



Cytophysiology

1. IMPRINT	
Academic Year	2024/2025
Department	Faculty of Medicine
Field of study	Medicine
Main scientific discipline	Medical science
Study Profile	General academic
Level of studies	Uniform MSc
Form of studies	full-time studies
Type of module / course	obligatory
Form of verification of learning outcomes	exam
Educational Unit / Educational Units	<p>Department of Histology and Embryology Center for Biostructure Research 02-004 Warszawa, Chałubińskiego 5 Str.(Anatomicum bldg.) Web site: http://histologia.wum.edu.pl Department office is open for students on working days. Business hours 9: 30 - 14: 00, tel/fax 22 629-5282.</p> <p>Department of Transplantology and Main Tissue Bank Center for Biostructure Research 02-004 Warszawa, Chałubińskiego 5 Str.(Anatomicum bldg.) https://transplantologia.wum.edu.pl/ Department office is open for students on working days. Business hours 9: 30 - 14: 00, tel./fax 22 621 75 43</p>
Head of Educational Unit / Heads of Educational Units	<p>Paweł Włodarski, MD, PhD, Professor Artur Kamiński, M.D., Ph.D., Associate professor</p>

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2. BASIC INFORMATION

Year and semester of studies	2, 1 st semester	Number of ECTS credits	2
FORMS OF CLASSES		Number of hours	ECTS credits calculation
Contacting hours with academic teacher			
Lecture (L)		10	0,25
Seminar (S)		10	0,25
Discussions (D)			
e-learning (e-L)			
Practical classes (PC)		25	1
Work placement (WP)			
Unassisted student's work			
Preparation for classes and completions		15	0,5

3. COURSE OBJECTIVES

O1	
O2	
O3	

4. STANDARDS OF LEARNING – DETAILED DESCRIPTION OF EFFECTS OF LEARNING	
Code and number of effect of learning in accordance with standards of learning	Effects in time

Knowledge – Graduate* knows and understands:

B.W7	physicochemical and molecular basis of the functioning of sensory organs
B.W11	structure of lipids and polysaccharides and their roles in cellular and extracellular structures;
B.W13	functions of nucleotides in the cell, the structure of I and II DNA and RNA and the structure of chromatin;
B.W14	functions of the genome, transcriptome and human proteome and the basic methods used in their study; processes of replication, repair and recombination of DNA, transcription and translation and degradation of DNA, RNA and proteins; knows the concepts of the gene expression regulation;
B.W17	ways of communication between cells, as well as between the cell and the extracellular matrix and the pathways of transmitting signals in the cell and examples of disruption of these processes leading to cancer and other diseases;
B.W18	processes, such as the cell cycle, proliferation, differentiation and aging of cells, apoptosis and necrosis, as well as their importance for the functioning of the organism;
B.W19	basic aspects associated with stem cells and their medical use;
B.W23	the mechanisms of aging of the body;
C.W4	structure of chromosomes and the molecular basis of mutagenesis;
C.W51	mechanism of hormone activity

Skills– Graduate* is able to:

B.U13	plan simple research and interpret the results and draw conclusions.
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* In appendix to the Regulation of Minister of Science and Higher education from 26th of July 2019 „graduate”, not student is mentioned.

5. ADDITIONAL EFFECTS OF LEARNING	
Number of effect of learning	Effects of learning in time

Knowledge – Graduate knows and understands:

K5	perceiving and recognizing own limitations and self-assessment of deficits and educational needs
K7	readiness to use objective sources of information

Skills– Graduate is able to:

S1	
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Social Competencies – Graduate is ready for:

