

SYLLABUS
concerning the cycle of education 2019-2025

(date range)

1.1. BASIC INFORMATION CONCERNING THIS SUBJECT / MODULE

Subject / Module	Histology, embryology and cytophysiology
Course code / module *	HEC/B
Faculty of (name of the leading direction)	Faculty of Medicine, University of Rzeszow
Department Name	Department of Morphological Sciences, Department of Histology and Embryology
Field of study	Medical
Level of education	Uniform Master studies
Profile	General academic
Form of study	Stationary / non-stationary
Year and semester	1st year, 2nd semester
Type of course	Obligatory
Coordinator	prof. dr hab. Stanisław Orkisz

* - According to the resolutions of the Faculty of Medicine

1.2. Forms of classes, number of hours and ECTS

Lecture	Exercise	Conversation	Laboratory	Seminar	ZP	Practical	Self-learning	Number of points ECTS
15	20	-	-	10	-	-	-	6

1.3. The form of class activities

☒ classes are in the traditional form

☐ classes are implemented using methods and techniques of distance learning

1.4. Examination Forms / module (exam, credit with grade or credit without grade)

2. REQUIREMENTS

Basic knowledge in the field of biology

3. OBJECTIVES, OUTCOMES, AND PROGRAM CONTENT USED IN TEACHING METHODS

3.1. Objectives of this course/module

C1	Acquainting with the mechanisms of the body's formation during embryogenesis, the basic processes of regulating the development of systems and organs and the emergence of developmental defects.
C2	Mastering the practical skills of recognizing under the microscope the basic structural elements that make up the tissues and the recognition of normal organs on histological preparations.

3.2 OUTCOMES FOR THE COURSE / MODULE (TO BE COMPLETED BY THE COORDINATOR)

EK (the effect of education)	The content of learning outcomes defined for the class (module)	Reference to directional effects (KEK)
EK_01	He knows the basic cellular structures and their functional specializations	A.W4.
EK_02	He knows the microarchitecture of tissues, extracellular matrix and organs	A.W5.
EK_03	He knows the stages of the development of the human embryo, the structure and function of the fetal membranes and placenta and knows the stages of development of individual organs	A.W6.
EK_04	OPTICAL MICROSCOPE USE, ALSO IN THE USE OF IMMERSION	A.U1.
EK_05	Recognizes histological structures in images from an optical or electron microscope corresponding to organs, tissues, cells and cell structures, and describes and interprets their structure, and interprets relations between structure and function	A.U2.
EK_06	He knows the functions of the genome, transcriptome and human proteome and the basic methods used in their study; describes the processes of DNA replication, repair and recombination, transcription and translation, and DNA, RNA and protein degradation; knows the concepts of gene expression regulation	B.W14.
EK_07	He knows the ways of communication between cells, as well as between the cell and the extracellular matrix, and signaling pathways in the cell and examples of disorders in these processes leading to the development of cancer and other diseases;	B.W21.
EK_08	He knows processes such as: cell cycle, proliferation, differentiation and aging of cells, apoptosis and necrosis, and their importance for the functioning of the body	B.W22
EK_09	He knows the problem of stem cells in the basic scope and their application in medicine	B.W23.

3.3 CONTENT CURRICULUM (filled by the coordinator)

A. Lectures

Problems of the lecture

Course content

Course contents

1. Molecular mechanisms of signal transduction - basic signaling pathways of the cell, phosphorylation and cell signaling, signaling pathways with non-exposed receptors on the surface of the cell, communication through receptors connected with the enzyme and related receptors with enzyme.
2. Cell cycle - research history, the role of cyclins and kinases in the regulation of the cell cycle. Cell division - a type of cell division. Disorders in the cancer cell, tumor development. oncogenes and tumor suppressor genes, benign and malignant tumors. The role of chromosomal disorders in the process of neoplasia.
3. Abnormalities in the cell cycle and their consequences. Intracellular repair mechanisms (repair of DNA, heat shock proteins, telomeres and their importance in aging processes, systems inducing cell death.) Types of cell death - apoptosis, necrosis and autophagy. Methods of testing types of cell death.
4. Epithelial tissue. Definition and classification of epithelia. Common features of epithelial tissues. Single-layer epithelia - structure and place of occurrence. Multilayer multilayers - structure and place of occurrence. Modifications of the epithelial tissue structure depending on the function performed. Glands - types of construction and secretion.
5. Connective tissue. General characteristics of connective tissues and their classification. Intracellular connective tissue: fiber structure and basic substance. Origin, structure and function of connective tissue cells. Embryonic connective tissues, connective tissue proper. Connective connective tissues: cartilage and bone. Cartilage: characteristics of the extracellular matrix, cartilage types, mechanical properties, nutrition and growth. Bone components - intercellular substance and cells: osteoblasts, osteocytes and osteoclasts. Bone plate, organization of spongy and compact bone. Bone vascularization. Bony on the mesenchymatic and cartilage basis. Bone height and reconstruction. Blood: plasma structure, characteristics and adaptation to the functions of the morphing elements of the blood.
6. Muscle tissue. Classification and occurrence of muscle tissues. Characterization of the building blocks of particular types of muscle tissue. Structure of a structural-functional unit of striated muscle tissues. Molecular mechanism of contraction: T-system channels, sarcoplasmic reticulum. Conductive cardiac cells. Miocyte structure.
7. Nervous and glial tissue. The concept of a neuron, the characteristics of its cytoplasmic equipment. Nerve fibers: structure and classification, myelination process. Construction and types of synapses, synaptic guidance. Construction, function and place of occurrence

