

# **EUROPEAN MEDICAL UNIVERSITY**

## **SYLLABUS OF THE EDUCATIONAL DISCIPLINE " HISTOLOGY, EMBRYOLOGY AND CYTOLOGY "**

|                                    |                                                               |
|------------------------------------|---------------------------------------------------------------|
| <b>Cycle of Higher Education:</b>  | <b>second cycle of higher education<br/>(Master's degree)</b> |
| <b>Field of Study:</b>             | <b>22 «Healthcare»</b>                                        |
| <b>Specialty:</b>                  | <b>222 «Medicine»</b>                                         |
| <b>Educational qualification:</b>  | <b>Master of Medicine</b>                                     |
| <b>Professional qualification:</b> | <b>doctor</b>                                                 |

**Teacher's:**

**Head of the Department of Fundamental Disciplines, Dr. Sci. (Biol.), professor  
S.S. Ostrovska**

**Lecturer Tereshchenko N.M.**

### **1. Name, Code of the discipline and number of credits**

#### **SYLLABUS OF THE EDUCATIONAL DISCIPLINE "HISTOLOGY, CYTOLOGY AND EMBRYOLOGY"**

Cycle of Higher Education: second cycle of higher education (Master's degree)

Field of Study: 22 «Healthcare»

Specialty: 222 «Medicine» (1 course)

Educational qualification: Master of Medicine

Professional qualification: doctor

Semester: 1, 2.

Number of credits ECTS (number of hours): 9 credits ECTS (270 hours).

Distribution by types of training and hours of study – Lectures 18 hours,  
Practical lessons – 112 hours, Independent work – 140 hours.

### **2. Time and place of educational discipline**

Semester: 1, 2.

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3, Akademika H. Dzyaka St., Dnipro.

### **3. Prerequisites and Postrequisites of educational discipline**

Prerequisites: human anatomy, medical biology, medical chemistry.

Post-qualifications: normal physiology, microbiology, virology and immunology, clinical anatomy and operative surgery, pathological anatomy, pathological physiology, forensic medicine, immunology, ophthalmology, otolaryngology, obstetrics and gynecology, endocrinology, neurology.

### **4. Characteristic of the educational discipline**

#### **4.1. Purpose and definition of the educational discipline:**

**The aim** of teaching the discipline "Histology, Cytology and Embryology" is to form an understanding of general cytology and histology as important components of medicine, which study the structural and functional organization of prokaryotic and eukaryotic cells in general and their structural components in particular, molecular mechanisms of regulation of cellular functions, the nature and transmission of signals that determine cell ontogeny and the formation of intercellular connections, reproduction, differentiation and aging of cells; structure and functions of the main

types of animal tissues; features of the interaction of cells and intercellular substance that make up a particular tissue, phylogeny and ontogeny of tissues.

This discipline studies the microscopic and ultramicroscopic structure of the human body, their development and changes in various conditions of life.

**"Histology, Cytology and Embryology"** is an academic discipline that studies the cellular architecture of tissues and provides a deep understanding of the functioning of the body. It also substantiates the structure of tissues and organs in close connection with their function; helps students to acquire in-depth knowledge of histology and use this knowledge in the process of further education and in professional activities to solve clinical problems, create a theoretical basis for students to master clinical disciplines.

#### **4.2. Tasks of educational “Histology, cytology and Embryology” discipline**

- 1) study of the cellular and tissue levels of the human body organization and prenatal ontogeny;
- 2) study of the morphological and functional organization of major tissues;
- 3) studying the structural organization of vital processes and the possibilities of targeted influence on them;
- 4) study of molecular and structural bases of functioning and recovery of cells and their derivatives;
- 5) study of the basics of adaptation, reactivity and maintenance of homeostasis;
- 6) determination of adaptive and regenerative capabilities of organs, taking into account their tissue composition, peculiarities of regulation and age-related changes;
- 7) interpretation of patterns of human embryonic development, regulation of morphogenesis processes;
- 8) to determine critical periods of embryogenesis, defects and anomalies of human development;
- 9) characterize the microscopic structures of four specialized tissues and be able to identify specific structures in microscopic images;
- 10) demonstrate an understanding of the basic functions and structural relationships with the characteristics of basic and specialized tissues;
- 11) to interpret the structural basis of adaptation, reactivity and maintenance of homeostasis, molecular and structural basis of functioning and repair of cells and their derivatives;
- 12) to interpret the structural basis of human reproduction, to determine the critical periods of embryogenesis, defects and anomalies of human development;
- 13) demonstrate the ability to use a variety of resources to perform laboratory tasks, including answering questions, solving problems and critical thinking to make decisions.

