

Appendix number 1.5 to The Rector UR Resolution No. 12/2019  
**SYLLABUS**  
 concerning the cycle of education 2021-2027  
 Academic Year 2021/2022

**1.1. BASIC INFORMATION CONCERNING THIS SUBJECT**

Subject / Module	<b>Histology and embryology</b>
Course code / module *	<b>HE/A</b>
Faculty of (name of the leading direction)	<b>Medical College of Rzeszów University</b>
Department Name	<b>Department of Morphological Sciences</b>
Field of study	<b>Medical</b>
Level of education	<b>Uniform Master studies</b>
Profile	<b>General academic</b>
Form of study	<b>Stationary / non-stationary</b>
Year and semester	<b>1st year, 1-st and 2-nd semester</b>
Type of course	<b>Obligatory</b>
Coordinator	<b>dr hab. Agata Wawrzyniak prof. UR</b>
Name and surname lecturer / lecturers	<b>dr hab. Agata Wawrzyniak prof. UR dr n. med. Paweł Porzycki</b>

\* According to the resolutions of the Faculty of Medicine

**1.2. Forms of classes, number of hours and ECTS**

Semestr (nr)	Lecture	Laboratory class .	Conver- sation.	Laboratory	Seminar	ZP	Practical	Self- learning	Number of points ECTS
I	20	22	-	-	10	-	-	-	5
II	20	28	-	-	15	-	-	-	5
BOTH	40	50	-	-	25	-	-	-	10

**1.3. The form of class activities**

☒ classes are in the traditional form ( lectures and laboratory class)

☒ classes are implemented using methods and techniques of distance learning (lectures and seminars)

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

**2. REQUIREMENTS**

Basic knowledge in the field of biology
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**3. OBJECTIVES, OUTCOMES, AND PROGRAM CONTENT USED IN TEACHING METHODS**

**3.1. Objectives of this course**

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 slides.

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

<b>EK</b> (the effect of education)	The content of learning outcomes defined for the class (module)	Reference to directional effects <b>(KEK)</b>
EK_01	Knows the basic cellular structures and their functional specializations	A.W4.
EK_02	Knows the microarchitecture of tissues, extracellular matrix and organs	A.W5.
EK_03	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, describes and interprets their structure, and interprets relations between structure and function	A.U2.
EK_06	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	Knows and understands the methods of communication between: cells, cells and the extracellular matrix and the signal transmission pathways in the cell, as well as examples of disorders in these processes leading to the development of neoplasms and other diseases;	B.W17.
EK_08	Knows and understands the processes of: cell cycle, proliferation, cell differentiation and aging, apoptosis and necrosis and their importance for the functioning of the body;	B.W18.
EK_09	Knows and understands the basic issues of stem cells and their application in medicine.	B.W19.
EK_10	Recognizes, acknowledges limitations and makes a self-assessment of deficits and educational needs.	K.05
EK_11	Uses objective sources of information.	K.07
EK_12	Formulates conclusions from his own measurements or observations.	K.08
EK_13	Accepts responsibility related to the decisions taken in the course of a professional activity, including in terms of safety and the safety of	K.11

	others.	
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### 3.3 CONTENT CURRICULUM

#### A. Problems of the lecture

#### B. Problems of auditorium, seminar, laboratory and practical classes

##### A. Problems of the lecture

Course content- I-st semester	Hours
1. Modern solutions in microscopy	2
2. Histological procedure; histological techniques in imaging the morphology of tissues and organs	2
3. Epithelial tissue. Definition and classification of epithelia. Common features of epithelial tissues. Simple and stratified epithelium - structure and place of occurrence. Modifications of the epithelial tissue structure depending on the function performed. Glands - types of construction and secretion	2
4. Connective tissue part I. General characteristics of connective tissues and their classification. The extracellular matrix of connective tissue: fiber and ground substance. Origin, structure and function of connective tissue cells. Embryonic connective tissues, connective tissue proper..	2
5. Connective tissues part II.: Cartilage and bone. Cartilage: characteristics of the extracellular matrix, cartilage types, mechanical properties, nutrition and growth. Bone components - extracellular substance and cells: osteoblasts, osteocytes and osteoclasts. Bone plate, organization of spongy and compact bone. Bone vascularization. Osteogenesis (intramembranous ossification and endochondral ossification).	2
6. Connective tissues part III: Blood: plasma structure, characteristics and adaptation to the functions of the morphing elements of the blood	2
7. Muscle tissue. Classification and occurrence of muscle tissues. Characterization of the building blocks of particular types of muscle tissue. Structural-functional unit of striated muscle tissues. Molecular mechanism of contraction: T-system channels, sarcoplasmic reticulum; conductive cardiac cells. Myocyte structure	2
8. Nervous and glial tissue. The concept of a neuron, the characteristics of its cytoplasmic equipment. Nerve fibers: structure, classification and myelination. Construction, types of synapses, synaptic transmission. Construction, function and place of occurrence.	2
9. The nervous system. Central nervous system: brain and spinal cord. White and gray matter, cerebral cortex and cerebellar cortex, meninges, choroid plexus. Peripheral nervous system: ganglia, nerves. completion	2
10. The Circulatory System. Vascular system. Morphological and functional characteristics of large blood vessels - muscular and elastic arteries, veins. Histological structure, types of capillaries and place of occurrence. Capillary beds, histological structure of the heart.	2

