

## DESCRIPTION OF THE COURSE OF STUDY

|                              |                           |                                  |
|------------------------------|---------------------------|----------------------------------|
| <b>Course code</b>           | <b>0912-7LEK-B2.2-BBK</b> |                                  |
| <b>Name of the course in</b> | Polish                    | <b>Podstawy Biologii Komórki</b> |
|                              | English                   | <b>Basis of cell biology</b>     |

### 1. LOCATION OF THE COURSE OF STUDY WITHIN THE SYSTEM OF STUDIES

|  |   |
|--|---|
| <b>1.1. Field of study</b>                             | Medicine  |
| <b>1.2. Mode of study</b>                              | Full-time   |
| <b>1.3. Level of study</b>                             | Uniform Master's study                                      |
| <b>1.4. Profile of study*</b>                          | General academic  |
| <b>1.5. Specialization*</b>                            | lack  |
| <b>1.6. Unit running the course of study</b>           | Faculty of Mathematics and Natural Sciences                 |
| <b>1.7. Person/s preparing the course description</b>  | prof. UJK dr hab. Teodora Król                              |
| <b>1.8. Person responsible for the course of study</b> | dr Małgorzata Łysek- Gładysińska (classes)                  |
| <b>1.9. Contact</b>                                    | tkrol @onet.pl; malgorzata.lysek-<br>gladysinska@ujk.edu.pl |

### 2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

|   |                              |
|---|------------------------------|
| <b>2.1. Affiliation with the module</b>                       | Scientific basis of medicine |
| <b>2.2. Language of instruction</b>                           | English                      |
| <b>2.3. Semesters in which the course of study is offered</b> | 2 <sup>nd</sup> semester     |
| <b>2.4. Prerequisites*</b>                                    | -----                        |

### 3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

|                                |  |  |
|--------------------------------|--|--|
| <b>3.1. Form of classes</b>    | Lecture (30 h) + laboratories(30 h)                        |  |
| <b>3.2. Place of classes</b>   | Courses in the teaching rooms of UJK                       |  |
| <b>3.3. Form of assessment</b> | lecture (exam), laboratories (credit with grade)           |  |
| <b>3.4. Teaching methods</b>   | Informative lecture<br><br>Laboratories- practical classes |  |
| <b>3.5. Bibliography</b>       | <b>Required reading</b>                                    | „Essential Cell Biology” – Bruce Albert, Dennis Bray, Hopkin Karen ,Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter. 3rd edition |
|                                | <b>Further reading</b>                                     | Cell & Molecular Biology, Lippincott's Illustrated Reviews- 2010, Nalini Chandar, Susan Visell   |

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

#### 4.1. Course objectives (for both forms of the course)

Lectures:

C1-Familiarizing the students with the contemporary knowledge of the cell.

C2-Paying attention to the link of the structural organization of the cell with basic physiological processes that extend in it.

C3-Focusing on the functional link between cell components and phenomenon giving the cell the main position in the knowledge of the phenomena of life.

C4-Acquaintance with the ultrastructure and chemical components of prokaryotic or eukaryotic cells.

C5- Familiarizing students with the most common causes and mechanisms of cell damage.

C6-Making students aware that every disease process has its source in a specific cell structure.

C7- Paying attention to the issues relationship of cell biology with practical problems and their importance in medicine and pharmacology.

**Laboratories:**

C1-Familiarizing the students with techniques of using cell research especially in techniques for running a cell culture.

C2- Acquisition of skills in analysis of cell structure at light and electron microscope level and identification of subcellular structures of using modern techniques .