#### **4.3. Appointment of the discipline**

## **Competencies.**

### *General competencies (GC):*

|       |                                                                                               |
|-------|-----------------------------------------------------------------------------------------------|
| GC 1  | Ability to think abstractly, analyses and synthesize.                                         |
| GC 2  | Ability to learn and master modern knowledge.                                                 |
| GC 3  | Ability to apply knowledge in practical situations.                                           |
| GC 4  | Knowledge and understanding of the subject area and understanding of professional activities. |
| GC 6  | Ability to make justified decisions.                                                          |
| GC 10 | Ability to use information and communication technologies.                                    |
| GC 11 | Ability to search, process and analyses information from various sources.                     |
| GC 12 | Certainty and perseverance in relation to the tasks set and responsibilities assumed.         |

### *Special (professional, subject) competencies (SC):*

|       |                                                                                                                            |
|-------|----------------------------------------------------------------------------------------------------------------------------|
| SC 23 | Ability to develop and implement scientific and applied projects in the healthcare sector.                                 |
| SC 25 | Compliance with professional and academic integrity, being responsible for reliability of the obtained scientific results. |

### *Program learning outcomes (PLO):*

|        |                                                                                                                                                                                                                                                                                             |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PLO 1  | Have a thorough knowledge of the structure of professional activity. Be able to carry out professional activities that require updating and integrating knowledge. Be responsible for professional development, the ability to further professional training with a high level of autonomy. |
| PLO 2  | Understanding and knowledge of fundamental and clinical biomedical sciences at a level sufficient to solve professional problems in the field of healthcare.                                                                                                                                |
| PLO 3  | Specialized conceptual knowledge that includes scientific achievements in the field of healthcare and is the basis for conducting research, critical understanding of problems in the field of Medicine and related interdisciplinary problems.                                             |
| PLO 21 | Searching for the necessary information in professional literature and databases of other sources, analyzing, evaluating and applying this information.                                                                                                                                     |

## **4.4 Content of the discipline**

## **Lectures plan (L)**

Semester: 1.

1. Introduction to the course of histology, cytology and embryology. The History of the development of science. Cytology.
2. General and comparative embryology.
3. Introduction to the doctrine of tissues. Epithelial tissues.
4. Blood and lymph. Hematopoiesis.
5. Organs of hematopoiesis and immune defense.
6. Actually connective tissues. Immune reactions.
7. Skeletal connective tissues.
8. Muscle tissue.
9. Nervous tissue and nervous system.

## **Practical lessons plan (PL)**

1st semester

1. History of histology, cytology and embryology. Methods of histological, cytological and embryological studies.
2. Cytology. Cytolemma (plasmolemma).
3. Structural components of the cell. Cytoplasm.
4. Structural components of the cell. The nucleus.
5. Cell reproduction. Aging and cell death.
6. Fundamentals of general embryology. Embryogenesis of chordates and vertebrates.
7. Human embryogenesis.
8. General principles of tissue organization.
9. Epithelial tissues.
10. Tissues of the internal environment. Mesenchyme. Blood and lymph.
11. Actually connective tissues.
12. Skeletal connective tissues.
13. Hematopoiesis.
14. Central hematopoietic organs.
15. Peripheral hematopoietic organs.
16. Muscle tissue.
17. Nervous tissue.
18. Nervous system.

2nd semester

19. Sensory organs.
20. The organ of sight and smell.
21. The organ of hearing and balance.
22. Endocrine system. Central endocrine glands.
23. Endocrine system. Peripheral endocrine glands.