B The problem of exercises

Course contents

1. Function and structure of cellular organelles (cell membrane, mitochondrion, SER, RER, lysosome, proteasome, peroxisome, cytoskeleton). Function and structure of the cell nucleus. Stem cells - the hope of regenerative medicine.
2. Epithelial tissue - division, structure, examples (single and multilayered epithelia, flat, cubic and cylindrical epithelia).
3. Connective tissue - division, structure, examples (mesenchymatic, jelly-like, total proper: loose, compact, reticular, fat, joint support: cartilage).
4. Connective tissue - total support: bone. Blood: structure and functions of blood cells (erythrocytes, leukocytes, thrombocytes). Marrow. hematopoiesis.
5. Muscle tissue - division and structure (muscular tissue striated skeletal and cardiac, smooth muscle tissue). Mechanism of contraction.
6. nervous system (spinal cord, cerebral cortex, cerebellar cortex, spinal ganglion, neural stem, choroid plexus)
7. Circulatory and lymphatic-immune systems (general structure of blood and lymph vessels and their types, differences in artery and vein structure, histological structure of the heart, cardiac conduction system, histological structure and functions of lymphatic organs: spleen, tonsils, lymph node, thymus).

c. Seminars

Course contents
1. The course and regulation of gametogenesis: oogenesis, spermatogenesis, meiosis. Periodic interval, embryogenesis: insemination, fertilization, sulcus: germinal node and trophoblast, implantation, gastrulation: bi-worm germplasm, three-letter germplasm; development of the dorsal string. The formation and role of the membranes. The formation, construction and functioning of the bearing. Molecular signaling pathways in the process of embryonic development
Embryonic period and fetal period: organogenesis processes, morphogenesis, morphological and functional differentiation processes of tissues, organs and systems. Tissues and organs arising from mesoderm, endoderm and ectoderm. Body cavities, mesentery and diaphragm. Development of the throat and respiratory organs, lung development. Digestive system: development of the anterior intestine, spleen, central and posterior intestine. The genitourinary system: urinary tract development, adrenal gland development; development of the genital system and inguinal canal. Cardiovascular system: stages of development of the heart and blood vessels; circulation in the fetus and newborn; development of the lymphatic system: lymph nodes, spleen and tonsils. Musculoskeletal system; skeletal system: cartilage histogenesis and bone histogenesis; axial skeleton: spine, bone and bone stages of vertebral development, development of ribs, sternum and skull; skeleton of limbs; Muscle system: development of skeletal, smooth and myocardial muscles; Limb development: limb development stages. Nervous system: origin of the nervous system; development of the spinal cord: spinal ganglia, spinal meninges, myelination of nerve fibers. Brain development: bending of the brain, hindbrain, core brain tumors, secondary fibrosis, choroid plexuses and cerebrospinal fluid; midbrain, forebrain. Peripheral nervous system: spinal nerves, cranial nerves. Autonomic nervous system: sympathetic and parasympathetic nervous system. Eyes and ears: development of the eye and related structures; development of the inner, middle and outer ear. Coating: development of skin, hair, nails, mammary glands; stages of tooth development.
3. Embryological issues in clinical practice. Correct and abnormal embryogenesis. Pathological conditions of the placenta and membranes. Teams and types of congenital defects; Causes, types and mechanisms of formation of malformations in the pre-congenital, embryonic and fetal periods, as well as their genetic and environmental conditions. Congenital tumors. Teratogenic factors. Congenital defects caused by teratogenic factors.

