# DESCRIPTION OF THE COURSE OF STUDY

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| **Course code**  |  | **0912.4.LEK.B.BCB** |
| **Name of the course in**  | Polish  | **Podstawy Biologii Komórki**  |
| English  | **The basics of cell biology** |

## LOCATION OF THE COURSE OF STUDY IN THE SYSTEM OF STUDIES

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| **1.1. Field of study**  | Medicine  |
| **1.2. Mode of study**  | Full-time  |
| **1.3. Level of study**  | Unified Master studies |
| **1.4. Profile of study\***  | General academic  |
| **1.5. Person preparing the course description**  | Dr Małgorzata Łysek-Gładysińska |
| **1.6. Contact**  | mglad@ujk.edu.pl |

## 2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

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| **2.1. Language of instruction**  | English  |
| **2.2. Prerequisites\***  | **-------------------**  |

## 3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

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| **3.1. Form of classes**  | Lecture (30 h including 5 h e-learning), classes (10 h), laboratories (20 h) |
| **3.2. Place of classes**  | Courses in the teaching rooms of UJK, e-learning platform |
| **3.3. Form of assessment**  | lecture (exam), laboratories (credit with grade), **,** classes (credit with grade) |
| **3.4. Teaching methods**  | Informative lecture Laboratories- practical classes |
| **3.5. Bibliography**  | **Required reading**  | Bruce Albert, Dennis Bray, Hopkin Karen ,Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter: Essential Cell Biology, 3rd edition. |
|  **Further reading**  |  Nalini Chandar, Susan Viselli: Lippincott Illustrated Reviews: Cell & Molecular Biology 2010.Anthony L. Mescher: Junqueira’s Basic Histology. Text and Atlas 14th edition. |

## 4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED TEACHING OUTCOMES

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| **4.1. Course objectives *(for both forms of the course)*** **Lectures:** C1-Familiarizing students with the contemporary knowledge of the cell. C2-Drawing students’ attention to the link of the structural organization of the cell with basic physiological processes that extend there. C3- Acquainting students with the ultrastructure and chemical components of prokaryotic or eukaryotic cells. C4 - Familiarizing students with the most common causes and mechanisms of cell damage. C5 - Making students aware that every disease process has its source in a specific cell structure. C6 - Drawing students' attention to the importance of cell biology in relation to human diseases, diagnostics, and therapeutic strategies. **Laboratories, classes:** C1- Familiarizing students with research techniques used in cell biologyC2- Students acquire skills in the analysis of cell structure at the light and electron microscope level and in the identification of subcellular structures using modern techniques.C3 - Familiarizing students witch morphological manifestations of cellular damage at the level of the light microscope and the transmission electron microscope. **4.2. Detailed syllabus (*for both forms of the course)*** Lecture:  The basics of cell metabolism. The differences and similarities of pro- and eukaryotic cells. The chemical components of the cell. Biological membranes. Chemical components of biological membranes. The model and function of the plasma membrane. The membranes in pathological processes. Nucleus, the outline of microscopic and chemical structure. The structural organization of chromatin. The functions of the cell nucleus. The pathology of the cell nucleus. The organization and functions of the cytoplasm. Cytoplasmic matrix and the cytoskeleton. Pathomorphological changes in the cytoskeleton. Mitochondria - the outline of ultrastructure and compartmentalization. The chemical composition of the mitochondrion. Mitochondrial membrane. Biochemical processes located in the mitochondrial region. The pathology of mitochondria (quantitative changes, swelling and mitochondrial condensation, megamitochondria, inclusions, inhibitors of mitochondrial respiration, diseases caused by genetically determined mitochondrial dysfunction). Structure and function of the ribosomes. The structure of the endoplasmic reticulum. Biochemical processes located in the smooth and rough endoplasmic reticulum. The drug detoxification processes. Changes in the morphology of the endoplasmic reticulum. Metabolic disorders of proteins. The disposal of xenobiotics. The morphology and ultrastructure of the Golgi apparatus. The chemical structure and basic functions of the Golgi apparatus. The influence of physicochemical factors on the Golgi apparatus. Changes in the structure and function of the Golgi apparatus in certain diseases. Lysosomes- morphological and molecular structure. The function of lysosomes. The degradation of intracellular proteins. Lysosomal diseases associated with a lack of enzymes. Lysosomal storage disease. The peroxisomes. The enzyme equipment and functions of peroxisomes. Participation of peroxisomes in pathological processes. Intercellular junctions. A cell junction pathology. Mechanisms to ensure the transport of proteins into organelles. Vesicular transport. Secreted roads. The roads of endocytosis. Principles of cell signaling. Intracellular signaling cascades. Classification of receptors. The cell cycle. Control of the cell cycle. Damage, aging of cells. Cell death: necrosis and apoptosis. Apoptosis in tumor cells. Degradation of extracellular proteins. Mechanisms of drug action at the cellular level. The ultrastructure of selected cells. Normal cells compared to cancer cells. The stem cells and their use in medicine Cell cultures. The importance of cell cultures in medicine and toxicology.  Laboratories**,** classes: The observation of prokaryotic and eukaryotic cells. Intravital observation of cells using various staining techniques. Evaluation of the barrier properties of biological membranes. Evaluation of the proliferative capacity of in vitro cells. The structure of the cell nucleus. The life cycle of eukaryotic cells. Damage to the life cycle and cell death. Separation of cellular structures from cell homogenate through differential centrifugation and density gradient. Cell organelles and their chemical determinants. The structure and functions of mitochondria.The detection of the activity of succinate dehydrogenase- enzyme markers for mitochondrial fraction. Peroxisomes, histochemical location of peroxidase in granulocytes of mammalian blood granulocytes. Lysosomes-determination of acid phosphatase activity- the marker of the lysosome fraction. The structure and physiological properties of the endoplasmic reticulum, the Golgi apparatus- observation of ultrastructure organization of human hepatocytes with the usage of electron microscopy. Preparation of stable slide (sampling test material, fixation, embedding, cutting microtome, staining. |