24. Cardiovascular system.
25. Respiratory system.
26. Skin and its derivatives.
27. The digestive system. Organs of the oral cavity. The tongue.
28. Salivary glands.
29. Pharynx and esophagus.
30. The digestive system. Stomach.
31. The digestive system. Small intestine.
32. The digestive system. Large intestine.
33. The digestive system. The pancreas. The liver.
34. Urinary organs.
35. Male reproductive system.
36. Female reproductive system. The ovary.
37. Female reproductive system. Fallopian tubes.
38. The female reproductive system. Uterus.
39. Ovarian-menstrual cycle.
40. Human embryogenesis.
41. The placenta.
42. Final control.

### **Independent work topics (IW)**

#### 1st semester

1. Fundamentals of the doctrine of the cell. Methods of research in histology.
2. Structural components of the cell. Cytolemma (plasma).
3. Cytoplasm.
4. Nucleus, cell reproduction. Aging and death of the cell.
5. Fundamentals of embryology. Progenesis and initial stages of embryogenesis.
6. Fundamentals of embryology. Gastrulation and histogenesis.
7. General principles of tissue organization. Epithelial tissues
8. Tissues of the internal environment. Blood and lymph.
9. Connective tissue itself.
10. Skeletal connective tissues.
11. Tissues of the internal environment. Hematopoiesis.
12. Central organs of hematopoiesis and immune defense.

13. Peripheral organs of hematopoiesis and immune defense.
14. Muscle tissue.
15. Nervous tissue.
16. Nervous system.

## 2nd semester

17. Sensory systems: visual, olfactory, taste analyzers.
18. Sensory systems: auditory and gravitational analyzers.
19. Cardiovascular system. Vessels and microcirculatory system.
20. Cardiovascular system. The heart.
21. Central endocrine organs.
22. Peripheral endocrine organs.
23. General cover. Derivatives of the skin.
24. Digestive system. Organs of the oral cavity. Salivary glands. Esophagus.
25. The digestive system. Stomach, colon, small intestine, rectum.
26. The digestive system. The pancreas. Liver.
27. Respiratory system.
28. Urinary system.
29. The male reproductive system.
30. Female reproductive system. Ovary.
31. Female reproductive system. Uterus, fallopian tubes. Ovarian and menstrual cycle. Placenta.

### **4.5 Credit structure of “Histology, Cytology and Embriology” discipline.**

#### **“HISTOLOGY, CYTOLOGY AND EMBRIOLOGY”**

| Content section 1. “Histology and Cytology” |       |                   |       |                  |       |
|---------------------------------------------|-------|-------------------|-------|------------------|-------|
| Lecture                                     | Hours | Practical lessons | Hours | Independent work | Hours |

|                                                                                                                    |          |                                                                                                                |    |                                                                             |    |
|--------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------|----|-----------------------------------------------------------------------------|----|
| Introduction to the course of histology, cytology and embryology. History of the development of science. Cytology. | 2        | History of histology, cytology and embryology. Methods of histological, cytological and embryological studies. | 3  | Fundamentals of the doctrine of the cell. Research methods in histology.    | 4  |
| -                                                                                                                  | -        | Cytology. Cytolemma (plasmolemma).                                                                             | 3  | -                                                                           | -  |
| -                                                                                                                  | -        | Structural components of the cell. Cytoplasm.                                                                  | 3  | Structural components of the cell. The cytolemma (plasma membrane).         | 4  |
|                                                                                                                    |          |                                                                                                                |    | Cytoplasm.                                                                  | 4  |
|                                                                                                                    | -        | Structural components of the cell. Nucleus.                                                                    | 3  | Nucleus, cell reproduction. Cell aging and death.-                          | 4  |
| -                                                                                                                  | -        | Cell reproduction. Aging and cell death.                                                                       | 2  | -                                                                           | -  |
| General and comparative embryology.                                                                                | 2        | Fundamentals of general embryology. Embryogenesis of chordates and vertebrates.                                | 2  | Fundamentals of embryology. Progenesis and initial stages of embryogenesis. | 4  |
|                                                                                                                    |          |                                                                                                                |    | Fundamentals of embryology. Gastrulation and histogenesis.                  | 4  |
| -                                                                                                                  | -        | Human embryogenesis                                                                                            | 2  | -                                                                           | -  |
| Hours                                                                                                              | 4        |                                                                                                                | 18 |                                                                             | 24 |
| Total hours                                                                                                        | 45 hours |                                                                                                                |    |                                                                             |    |
| Content section 2. "General tissues. Blood-forming organs"                                                         |          |                                                                                                                |    |                                                                             |    |
| -                                                                                                                  | -        | General principles of tissue organization.                                                                     | 2  | General principles of tissue organization. Epithelial tissues.              | 4  |
| Introduction to the study of tissues. Epithelial tissues.                                                          | 2        | Epithelial tissues.                                                                                            | 2  | -                                                                           | -  |
| -                                                                                                                  | -        | Tissues of the internal                                                                                        | 2  | Tissues of the                                                              | 4  |