C3- Familiarizing the students with 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 basic concept related to energy cells. The basics of cell metabolism. The differences and similarities of pro- and eukaryotic cell. The chemical components of the cell. Biological membranes. The chemical components of biological membranes. The model of biological membrane. The functions of biological membranes. The transport through biological membranes. The membranes in pathological processes. The damage to cell membranes. The participation of lipids in membrane pathology. Nucleus- the outline of microscopic and chemical structure. The structural organization of chromatin. The protein components of chromatin. The functions of the cell nucleus. Pathological deposits in the nucleus. The pathology of cell nucleus (changes in the image of chromatin and the structure of the nucleus as well as nuclear envelope, nuclear inclusions, participation of micronuclei in the pathology of the cell). The organization and functions of the cytoplasm. Cytoplasmic matrix and the cytoskeleton. Pathomorphological changes in the cytoskeleton (the microtubule poisons, genetic diseases caused by defects in genes encoding the proteins of the cytoskeleton. Medicines which have the effect on the microtubular. Mitochondria- the outline of ultrastructure and compartmentalization. The chemical composition of mitochondrion. Mitochondrial membrane, mitochondrial membrane permeability. The carriers of nucleotides adenylate, phosphates, as well as di- and tricarboxylate. The transport of reducing equivalents. Biochemical processes located in the inner mitochondrial membrane. Mitochondrial matrix. Mitochondrial biogenesis. The pathology of mitochondria (quantitative changes, swelling and mitochondrial condensation, megamitochondria, inclusions, inhibitors of mitochondrial respiration, diseases caused by genetically determined mitochondrial dysfunction). Ribosomes. Protein synthesis inhibitors. The structure of the endoplasmic reticulum. Biochemical processes located in smooth and rough endoplasmic reticulum. The drug detoxification processes. The changes in the morphology of 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 lack of enzymes. Lyso-somal storage disease. The microbodies, peroxisomes and glyoxysomes. The enzyme equipment and functions of peroxisomes. The participation of peroxisomes in pathological processes. Intercellular junctions. A cell junction pathology. The sorting of proteins. Mechanisms ensuring the transport of proteins into organelles. Vesicular transport. Secreted roads. The roads of endocytosis. Principles of cell signalling. Intercellular signaling. Principles of cell signalling. Intracellular signaling cascades. Classification of Receptors. The cell cycle. Control of the cell cycle. Damage, cell aging. Cell death- necrosis and apoptosis. Apoptosis in tumor cells. Degradation of extracellular proteins. The mechanisms of drug action at a cellular level. The ultrastructure of selected cells. Normal cells compared to cancer cells. Cell cultures. The importance of cell cultures in medicine and toxicology.

**Laboratories:**

The observation of prokaryotic and eukaryotic cells. Intravital observation of cells using various staining techniques. Evaluation of barrier properties of biological membranes.

The techniques for establishing and running the cell culture. The evaluation of proliferative capacity of cells.

The structure of cell nucleus. The life cycle of eukaryotic cells. Damage of life cycle and cell death.

The separation of cellular structures from the 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- enzymatic markers for mitochondrial fraction. Peroxisomes , histochemical localization of peroxidase in the granulocytes of mammalian blood. Lysosomes-determination of acid phosphatase activity- the marker of lysosome fraction. The structure and physiological properties of the endoplasmic reticulum as well as the Golgi apparatus- observation of ultrastructure organization of human hepatocytes with the

usage of electron microscopy. Preparation of stable preparations (sampling test material, fixation, embedding, cutting microtome, staining). Detection of storage materials in paraffin-embedded and frozen liver histological preparations.

#### 4.3. Education outcomes in the discipline

| Code                                  | A student, who passed the course   | Relation to teaching outcomes |
|---------------------------------------|--|-------------------------------|
| within the scope of <b>KNOWLEDGE:</b> |  |                               |
| W01                                   | knows basic cellular structures and their functional specifications;   | A.W4.                         |
| W02                                   | describes the structure of lipids and polysaccharides and their functions in the cellular and extracellular structures;  | B.W11.                        |
| W03                                   | characterizes the protein primary, secondary, tertiary and quaternary structures; knows the post-translational and functional protein modifications and their significance;  | B.W12.                        |
| W04                                   | knows the functions of nucleotides in the cell, RNA and DNA primary structure as well as chromatin structure;  | B.W13.                        |
| W06                                   | knows 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.W21.                        |
| W07                                   | knows the processes such as cell cycle, proliferation, differentiation, and cell aging, apoptosis and necrosis, and their importance for the functioning of the body;  | B.W22.                        |
| W08                                   | knows basic problems concerning stem cells and their use in medicine;  | B.W23                         |
| within the scope of <b>ABILITIES:</b> |  |                               |
| U01                                   | operates the optical microscope, also making use of immersion;   | A.U1.                         |