### 4.3. Education outcomes in the discipline

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| **Code** | **A student, who passed the course**  | **Relation to teaching outcomes**  |
|  | within the scope of **KNOWLEDGE**, the graduate knows and understands**:**  |  |
| W01 | Basic cellular structures and their functional specifications; | A.W2. |
| W02 | The structure of lipids and polysaccharides and their functions in the cellular and extracellular structures;  | B.W9. |
| W03 | The protein primary, secondary, tertiary and quaternary structures as well as the post-translational and functional protein modifications and their significance; | B.W10. |
| W04 | The functions of nucleotides in the cell, RNA and DNA primary and secondary structure as well as chromatin structure;  | B.W11. |
| W06 | The ways of communication between cells as well as between the cell and the extracellular matrix and signal transduction pathways in the cell as well as examples of disorders in these processes leading to the development of tumors and other diseases; | B.W16. |
| W07 | The processes such as: cell cycle, proliferation, differentiation and cell aging, apoptosis and necrosis, and their importance for the functioning of the body; | B.W17. |
| W08 | Functions and applications of stem cells in medicine; | B.W18. |
|  | within the scope of **ABILITIES**, the graduate knows how to**:**  |  |
| U01 | Operate the optical microscope, also making use of immersion;  | A.U1. |
| U02 | Recognize histological structures of organs, tissues, cells and cellular structures on the optical or histological microscope images, describe and interpret the structure and relations between the structure and the function;  | A.U2. |
| within the scope of **SOCIAL COMPETENCE**, the graduate is able to: |
| K01 | recognize his/her own limitations and self-evaluate educational deficiencies and needs; | K.S5 |
| K02 | use reliable information sources; | K.S7 |
| K03 | conclude on the basis of own surveys and observations; | K.S8 |
| K04 | introduce rules of social conduct and teamwork to the group of specialists, including specialists form other medical professions also in the multicultural and multinational environment; | K.S9 |
| K05 | give opinions concerning various aspects of professional activity; | K.S10 |
| K06 | take responsibility for own decisions made during professional activities including own safety and safety of other people; | K.S11 |