|                                                                                                                            |          |                                                |    |                                                          |    |
|----------------------------------------------------------------------------------------------------------------------------|----------|------------------------------------------------|----|----------------------------------------------------------|----|
|                                                                                                                            |          | environment. Mesenchyme. Blood and lymph.      |    | internal environment. Mesenchyme. Blood and lymph.       |    |
| Connective tissues. Immune reactions.                                                                                      | 2        | Connective tissues.                            | 2  | Connective tissues.                                      | 4  |
| Skeletal connective tissues.                                                                                               | 2        | Skeletal connective tissues.                   | 2  | Skeletal connective tissues.                             | 4  |
| Blood and lymph. Hematopoiesis                                                                                             | 2        | Hematopoiesis.                                 | 2  | Tissues of the internal environment. Hematopoiesis.      | 4  |
| Organs of hematopoiesis and immune defense.                                                                                | 2        | Central hematopoietic organs.                  | 2  | Central organs of hematopoiesis and immune defense.      | 4  |
| -                                                                                                                          | -        | Peripheral hematopoietic organs.               | 2  | Peripheral organs of hematopoiesis and immune defense.   | 4  |
| Hours                                                                                                                      | 10       |                                                | 16 |                                                          | 28 |
| Total hours                                                                                                                | 54 hours |                                                |    |                                                          |    |
| Content section 3. "Special tissues. Nervous system"                                                                       |          |                                                |    |                                                          |    |
| Muscle tissue.                                                                                                             | 2        | Muscle tissue.                                 | 2  | Muscle tissue.                                           | 4  |
| Nervous tissue and nervous system.                                                                                         | 2        | Nervous tissue.                                | 2  | Nervous tissue.                                          | 3  |
| -                                                                                                                          | -        | Nervous system.                                | 2  | Nervous system.                                          | 3  |
| Hours                                                                                                                      | 4        |                                                | 6  |                                                          | 10 |
| Total hours                                                                                                                | 20 hours |                                                |    |                                                          |    |
| Total hours of 1 semester                                                                                                  | 18       |                                                | 40 |                                                          | 62 |
| Total hours                                                                                                                | 120      |                                                |    |                                                          |    |
| 2 semester                                                                                                                 |          |                                                |    |                                                          |    |
| Content section 4. "Sensory organs. Endocrine system. Cardiovascular system. Respiratory system. Skin and its derivatives" |          |                                                |    |                                                          |    |
| -                                                                                                                          | -        | Sensory organs.                                | 3  | Sensory systems: visual, olfactory, and taste analyzers. | 5  |
| -                                                                                                                          | -        | An organ of sight and smell.                   | 3  | -                                                        | -  |
| -                                                                                                                          | -        | The organ of hearing and balance.              | 3  | Sensor systems: hearing and gravity analyzers.           | 5  |
| -                                                                                                                          | -        | Endocrine system. Central endocrine glands.    | 3  | Central endocrine glands.                                | 5  |
| -                                                                                                                          | -        | Endocrine system. Peripheral endocrine glands. | 3  | Peripheral endocrine organs.                             | 5  |
| -                                                                                                                          | -        | Cardiovascular system.                         | 3  | Cardiovascular system. Vessels                           | 5  |