#### 4.4. Methods of assessment of the intended teaching outcomes

| Teaching outcomes<br>(code) | Method of assessment (+/-) |   |     |                 |   |     |                 |   |     |                  |   |     |                 |   |     |                 |   |     |                 |   |     |
|-----------------------------|----------------------------|---|-----|-----------------|---|-----|-----------------|---|-----|------------------|---|-----|-----------------|---|-----|-----------------|---|-----|-----------------|---|-----|
|                             | Exam oral/written*         |   |     | Test*           |   |     | Project*        |   |     | Effort in class* |   |     | Self-study*     |   |     | Group work*     |   |     | Others*         |   |     |
|                             | 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                         | +                          |   |     |                 |   |     |                 |   |     |                  |   |     |                 |   |     |                 |   |     |                 |   |     |

\*delete as appropriate

**4.5. Criteria of assessment of the intended teaching outcomes**  
**Lecture:** final grade is a grade received from written exam.  
**Laboratory:** final grade is an average calculated from partial marks, each partial tests must be passed on positive grade.

| Form of classes                | Grade      | Criterion of assessment  |
|--------------------------------|------------|--|
| <b>lecture (L)</b>             | <b>3</b>   | Receiving from 61% - 68% the total number of points available for the written exam   |
|                                | <b>3,5</b> | Receiving from 69% - 76% the total number of points available for the written exam   |
|                                | <b>4</b>   | Receiving from 77% - 84% the total number of points available for the written exam   |
|                                | <b>4,5</b> | Receiving from 85% - 92% the total number of points available for the written exam   |
|                                | <b>5</b>   | Receiving from 93% - 100% the total number of points available for the written exam  |
| <b>Practical classes (PC)*</b> | <b>3</b>   | Receiving from 61% - 68% the total number of points obtained from each partial test  |
|                                | <b>3,5</b> | Receiving from 69% - 76% the total number of points obtained from each partial test  |
|                                | <b>4</b>   | Receiving from 77% - 84% the total number of points obtained from each partial test  |
|                                | <b>4,5</b> | Receiving from 85% - 92% the total number of points obtained from each partial test  |
|                                | <b>5</b>   | Receiving from 93% - 100% the total number of points obtained from each partial test |

- **Thresholds are valid from 2018/ 2019 academic year**

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

| <b>Category</b>   | <b>Student's workload</b> |
|---|---------------------------|
|   | <b>Full-time studies</b>  |
| <i>NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/</i> | <b>60</b>                 |
| <i>Participation in lectures*</i>   | <b>30</b>                 |
| <i>Participation in classes, seminars, laboratories*</i>                            | <b>30</b>                 |
| <i>Preparation in the exam/ final test*</i>   |                           |
| <i>Others*</i>  |                           |
| <i>INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/</i>                           | <b>40</b>                 |
| <i>Preparation for the lecture*</i>   | <b>10</b>                 |
| <i>Preparation for the classes, seminars, laboratories*</i>                         | <b>20</b>                 |
| <i>Preparation for the exam/test*</i>   | <b>10</b>                 |
| <i>Gathering materials for the project/Internet query*</i>                          |                           |
| <i>Preparation of multimedia presentation</i>                                       |                           |
| <i>Others*</i>  |                           |
| <b>TOTAL NUMBER OF HOURS</b>  | <b>100</b>                |
| ECTS credits for the course of study  | <b>4</b>                  |

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

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