Course content- II-nd semester	Hours
1. The Immune System and Lymphoid Organs . Cells involved in immune system: lymphocytes and their subpopulations, antigen presenting cells. Lymphoid tissue. The structure of lymphoid nodules. Structure and function of the lymph node. Spleen - white and red pulp structure and their functions. Thymus -structure and function as a central lymphatic organ.	2
2. Digestive system part I - (oral cavity, lip, tongue, esophagus). Mucosa of the oral cavity and its regional differences. Histological structure of the lip. Tongue - papillae and glands. Structure and function of taste buds. Histological structure of the esophagus	2

3. Digestive system part II - (stomach, small, large intestine). Organization of the gastric mucosa, characteristics of the glands and their cellular composition. Small and large intestine, function adaptation (villi and intestinal crypts), segmental diversity of their structure.	2
4. Digestive system part III - (organs associated with the digestive tract – salivary glands, liver, gallbladder, pancreas - histological structure and functions).	2
5. Respiratory system. The conducting part: nasal cavity - characteristics of the mucosa including the olfactory membrane. Respiratory epithelium - cell types. Larynx, trachea, bronchial tree. The respiratory part: respiratory bronchioles, alveolar ducts, and alveoli. Pneumocyte types and their functions. Blood circulation.	2
6. Urinary system. Kidney - cortical and medullary part. Blood circulation. The concept of nephron and location of its parts within the renal parenchyma. Renal function: filtration, secretion, and reabsorption. Structure and function of ureters, bladder, and urethra.	2
7. The male reproductive system. Construction and function of testis. Seminiferous tubules, sperm-forming epithelium, sperm structure, interstitial tissue. The intratesticular ducts and the excretory genital ducts: epididymis, vas deferens, the accessory glands of the male reproductive tract: seminal vesicles, prostate gland, bulbourethral gland, penis.	2
8. Female reproductive system. Histological structure of: ovary, ovarian follicles, corpus luteum, fallopian tube, uterus - mucosa and muscle, vagina). Ovarian and menstrual cycle.	2
9. Endocrine system. Pituitary gland - division into the glandular and nerve part. Classification of glandular cells. Nerve part. Functional relationship of the pituitary gland with the hypothalamus. Thyroid - the structure of the follicle, the structure of its cells and their production cycle, C cells. Parathyroid - histological structure and types of cells. Pineal gland. Adrenal gland: cortical part, division into layers and their function. Ultrastructural features of cells. Paraganglia - ganglia. Gastrointestinal hormones, gonad endocrine cells. DNES diffuse endocrine system / APUD system.	2
10. Skin. Histological structure of epidermis, dermis and subcutaneous tissue. Skin glands: sebaceous, sweat and mammary. Hair structure at the root level.	2

## B. The problem of laboratory classes

Course contents- I-st semester	Hours
1. Cytology- part I. Structure and function of cell organelles (cell membrane, mitochondria, SER, RER, lysosome, proteasome, peroxisome, cytoskeleton).	3
2. Cytology - part I. Structure and function of the cell nucleus. Stem cells - the hope of regenerative medicine	3
3. Epithelial tissue-division and structure of simple and stratified epithelium	2
4. Connective tissue part I. - division, structure, examples (connective tissue proper, mucoid tissue, reticular tissue, adipose tissue).	3
5. Connective tissue part II. Support connective tissue: cartilage and bone.	3
6. Connective tissue part II. Blood: structure and functions of blood cells (erythrocytes, leukocytes, thrombocytes). Bone marrow. Hematopoiesis.	3
7. Muscle tissue - division and structure of muscular tissue: striated skeletal and cardiac tissue, smooth muscle tissue). Mechanism of contraction	3

