COURSE DESCRIPTION (SYLLABUS)

1.	Course: **Biophysics**
2.	Language of instruction: **English**
3.	Faculty: **Faculty of Biotechnology**
4.	Course/module code: **29-BT-S1-E4-EnBph**
5.	Course/module type (*mandatory* or *elective*): **mandatory**
6.	Programme: **Biotechnology**
7.	Study cycle (*1st/2nd*): **1st cycle**
8.	Year: **2nd**
9.	Semester *(autumn* or *spring):* **spring**
10.	Form of tuition and number of hours Lecture: **30 h**
11.	Coordinator(s): **Mr. Maciej WIKTOR, PhD**
12.	Initial requirements (knowledge, skills, social competences) **understanding of fundamentals of biology, physics and calculus**
13.	Objectives: **Acquiring knowledge on the structure and function of protein complexes carrying bioenergetics reactions.**
14.	Content: • **Structure of biopolymers.** • **First and second law of thermodynamics, entropy and Gibbs free energy.** • **Electrical and chemical work, electrochemical potential.** • **Thermodynamics linked active transport.** • **Oxidation-reduction reactions in biology.** • **Biophysics of lipids, phase transition, monolayer and liposomes.** • **Biological membranes, structure and function, peripheral and integral membrane**

	proteins. • **Transport across biological membrane, diffusion, natural permeability, ionophore mediated.** • **Protein mediated transport, uniport, symport, antiport.** • **Transport of sugars and amino acids, periplasmic transport system, transport of macromolecules.** • **The chemiosmotic theory, the tenets of the chemiosmotic hypothesis.** • **The chemisomotic proton circuit, the measurement of protonmotive forces, seprate estimation of membrane potential and proton gradient.** • **Mitochondrial respiratory chains, complex I (NADH-UQ oxidoreductase), complex II, complex III (UQ-cyt *c* oxidoreductase), complex IV (ytochrome *c* oxidase).** • **The light reaction of photosynthesis in bacteria.** • **Structure of photosynthetic reaction centers.** • **The photosynthetic electron transport in plant, oxygen evolution.** • **The photosynthetic antenna pigment-protein complexes, light energy transfer.** • **Gibbs energy content of reaction as a function of its displacement fron equilibrium.** • **The ATP synthase, structure and function. Stereochemistry of ATP hydrolysis.** • **Techniques of chloroplast and tylakoid preparation.** • **Experimental methods in photosynthetic electron transfer chain study.**	
15.	Learning outcomes: Student: • **makes a qualitative and quantitative description of the basic biological phenomena and processes;** • **have extensive knowledge in the field of biophysics;** • **knows the basic concepts, terms, techniques used in biophysics;** • **reads and understands scientific literature in the field biophysics in English;** • **takes advantage of the online resources and literature to obtain information on biophysics;** • **understands the need for continuing education throughout the whole life, including broadening knowledge in biophysics.**	Outcome symbols: K1_W01 K1_W05 K1_W06 K1_U03 K1_U04 K1_K01
16.	Recommended literature: • **D. G. Nicholls, S. J. Ferguson; Bioenergetics 4th edition, Academic Press.** • **W. A. Cramer, D. B. Knaff ; Energy Transduction in Biological Membranes, Springer-Verlag.**	
17.	Methods of verification of the assumed learning outcomes: **written exam**	

<table>
<tr><td>18.</td><td colspan="2">Conditions of earning credits:
possitive exam result.</td></tr>
<tr><td rowspan="5">19.</td><td colspan="2">Student’s workload:</td></tr>
<tr><td>Activity</td><td>Number of hours for the activity</td></tr>
<tr><td>Hours of instruction (as stipulated in study programme):
• lecture: 30 h
• consultations: 5 h</td><td>35 h</td></tr>
<tr><td>Student’s own work:
• reading the literature
• preparation for the exam</td><td>35 h</td></tr>
<tr><td>Total number of hours:</td><td>70 h</td></tr>
<tr><td></td><td>Number of ECTS:</td><td>3 ECTS</td></tr>
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