4. Histological preparation - preparation of material for examination in light microscopy, freezing technique, basics of classical histochemistry and immunohistochemistry.

Microscopy - construction of a light microscope (mechanical and optical assembly). Variations of light microscopes - dark field microscope, polarization, phase-contrast, fluorescent, confocal. Electron microscope - principles of electron optics, transmission and scanning electron microscope.

3.4 TEACHING METHODS

Lecture: lecture with multimedia presentation, providing students with in-depth scientific knowledge

in the field of histology, embryology and cytophysiology, solving research problems

Seminars: multimedia presentation, discussion, group work, preparation of a research problem and research methodology based on scientific publications, searching and collecting literature data on the basis of scientific publications, working with databases

Exercises: theoretical introduction with multimedia presentation, work with a microscope, group work, discussion, participation in planning and performing experiments - handling of basic equipment in the histological laboratory equipment, development of experimental results, statistical analysis, formulation and analysis of applications, participation in the writing of publications scientific and preparation of the conference message Case center - a database of histological preparations

METHODS AND EVALUATION CRITERIA

4.1 Methods of verification of learning outcomes

Symbol of effect	Methods of assessment of learning outcomes (Eg.: tests, oral exams, written exams, project reports, observations during classes)	Form of classes
EK_01	Test	L,E,S
EK_02	TEST	L,E,S
EK_03	TEST	S
EK_04	Observation during classes	E
EK_05	TEST	L,E,S
EK_06	TEST	L
EK_07	TEST	L
EK_08	TEST	L
EK_09	Test	L,E

4.2 Conditions for completing the course (evaluation criteria)

Lecture messages required in colloquiums (EK_01, EK_02, EK_05-EK_09).

Seminars - credit with an assessment including (EK_01-EK_03, EK_05

1. Presence in class.

2. Grades from two tests in the winter semester. Range of ratings: 2.0 - 5.0

Exercises - pass with a passing grade (EK_01, EK_02, EK_04, EK_05, EK_09):

1. Student's skills - recognition of histological preparations and electronograms.

2. Presence in class.

3. Grades from two tests in the winter semester.

4. Correctly completed workbook.

5. Activity on exercises.

Range of ratings: 2.0 - 5.01. Attendance.

2. Grades from two tests in the winter semester. Range of ratings: 2.0 - 5.0

Knowledge assessment (exercises): Colloquia - cover the practical part in the form of recognition of photos of preparations and electronograms or preparations under the microscope and the theoretical part in the form of single-choice test questions, diagrams and open questions / oral answers (16 questions - exercises, 5 questions - seminars)

5.0 - has knowledge of each of the contents of education at the level of 90% -100%

4.5 - has knowledge of each of the content of education at the level of 84% -89%

4.0 - has knowledge of each of the content of education at the level of 77% -83%

3.5 - has knowledge of each of the content of education at the level of 70% -76%

3.0 - has knowledge of each of the content of education at the level of 60% -69%

2.0 - has knowledge of each of the contents of education below 60%.

Skill assessment:

5.0 - the student actively participates in classes,.

5. Total student workload required to achieve the desired result in hours and ECTS credits

Activity	Hours / student work
Hours of classes according to plan with the teacher	45
Preparation for classes	50
Participation in the consultations	2
The time to write a paper / essay	-
Preparation for tests	50
Participation in colloquia	-
Other (e-learning)	-
SUM OF HOURS	147
TOTAL NUMBER OF ECTS	6

6. TRAINING PRACTICES IN THE SUBJECT / MODUL

Number of hours	-
Rules and forms of apprenticeship	-

1. LITERATURE

Obligatory sources:

1. Junqueira's Basic Histology - Text and Atlas, Anthony L. Mescher.
Edition: 14th, 2016, Publisher: McGraw-Hill Medical

2. Before We Are Born - Essentials of Embryology and Birth Defects, Keith L. Moore, T. V. N. Persaud, Mark G. Torchia, Edition: 9th, 2015, Publisher: Saunders

Additional sources for self-studying:

1. Essential Cell Biology 3rd Edition, Bruce Alberts, Edition: 3rd, 2009, Publisher: Garland Science

2. Wheater's Functional Histology - A Text and Colour Atlas, Barbara Young, Phillip Woodford, Geraldine O'Dowd, Edition: 6th, 2013, Publisher: Churchill Livingstone

Acceptance Unit Manager or authorized person