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| **4.4. Methods of assessment of the intended teaching outcomes**  |  |  |
| **Teaching outcomes** ***(code)***  | **Method of assessment (+/-)**  |  |  |
| **Exam** **oral/written\***  | **Test\***  | **Project\***  | **Effort in class\***  | **Self-study\***  | **Group** **work\***  | **Others\*****Observation**  |
| ***Form of classes***  | ***Form of classes***  | ***Form of classes***  | ***Form of classes***  | ***Form of classes***  | ***Form of classes***  | ***Form of classes***  |
| *L*  | *C*  | *...*  | *L*  | *C*  | *...*  | *L*  | *C*  | *...*  | *L*  | *C*  | *...*  | *L*  | *C*  | *...*  | *L*  | *C*  | *...*  | *L*  | *C*  | *..**.*  |
| W01  | ***+***  |  |  |  | ***+***  |  |  |  |  |  | ***+***  |  |  |  |  |  | ***+***  |  |  |  |  |
| W02 | ***+***  |  |  |  | ***+***  |  |  |  |  |  | ***+***  |  |  |  |  |  | ***+***  |  |  |  |  |
| W03  | ***+***  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| W04  | ***+***  |  |  |  | ***+***  |  |  |  |  |  | ***+***  |  |  |  |  |  | ***+***  |  |  |  |  |
| W05  | ***+***  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| W06  | ***+***  |  |  |  | ***+***  |  |  |  |  |  | ***+***  |  |  |  |  |  | ***+***  |  |  |  |  |
| W07 | ***+***  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| U01 |  |  |  |  | ***+***  |  |  |  |  |  | ***+***  |  |  |  |  |  | ***+***  |  |  |  |  |
| U02 | ***+*** |  |  |  |  | ***+*** |  |  |  |  | ***+*** |  |  |  |  |  | ***+*** |  |  |  |  |
| K01-K06 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ***+*** | ***+*** | ***+*** |

***\*delete as appropriate.***

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| **4.5. Criteria of assessment of the intended teaching outcomes** **Lecture:** Thefinal grade is the grade received from the written exam. **Laboratory:** final grade is an average calculated from partial marks, each partial test must be passed on positive grade**.**  |
| **Form of classes**  | **Grade**  | **Criteria of assessment**   |
| **lecture (L)** | **3**  | Receiving from 61% - 68% the total number of points available for the written exam  |
| **3,5**  | Receiving from 69% - 76% the total number of points available for the written exam  |
| **4**  | Receiving from 77% - 84% the total number of points available for the written exam  |
| **4,5**  | Receiving from 85% - 92% the total number of points available for the written exam  |
| **5**  | Receiving from 93% - 100% the total number of points available for the written exam  |
| **Practical** **classes** **(****)\*****PC** | **3**  | Receiving from 61% - 68% the total number of points obtained from each partial test  |
| **3,5**  | Receiving from 69% - 76% the total number of points obtained from each partial test  |
| **4**  | Receiving from 77% - 84% the total number of points obtained from each partial test  |
| **4,5**  | Receiving from 85% - 92% the total number of points obtained from each partial test  |
| **5**  | Receiving from 93% - 100% the total number of points obtained from each partial test  |

##  [Thresholds](https://pl.bab.la/slownik/angielski-polski/thresholds) are valid from 2018/ 2019 academic year

**5. BALANCE OF ECTS CREDITS – STUDENT’S WORK INPUT**

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| **Category**  | **Student's workload**  |
| **Full-time studies**  |
| *NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/*  | **60** |
| *Participation in lectures\**  | 25 |
| *Participation in classes, seminars, laboratories\**  | 30 |
| *Preparation in the exam/ final test\**  |  |
| *Others\**  | 51 |
| *INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/* | **40** |
| *Preparation for the lecture\** | 25 |
| *Preparation for the classes, seminars, laboratories\**  | 15 |
| *Preparation for the exam/test\**  |  |
| *Gathering materials for the project/Internet query\**  |  |
| *Preparation of multimedia presentation*  |  |
| *Others\**  |  |
| *TOTAL NUMBER OF HOURS*  | **100** |
| ECTS credits for the course of study  | **4** |

  ***\*delete as appropriate***

1 e-learning (without participation of the lecturer)

***Accepted for execution*** *(date and signatures of the teachers running the course in the given academic year ......................................................................................................................*