|                                                                                              |          |                                                          |    |                                                                                                 |    |
|----------------------------------------------------------------------------------------------|----------|----------------------------------------------------------|----|-------------------------------------------------------------------------------------------------|----|
|                                                                                              |          |                                                          |    | and microcirculatory system.                                                                    |    |
|                                                                                              |          |                                                          |    | Cardiovascular system. Heart.                                                                   | 5  |
| -                                                                                            | -        | Respiratory system.                                      | 3  | Respiratory system.                                                                             | 5  |
| -                                                                                            | -        | Skin and its derivatives.                                | 3  | Generic skin. Skin derivatives.                                                                 | 5  |
| Hours                                                                                        |          |                                                          | 24 |                                                                                                 | 40 |
| Total hours                                                                                  | 64 hours |                                                          |    |                                                                                                 |    |
| Table of contents section 5. "Digestive system"                                              |          |                                                          |    |                                                                                                 |    |
| -                                                                                            | -        | The digestive system. Organs of the oral cavity. Tongue. | 3  | The digestive system. Organs of the oral cavity. Salivary glands. Esophagus.                    | 5  |
| -                                                                                            | -        | Salivary glands. Pharynx and esophagus.                  | 3  |                                                                                                 |    |
| -                                                                                            | -        | The digestive system. Stomach.                           | 3  |                                                                                                 |    |
| -                                                                                            | -        | The digestive system. Small intestine.                   | 3  | Digestive system. Stomach, colon, small intestine, rectum.                                      | 5  |
| -                                                                                            | -        | The digestive system. Large intestine.                   | 3  |                                                                                                 |    |
| -                                                                                            | -        | The digestive system. The pancreas. Liver.               | 3  | The digestive system. The pancreas. Liver.                                                      | 5  |
| Hours                                                                                        |          |                                                          | 21 |                                                                                                 | 15 |
| Total hours                                                                                  | 36 hours |                                                          |    |                                                                                                 |    |
| Content section 6: "Urinary organs. The reproductive system. Human embryogenesis. Placenta." |          |                                                          |    |                                                                                                 |    |
| -                                                                                            | -        | Urinary organs.                                          | 3  | Urinary system.                                                                                 | 5  |
| -                                                                                            | -        | Male reproductive system.                                | 3  | The male reproductive system.                                                                   | 6  |
| -                                                                                            | -        | The female reproductive system. The ovary.               | 3  | The female reproductive system. The ovary.                                                      | 6  |
| -                                                                                            | -        | The female reproductive system. Fallopian tubes.         | 3  |                                                                                                 |    |
|                                                                                              |          | The female reproductive system. Uterus.                  | 3  |                                                                                                 |    |
| -                                                                                            | -        | The ovarian-menstrual cycle.                             | 3  | The female reproductive system. Uterus, fallopian tubes. The ovarian-menstrual cycle. Placenta. | 6  |
| -                                                                                            | -        | Human embryogenesis.                                     | 3  |                                                                                                 |    |
| -                                                                                            | -        | Placenta.                                                | 3  |                                                                                                 |    |
| -                                                                                            | -        | Final control.                                           | 3  | -                                                                                               | -  |

|                                  |                  |  |            |  |            |
|----------------------------------|------------------|--|------------|--|------------|
| <b>Hours</b>                     |                  |  | <b>27</b>  |  | <b>23</b>  |
| <b>Total hours</b>               | <b>50 hours</b>  |  |            |  |            |
| <b>Total hours of 2 semester</b> | -                |  | <b>72</b>  |  | <b>78</b>  |
| All for discipline:              | <b>18</b>        |  | <b>112</b> |  | <b>140</b> |
|                                  | <b>270 hours</b> |  |            |  |            |

**Topics of the lecture course:** reveal problematic issues in the relevant sections “Histology, Cytology, Embryology”.

**Practical classes** provide theoretical justification of the main issues of the topic and acquire **the following practical skills:**