SC1	
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6. CLASSES		
Form of class	Class contents	Effects of Learning
Lectures	<p>W1 Methods of DNA analysis – from Crichton to Crick</p> <p>W2 Monoclonal antibodies in diagnostics and therapy</p> <p>W3 Cholesterol</p> <p>W4 DNA repair</p> <p>W5 RNA interference</p> <p>W6 Proteasomes and ubiquitin in medicine</p> <p>W7 Cytokines in health and disease</p> <p>W8 Mitochondria – not only the source of energy</p> <p>W9 Metaplasia and endothelial to mesenchymal transition</p> <p>W10 Mechanisms of inflammation</p>	<p>B.W7;</p> <p>B.W11;</p> <p>B.W13;</p> <p>B.W14;</p> <p>B.W17;</p> <p>B.W18;</p> <p>B.W19;</p> <p>B.W23;</p> <p>C.W4;</p> <p>C.W51;</p>
Seminars (S) and Classes (C)	<p>S1. Physiology of selected cytoplasmic processes. Physiology of cell membranes. Structure of lipids and their function In the cell and extracellular matrix. Lipids rafts. Caveolae. Asymmetry of the plasma membrane. Cellular transport. Glucose transporters. ABC transporters and MDR phenomenon. Physicochemical and molecular aspects of perception of the organ of the hearing.</p> <p>C1. Structure and function of cytoplasm and cell membranes Physiology of membrane enclosed compartment. Physiology of selected cytosolic processes. Ribosomes, Polosomes. Endo and exocytosis pathways. Interactions between cells and extra-cellular matrix. Cytoskeleton.</p> <p>S2. Cytophysiology of Cell nucleus and function. Structure of the cell nucleus. Structure of chromatin and its modifications. Tissue specific modifications of chromatin. Transcriptional activity of chromatin. RNA interference Chromosomes. Telomers. Nuclear structures involved in RNA processing.</p> <p>C2. Structure of nucleus. Nucleolus- structure and function. Nuclear envelope and nuclear-cytoplasmic transport. Nuclear processes before cell division. RNA interference.</p> <p>S3. Cell to cell communication. Types of communication between cells in the human body. The answer of cells to extracellular stimuli. Molecular basis of sense perception and signal transmission in receptor cells.</p> <p>C3. Cell signalling – intracellular pathways. Receptors, second messengers (cAMP, cGMP, Ca²⁺. IP₃, DG at al.), transcription factors (general and specific – ie. CREB, AP-1, NFκB). Structure and function of G-proteins. Receptor and non-receptor tyrosine kinases. Kinases Src, Jak. MAP, Akt, PI3K pathways.</p> <p>S4. Cell signalling events</p>	<p>B.W7;</p> <p>B.W11;</p> <p>B.W13;</p> <p>B.W14;</p> <p>B.W17;</p> <p>B.W18;</p> <p>B.W19;</p> <p>B.W23;</p> <p>C.W4;</p> <p>C.W51;</p> <p>B.U13;</p> <p>K5</p> <p>K7</p>

	<p>Cell signalling by selected hormones, cytokines, growth factors and extra-cellular matrix components. Pathways activated by insulin, steroid hormones, nitric oxygen.</p> <p>C4. Clinical aspect of cell signalling Abnormalities in the cell signalling in human diseases. Cell signalling pathways as a therapeutic target.</p> <p>S5. Cell proliferation. Types of cell division; mitosis, meiosis. Cell cycle. Structure and function of mitotic spindle. Karyo- and cyto- kinesis.</p> <p>C5. Regulation of the cell cycle Cyclins i CDKinases. Role of p53, p21. pRb, Cdc25, Cdc6, APC-complex. Action of drugs interfering with cell division.</p> <p>S6. Cell differentiation Mechanism of cell differentiation. Genes involved in Cell differentiation. Epigenetic mechanisms. Cell differentiation during embryogenesis and tissue regeneration.</p> <p>C6. Stem cells. Cell potency. Stem cells, progenitor cells. Cell differentiation of stem cells in the human body.</p> <p>S7. Cell senescence and aging Cellular senescence. Replication senescence. Cell death: apoptosis, necrosis and other types of cell death.</p> <p>C7. Cell death Apoptotic pathways. Execution of apoptosis. Caspases. Apoptosis without caspases. Physiological apoptosis. Apoptosis induction as a therapeutic target. Methods of detecting of apoptotic cells.</p> <p>S8. Mechanisms of oncogenesis Protective cellular mechanisms against cancer transformation. Abnormal gene expression in cancer. Role of p53, p21, Rb, onco mi-RNA. ATM/ATR, BRCA1/2.</p> <p>C8. Cancer transformation Malignant transformation on the example of retinoblastoma, colon cancer, breast cancer, lung cancer, chronic myeloid leukaemia.</p> <p>S9. Cancer cell biology Cancer cells properties. Abnormalities in cellular processes in cancer cells. Abnormal cell growth. Models of cancer evolution. Cancer stem cell theory. Tumor progression. Tumor angiogenesis. Cancer cell – extracellular matrix interactions and metastasis.</p> <p>C9. Molecular cancer therapy Cellular target of anticancer drugs incl. molecular targets of novel drugs in oncology.</p> <p>S10. Regenerative medicine and tissue bio- engineering. Cells in regenerative medicine. Stem cells – embryonic and somatic. Differentiated cells: autologenic, izogenic (syngenic), allogenic, xenogeneic, primary and secondary. Method of stem generation: embryonic, somatic and induced stem cells. Therapeutic cloning.</p> <p>C10. Cell therapy Stem cell therapy possibilities in clinical usage.</p> <p>C11. Methods of cell culture and techniques used in the medical research</p>	
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	<p>Methods of cell culture for medical research and regenerative medicine. The in vitro experiment on cell cultures. Types of the cell cultures. Cytostatic/cytotoxic tests in a drug discovery. Laboratory methods of cell research in medicine.</p> <p>C12. Tissue and cell banking for medical proposes. Rules of tissue and cell banking. Qualification of donors of tissues and cells. Organisation of tissue and cell banking in Poland, EU at the word. Types of transplantation. Clinical usage of transplants. Coordination 2f tissue and cell transplantation. Advanced technology medical products (ATPM) in tissue and cell banking. Types of the scaffolds and cells in tissue engineering. Transplantation in a regenerative medicine.</p>	
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7. LITERATURE
Obligatory
<ol style="list-style-type: none"> 1. Essential Cell Biology by. Alberts at all (ed.) 2. Medical Cell Biology by Goodman (ed.) 3. Rewiew: Cell and Molecular Biology Lippincott's illustrated Review by Chandar, Viselli
Supplementary
<ol style="list-style-type: none"> 1. Molecular Cell Biology by Albers et all (ed.) 2. Cell Biology by Karp 3. The cell – a molecular approach by Cooper, Hausman