8. Nervous and glial tissue. Classification of nerve and glial cells	3
9. Histological structure of: spinal cord, cerebral cortex, cerebellar cortex, the hippocampus, midbrain, pons, spinal ganglion, choroid plexus,	3
10. Circulatory 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).	2

<b>Course contents - II-nd semester</b>	<b>Hours</b>
1. The immune system and lymphoid organs (histological structure and functions of lymphatic organs: spleen, tonsils, lymph node, thymus).	3
2. Digestive tract part I (general structure of the digestive tract, oral cavity, tongue, lingual papillae, taste buds, teeth, esophagus)	2
3. Digestive tract part II. (general histological structure of stomach, small and large intestine including differences).	3
4. Digestive tract part III. (histological structure and functions of organs associated with the digestive tract - salivary glands, liver, gallbladder, pancreas)	3
5. The respiratory system (The conducting part: nasal cavity, larynx, trachea, bronchi - histological structure; respiratory part: bronchioles, alveoli, gas exchange, barrier blood-air)	3
6. Urinary system (kidney - general structure, nephron - structure, juxtaglomerular apparatus, collecting ducts - ureter, bladder, urethra - histological structure).	3
7. Female reproductive system (ovary - general histological structure, follicles, corpus luteum, fallopian tube, uterus - mucosa and muscle, vagina - histological structure). Ovarian cycle and menstrual	3
8. The male reproductive system (testicle, epididymis, vas deferens, prostate - histological structure).	2
9. Endocrine glands (pituitary gland, pineal gland, thyroid gland, parathyroid gland, adrenal gland - histological structure).	3
10. The skin and its products (hairy and hairless, hair structure, glands: sebaceous, sweat, mammary glands).	1

## **B. Problems of seminar**

<b>Course contents- I-st semester</b>	<b>Hours</b>
1. Gametogenesis: a / oogenesis b / spermatogenesis; sexual cycle: a / ovarian b / menstrual; hormonal regulation of the sexual cycle.	2
2. Fertilization; Cleavage: a / structure of early and late blastocysts. Implantation.	2
3. 2-nd week of development - early gastrulation	2
4. 3-rd week of development - late gastrulation	2
5. Differentiation of the mesoderm: a) paraxial mesoderm; b / intermediate mesoderm; c / lateral mesoderm	2

<b>Course contents - II-nd semester</b>	<b>Hours</b>
1. Ectoderm differentiation: a / covering ectoderm; b / neuroectoderm; c / neural crest.	3
2. Endoderm differentiation	3
3. Primary organs; fetal membranes, Structure and function of the placenta	3
4. Development of the heart and blood vessels. Development of the muscular	3

and skeletal systems	
5. Development of the digestive and respiratory systems	3
6. Development of the urogenital system	3
7. Development of the central and peripheral nervous system	3
8. Sensory organs. Structure and function of the eye and ear..	3

### 3.4. DIDACTIC 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.

**Laboratory classes:** 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**

## 4. 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
EK_10	Observation during classes	E S
EK_11	Observation during classes	E S
EK_12	Observation during classes	E S
EK_13	Observation during classes	E, S

### 4.2 Conditions for completing the course (evaluation criteria)

**The lectures end with a credit, all other forms of classes with a grade.**

**Final credits and exams will be held in a traditional form.**

**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 one test in the both semester.
3. Evaluation for the prepared multimedia presentation

Range of ratings: 2.0 -5.0

**Laboratory Class** - pass with a passing grade (EK\_01, EK\_02, EK\_04, EK\_05, EK\_09):

1. Student's skills - recognition of histological slides.
2. Presence in class.
3. Grades from 3 tests in the first semester and 3 tests in the second semester
4. Correctly completed workbook.
5. Activity on exercises.

Range of ratings: 2.0 - 5.0

Knowledge assessment (laboratory class): Colloquia - cover the practical part in the form of recognition of photos of slides or slides under the microscope and the theoretical part in the form of single-choice test questions, diagrams and open questions / oral answers

(15 questions – laboratory class and 15 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 the classes, is well prepared in the field of the theory of the current material, correctly interprets the relationships between the structure and function of the tissues, organs and systems in question, correctly recognizes the basic structural elements under the microscope and correctly recognizes organs on histological slides,

4.5 - the student actively participates in the classes, with a little help from the teacher, correctly interprets the mechanisms, correctly recognizes the basic structural elements under the microscope and correctly recognizes the organs on histological preparations,

4.0 - the student actively participates in the classes, not always able to solve the problem himself, correctly recognize the basic structural elements under the microscope and recognize organs on histological slides, performs these activities with the help of the teacher,