#### **List of practical skills:**

1. Identify and describe cytology micrographs. Analyze standard electron micrographs in the normal.
2. Identify and describe micrographs from embryology. Analyze standard electron micrographs in the norm.
3. Identify and describe micrographs of epithelial, connective tissues, blood and lymph. Analyze standard electron micrographs in the normal.
4. Identify and describe micrographs of cartilage, bone, muscle and nervous tissue. Analyze standard electron micrographs in the norm.
5. Identify and describe microdissections of the nervous system and sensory organs, analyze standard electron micrographs in the norm.
6. Identify and describe microdissections of the cardiovascular, immune and endocrine systems, analysis of standard electron micrographs in the normal state.
7. Identify and describe microsections of the oral cavity. Analyze standard electron micrographs in the norm.
8. Identify and describe microdissections of the digestive system, analyze standard electron micrographs in the normal.
9. Identify and describe micrographs of the skin, respiratory and genitourinary systems, analyze standard electron micrographs in the normal state.

**Independent work of a student** provides for preparation for practical classes and final control, studying topics for independent out-of-class work, preparing abstract reports, presentations, tables. Control of learning results of topics of independent out-of-class work is carried out during the class and during final control in the discipline.

**Individual work** includes the study of scientific literature, preparation of reviews on the submitted topics for presentation, implementation of scientific and practical

research, participation in specialized competitions, scientific and practical conferences, competitions of student scientific papers.

*Calendar plans of practical classes, thematic plan of independent extracurricular work, scope and directions of individual work are published on the website of the Department.*

**Route for receiving materials:** Website of EMU /Student/ Department of Fundamental Disciplines with a course in traditional and non-traditional medicine/ Educational and methodological support of the Department/ Pediatrics / or follow the Department of Fundamental Disciplines with a course in traditional and non-traditional medicine, discipline "Histology, Cytology and Embryology". Materials are accessed from the student's Office 365-based corporate account.

## 5. 5. Forms and methods of monitoring learning success

|                                                                                             |                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Current control in practical classes                                                        | Methods: individual oral survey, structured written works, test tasks with the choice of correct answers.                                                                    |
| Control of mastering the thematic section of the discipline in intermediate control classes | Methods: oral or written survey, electronic testing, <i>methods of self-control and self-assessment.</i>                                                                     |
| Final semester control                                                                      | According to the regulation on control measures in EMU (regulation of EMU)                                                                                                   |
| Final control of the discipline - <i>exam</i>                                               | Methods: by exam cards in the form of an oral exam, monitoring of acquiring of practical skills (According to the Regulation on control measures in EMU (Regulation of EMU). |
| Tools for diagnosing learning success                                                       | Theoretical questions, tests, clinically oriented situational tasks, practical tasks, demonstration of practical skills.                                                     |

## 6. Evaluation criteria

Knowledge assessment is carried out according to regulation on control measures in EMU (regulation of EMU).

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Current control                  | According to the four-point system of traditional grades: 5 "Excellent", 4 "Good", 3 "Satisfactory", 2 "Unsatisfactory"                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Control of practical skills      | According to the four-point system of traditional grades                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Exam                             | Based on a 200-point scale (the sum of points for the current academic activity of the student, the result of passing the exam and for successful completion of an individual task, if any)<br>Credited: 120 to 200 points<br>Not credited: less than 120 points (see Rating scale)                                                                                                                                                                                                                                                                                                                  |
| Final control for the discipline | The final control of students' academic performance is carried out after completing the study of the discipline and is implemented in the form of an exam.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Discipline assessment:           | The score on the discipline is determined based on the results of assessment of current activities and is expressed using a <b>fourpoint scale</b> : ("Excellent", "Good", "Satisfactory", "Unsatisfactory"), multi-point scale and ECTS. The assessment in the discipline consists of an assessment of the current academic performance and the result of passing the exam (in points), which is set when evaluating theoretical knowledge and practical skills in accordance with the list defined by the discipline program. The number of points that the applicant scored for current academic. |
|                                  | performance in the discipline is defined as the arithmetic mean of the number of points that the applicant received during the study of the discipline (practical, seminar, laboratory classes, etc.). The resulting value of the average traditional rating is converted to points according to the scale of conversion of traditional ratings to rating points. The maximum number of points is 200.                                                                                                                                                                                               |