8. VERIFYING THE EFFECT OF LEARNING		
Code of the course effect of learning	Ways of verifying the effect of learning	Completion criterion
B.W7; B.W11; B.W13; B.W14; B.W17; B.W18; B.W19; B.W23; C.W4; C.W51;	Weekly test, examination	60%
B.U13; K5; K7	observation by the teacher during the classes	credit from the teacher

9. ADDITIONAL INFORMATION
<p>Regulations of classes in Cytophysiology for students of medicine:</p> <p>Organization of classes</p> <ol style="list-style-type: none"> 1.The classes begin with a seminar part where presence is obligatory. 2. Presence on practical classes and seminars is obligatory. Delays exceeding 15 minutes will be treated as absence. 3. Students enter the classes prepared essentially. The scope of material for classes is given in the "Program of classes". 4. Preparation of students for classes is assessed by the teacher. 5. During the classes, students answer questions, discuss issues covered by the subject of classes and view microscopic preparations, diagrams and electronograms. <p>Credit for classes – weekly tests.</p> <ol style="list-style-type: none"> 1. The condition for crediting is participation in classes and seminars, passing all classes and weekly tests 2. The condition for passing the class (practical and seminar) is the presence on both parts of the class and obtaining a positive

assessment of the knowledge of the material provided for the given occupation in the person conducting the practical part.

3. The days in which the dates of the classes are set are the days of obligatory classes.
4. Due to the character and organization of seminars and practical classes there is no possibility to make up for absences. **Absence at 3 or more classes, regardless of the reason, results in not getting a credit for the semester**, hence student will not be admitted to the examination.
5. **When students are absent, they are expected to negotiate with professors the form for make-up of lectures, seminars or classes missed.**
6. In order to get a credit for classes, the student must get at least 60% of the total number of points from all weekly tests.
7. If the student did not achieve 60%, she/he must get credit for all the tests for the classes for which he did not get 6 points. Not getting the minimum of 60% from all the retaken tests, results in not being admitted to the final examination.
8. All tests needs to be retaken before final examination.

Final examination

1. The final exam takes the form of a test. Test contains 50 single choice questions and the test duration is 50 minutes. Electronic test examinations are held in the building of Main Library in the computer room.
2. The criteria for passing the exam are determined by the Head of the Department after the test, but it is assumed that at least 60% of the correct answers in the test are required.
3. **Students may evaluate their paper during the quiz. Then, if any reservations arise, students can flag the question and express their concerns. Later complaints will not be accepted.**
4. In the case of absence from the exam caused by health reasons, the student is required to provide a medical certificate within three working days of the date of the examination, under pain of entering the unsatisfactory grade.
5. In the event of failing the retake examination, at the student's request, the Dean may set a board examination.

Position of the Chair regarding cheating during examinations

Cheating on examinations is a breach of ethics and Regulations of Studies at the Warsaw Medical University. Person actively or passively participating in cheating shall be punished by being expelled from the examination and receiving a failing mark. On the top of that, the Department shall institute disciplinary procedure against the cheating students.

Person actively participating in cheating is the one, who copies results from other students or uses illegal notes or electronic devices to communicate or store data. Bringing such devices to examinations is forbidden.

Passive participation in cheating means allowing other students copy one's own responses. Thus, a student is obliged to behave honestly, not to allow other students copy his/her own responses.

Head of the Department obliges students and examiners to strictly obey these regulations

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ATTENTION

The final 10 minutes of the last class in the block/semester/year should be allocated to students'
Survey of Evaluation of Classes and Academic Teachers