COURSE DESCRIPTION (SYLLABUS)

1.	Course: **Molecular Organization of the Cell**
2.	Language of instruction: **English**
3.	Faculty: **Faculty of Biotechnology**
4.	Course/module code: **29-BT-S1-E5-MOCeng**
5.	Course/module type (*mandatory* or *elective*): **mandatory**
6.	Programme: **Biotechnology**
7.	Study cycle (*1st/2nd*): **1st cycle**
8.	Year: **3rd**
9.	Semester *(autumn* or *spring):* **autumn**
10.	Form of tuition and number of hours: Lecture: **30 h**
11.	Coordinator(s): **Aleksander Sikorski, Prof.**
12.	Initial requirements *(knowledge, skills, social competences)*: **Basic knowledge on:** • **architecture of living organisms at various levels;** • **major molecules that build cells and subcellular structures;** • **biochemical reactions and enzymes that catalyze them;** • **storage, inheritance and expression of genetic information.**
13.	Objectives: **Major subject of teaching is the function of cellular organelles and compartments on the molecular level. In particular, membrane, vesicular traffic, structure and function of major organelles, cytoskeleton and cell adhesion structures and molecules. Important issue is to facilitate understanding regulation of the cell cycle and its aberrations.**

14.	Content: • ***Prokaryote* and *Eukaryote*.** • **Chosen methods used in the studies of the cell.** • **Chosen microscopy techniques and techniques of microscopic sample preparation, electron microscopy techniques and sample preparation.** • **Application of antibodies.** • **Cell cultures.** • **Compartmentation of eukaryotic cells.** • **Biological membranes, lipid bilayer. Membrane proteins. Membrane asymmetry.** • **Basics of the membrane transport phenomena. ABC-transporters. Exo- and endocytosis.** • **Cytosol. Cytoskeleton: microfilaments, intermediate filaments and microtubules. Organization and functions of cytoskeleton.** • **Cell-cell and cell extracellular matrix junctions/adhesions.** • **Extracellular matrix.** • **Nucleus – nuclear envelope structure, nuclear pores, nuclear traffic. Nuclear matrix.** • **Peroxisomes.** • **Endoplasmic (rough and smooth) reticulum.** • **Membrane biosynthesis.** • **Golgi complex and its role in glycoprotein and glycolipid carbohydrate chains processing.** • **Formation of secretory vesicles/granules.** • **Lysosomes role and heterogeneity.** • **Signal transduction to and within the cell.** • **Growth and division of the cell.** • **Eukaryotic cell cycle and its regulation. Molecular mechanisms of the cell cycle regulation; check points. Cyclins and cyclin-dependent kinases, growth factors and their receptor kinases.** • **Reciprocal interactions of cells during development.** • **TGF-β signaling.** • **Stem cells.** • **Programmed cell death and its regulation pathways.** • **Basic concepts of cancer. Proto-oncogenes and tumor suppressor genes.**	
1.	Learning outcomes: Student: • **has knowledge on biology of cells at a structural and molecular level.** • **has knowledge of the basic techniques and research tools used in in the studies of molecular organization and function of cells;** • **is able to link theoretical knowledge of biology of cells with its practical application;** • **reads and understands scientific literature in the field of biochemistry and biotechnology in English;** • **takes advantage of the online resources and**	Outcome symbols: K1_W02, K1_W06, K1_W08, K1_W09, K1_U03, K1_U04, K1_K02, K1_U03

<table>
<tr><td></td><td colspan="2">literature to obtain information on preparative biochemistry;
• recognizes the importance of knowledge and expert opinions in solving cognitive and practical problems.</td></tr>
<tr><td>2.</td><td colspan="2">Obligatory and recommended literature:
Lodish, H., Berk, A., Kaiser, C., Krieger M., Bretscher, A., Ploegh, H., Amon, A. and Scott, P. <u>Molecular Cell Biology</u>, 7th Ed. W.H. Freeman and Co. 2013
Alberts, Johnson, Lewis, Raff, Roberts, Walter, <u>Molecular Biology of the Cell</u>, 5th edition, Garland Press, 2008.</td></tr>
<tr><td>3.</td><td colspan="2">Methods of verification of the assumed learning outcomes:
written exam</td></tr>
<tr><td>4.</td><td colspan="2">Conditions of earning credits:
positive exam result</td></tr>
<tr><td rowspan="5">5.</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</td><td>30 h</td></tr>
<tr><td>Student’s own work:
• reading the literature;
• preparation for the exam.</td><td>50 h</td></tr>
<tr><td>Total number of hours:</td><td>80 h</td></tr>
<tr><td></td><td>Number of ECTS:</td><td>4 ECTS</td></tr>
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