Matching grades on a 200-point scale, a 4-point (traditional) scale, and ECTS scale

| On a 200-point scale | Rating on a 4-point scale |
|----------------------|---------------------------|
| 180–200              | Excellent                 |
| 140–179              | Good                      |
| 120–139              | Satisfactory              |
| 0–119                | Unsatisfactory            |

| On a 200-point scale | ECTS evaluation |
|----------------------|-----------------|
| 192–200              | A               |
| 172–191              | B               |
| 148–171              | C               |
| 128–147              | D               |
| 120–127              | E               |
| 0–119                | F               |

### **Discipline/course policy**

The student has the right to receive high-quality educational services, access to up-to-date scientific and educational information, qualified advice during the study of the discipline and mastering practical skills. The policy of the department in the provision of Educational Services is student-centered, based on the regulatory documents of the Ministry of Education and the Ministry of Health of Ukraine, the Charter of the EMU and the procedure for providing educational services regulated by the regulation on the organization of the educational process in the EMU and the principles of academic integrity.

### **Compliance with the EMU schedule, safety precautions in the classroom.**

#### **Requirements for preparing for practical classes.**

Students should arrive at classes on time, without being late. A student who is more than 10 minutes late for classes is not allowed in and must work it out in accordance with the established procedure. During practical classes, the student must wear a work uniform (medical gown, cap). Students who do not have a work uniform are not allowed to attend classes. The student must follow the safety rules during practical

classes and while staying in the Department's premises. When discussing theoretical issues, students should demonstrate tolerance, politeness and respect for their colleagues and the teacher; when performing practical tasks, the workplace should be kept in order and cleaned after completing practical work.

**Use of mobile phones and other electronic devices.** The use of mobile phones and other electronic devices in the classroom is not allowed, only during Distance Learning, provided that it is technically necessary.

**Academic integrity.** When studying the discipline, the student should be guided by the following regulations: on academic integrity of EMU (regulation of EMU). In case of violation of the regulations of academic integrity during the current and final controls, the student receives a grade of "2" and must work it out to the teacher in accordance with the established procedure.

Regulation on control measures in EMU (Regulation of EMU).

**Skipping classes.** Missed classes should be worked out in accordance with the procedure established in the regulations on control measures in the EMU (regulation of EMU) during the time determined by the work schedule (Department of Fundamental Disciplines with a course in traditional and non-traditional medicine) to the teacher on duty. To work out a missed lesson, the student must pass a test and answer in writing or verbally the question on the topic of the lesson.

**Procedure for admission to the final control** in the discipline is given in the regulations on control measures and regulations on the organization of the educational process in the EMU (regulation of EMU) and regulations on control measures in the TNM DMI (regulation of EMU). Students who do not have missed not worked out practical classes and lectures and have received an average traditional grade of at least "3" are allowed to participate in the final control.

**Additional individual points.** Points are awarded subject to the mandatory participation of the head, head teacher and teacher. These points are encouraging and are added once to the total score of the current academic performance and the result

of passing the comprehensive exam. Their total number for one student should not exceed 10, and the final amount of points for an academic discipline should not exceed 200 points.

**Individual tasks include:**

- 1) writing essays and creating multimedia presentations with reports at meetings of the student scientific group of the department – 3 points;
- 2) participation in the creation of tables, graphological structure, posters on the topics of practical classes – 2 points;
- 3) participation in the student competition in the discipline at the First Stage – 1 point;
- 4) participation/prize-winner of the All-Ukrainian student competition in the discipline - 7/10 points;
- 5) author or co-author of abstracts/article – 2/5 points;
- 6) author or co-author of an oral/information stand report at a scientific conference – 6/3 points;
- 7) author of a student scientific paper accepted for participation or awarded by a diploma of I-III degree in the – Ukrainian competition of student scientific papers at Stage II - 8 (participation) or 10 (diploma) points.

