 40%

Mark	Evaluation criteria	
Very good (5)	the student realizes the assumed learning outcomes at a very good level	the student demonstrates knowledge of the education content at the level of 95-100%
overgood (4.5)	the student accomplishes the assumed learning outcomes an over good level	the student demonstrates knowledge of the education content at the level of 85-94 %
Good (4)	the student accomplishes the assumed learning outcomes at a good level	the student demonstrates knowledge of the education content at the level of 75-84%
Quite good (3.5)	the student accomplishes the assumed learning outcomes at a quite good level	the student demonstrates knowledge of the education content at the level of 65-74%
sufficient (3)	the student accomplishes the assumed learning outcomes at a sufficient level	the student demonstrates knowledge of the education content at the level of 55-64%
insufficient (2)	the student accomplishes the assumed learning outcomes at an insufficient level	the student demonstrates knowledge of the education content below the level of 55%

VII. Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	70 (60 + 10 individual consultation)
Number of hours of individual student work	80

VIII. Literature

Basic literature
1) Paras N. Prasad: Introduction to Biophotonics, John Wiley & Sons, Hoboken, New Jersey (2003)
2) Gerd Keiser: Biophotonics: Concepts to Applications, Springer (2016)
Additional literature
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