3.5 - the student participates in the classes, its scope of preparation does not allow for a comprehensive presentation of the problem in question, draws incorrect conclusions and incorrectly recognizes the basic structural elements under the microscope and correctly recognizes organs on histological preparations,

3.0 - the student participates in the classes, formulates conclusions that require correction on the part of the teacher, making minor mistakes, not fully understanding the dependencies and cause-and-effect relationships, makes a lot of mistakes when recognizing the basic structural elements under the microscope and correctly recognizing organs on histological slides,

2.0 - the student passively participates in the classes, the statements are factually incorrect, do not understand the problems, recognize the basic structural elements and organs on histological slides incorrectly under the microscope

**FINAL EXAM**

**SUBJECT HISTOLOGY AND EMBRIOLOGY ENDS THE EXAM IN THE SUMMER SESSION, WHICH CONSISTS OF TWO PARTS: THE PRACTICAL AND THEORETICAL EXAM. TO TAKE THE EXAM, INCLUDE ALL THE LABORATORY AND SEMINARS POSITIVELY**

**PRACTICAL EXAM (EK\_04, EK\_05):**

Recognition of 15 slides under the microscope.

PASSING THE PRACTICAL EXAM IS THE CONDITION ACCESSION TO THE THEORETICAL EXAM

**THEORETICAL EXAM (EK 01-03, EK 06-09):**

PASSING THE PRACTICAL EXAM IS THE CONDITION ACCESSION TO THE THEORETICAL EXAM

**THEORETICAL EXAM (EK 01-03, EK 06-09):**

Test of 100 single-choice questions covering issues of histology, embryology and cytophysiology from the content of lectures, seminars and exercises. The test takes approx. 100 minutes since the start of the writing test ie., all students in the hall took place, leading exam presented the rules, explained all doubts and answered all the questions of students participating in the exam, the students confirmed with his signature they participating in the exam had the opportunity to familiarize themselves with the rules, with force on the exam.

- The test consists of 100 questions (single-choice questions - with 1 correct answer). The time for one questions maximum of 30-45 seconds.
- All students leave bags in a place specifically for this purpose.
- During the exam, the student may only carry a pen. Mobile phones must be turned off.
- Each attempt to communicate between students and cheat, will be punished. In this situation the student receives a grade of 2.0
- Students stay in their places until the exam is over.

Any comments on the test, including the correctness of the questions, can only be made during the test by raising the hand and reporting the question or problem to the examiner. Comments to the substantive content of the questions are submitted in during the test on a special sheet. Reported comments are considered by the course coordinator or the teachers. Students are informed about the result of the analysis of the submitted comments via the Virtual University portal or in person by the course coordinator. In the event of a substantive error: Question will be cancellation and percentage thresholds are calculated against the new number of questions.

**Unauthorized absence from the exam results in a 2.0. Absence from the examination may be excused only with a rector's / dean's or medical leave presented within 3 days from the date of the examination to the Dean's Office and the Department of Morphological Sciences. Failure to be released within this period results in receiving a failing grade.**

**Students who have obtained an average of 5.0 in all colloquiums, seminars and classes in a given academic year are allowed to take the zero exam**

**EXAM EVALUATION CRITERIA THEORETICAL AND PRACTICAL:**

5.0 - shows knowledge of each of the content of education at the level of 93% -100%

4.5 - shows knowledge of each of the content of education at the level of 85% -92%

4.0 - shows knowledge of each of the content of education at the level of 77% -84%

3.5 - shows knowledge of each of the content of education at the level of 69% -76%

3.0 - shows knowledge of each of the content of education at the level of 61% -68%

2.0 - shows knowledge of each of the content of education below 60%.

**5. Total student workload required to achieve the desired result in hours and ECTScredits**

Activity	The average number of hours to complete the activity
Contact hours (with the teacher) resulting from the study schedule of classes	119
Contact hours (with the teacher) participation in the consultations, exams	31
Non-contact hours - student's own work(preparation for classes, exam, writing a paper, etc.)	150
SUM OF HOURS	300
TOTAL NUMBER OF ECTS	10

*\*It should be taken into account that 1 ECTS point corresponds to 25-30 hours of total student workload.*



## 6. TRAINING PRACTICES IN THE SUBJECT /MODUL

Number of hours	-
Rules and forms of apprenticeship	-

## 7. LITERATURE

### **Basic literature::**

1. Junqueira's Basic Histology - Text and Atlas, Anthony L. Mescher. Edition: 14th, 2016, Publisher: McGraw-Hill Medical
2. Medical Embryology. Sadler T. W. Langman's, 14th Edition, 2018.

### **Additional literature**

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