**Resolving conflict issues.** If there are misunderstandings and complaints against the teacher due to quality of educational services provided, knowledge assessment, and other conflict situations, the student must first report his/her claims to the teacher. If the conflict issue is not resolved, the student has the right to submit an appeal to the head of the department in accordance with the regulations on consideration of applications from applicants for higher education in EMU (regulation of EMU), Regulations on consideration of applications, complaints, and proposals of students in EMU (regulation of EMU), Regulations on meeting the requirements of the organization of the educational process (regulation of EMU), Regulation on the appeal of the results of the final control of knowledge of applicants for higher education in EMU (regulation of EMU), Regulations on safe educational environment in EMU (regulation of EMU).

**Policy in the context of distance learning.** The procedure for distance learning is regulated by regulation of EMU. The main training platforms for conducting training sessions are Microsoft Teams, Zoom. The procedure for conducting practical classes and lectures, working out and consultations during Distance

Learning is published on the Department's Web page Department of Fundamental Disciplines with a course in traditional and non-traditional medicine. Feedback from the teacher is provided directly during the lesson and/or consultation, and is also possible via email (in case of force majeure) during working hours.

**Educational resources.**

Educational and methodological support of the discipline is published on the website of the department (Department of Fundamental Disciplines, with a course of traditional and alternative medicine). Consultations are held according to the consultation schedule.

**The schedule and distribution of groups** by teachers is published on the website of the department (Department of Fundamental Disciplines, with a course of traditional and alternative medicine).

**Exam questions:**

***General information:***

1. Histology. The main stages of historical development. Histological schools in Ukraine.
2. Histology. Definition, content and tasks of modern histology. Its sections, importance for biology and medicine.
3. Basic principles and stages of preparation of histological preparations.

**Cytology:**

1. Cytology. Definition, tasks, importance for biology and medicine.
2. Cell theory. History of the problem. The main provisions.
3. The cell as an elementary living system of a multicellular organism. Definition. Cytolemma (plasma membrane, cell membrane), structure and functions.
4. The surface complex of the cell. Membrane, supramembrane and submembrane components. Their structure and functions. Intercellular contacts, their types, structure and functions.
5. Metabolic apparatus of the cell. Its structural composition. General purpose organelles. Classification, structure and general characteristics.
6. The cell as an elementary living system. Definition. Membrane organelles. Golgi complex. Structure and functional significance.
7. The cell as an elementary living system. Definition. General structure. Granular and non-granular endoplasmic reticulum. Structure and functions.

8. The cell as an elementary living system. Definition. General purpose organelles.
9. Mitochondria, structure, functional significance. Cell as an elementary living system. Definition. General plan of the structure. Lysosomes, structure, functional significance.
10. Cell as an elementary living system. Definition. General plan of the structure of eukaryotic cells. Non-membrane organelles. Structure, functional significance.
11. The cell as an elementary living system. Non-membrane organelles. Centrosome (cell center). Structure, functional significance.
12. Cell as an elementary living system. Definition. General plan of the structure. Inclusion of cytoplasm. Their classification and importance.
13. The nuclear apparatus of the cell, its importance. The main components of the nucleus, their structural and functional characteristics. Nuclear-cytoplasmic relations as an indicator of the functional state of the cell.
14. Cell cycle: its stages, morphological and functional characteristics, features of different types of cells.
15. Methods of cell reproduction, their morphological characteristics. Importance for biology and medicine.
16. Mitosis: its importance, phases and regulation. Mitotic and interphase chromosomes.
17. Mitosis and its regulation. The importance of mitosis for biology and medicine.
18. Mitosis. General characteristics of different phases. The concept of endoreproduction and polyploidy.
19. Meiosis. Its importance. Difference from mitosis.
20. Cell growth, differentiation, aging and death. The reaction of cells to external influences.

***General embryology:***

1. Embryology. Content. Scientific directions. Importance for biology and medicine.
2. The germ cell. Morphological and functional characteristics of sperm and eggs. Fertilization.
3. Types of eggs, the nature of their fragmentation after fertilization.
4. Stages of embryogenesis. Gastrulation, its importance. Comparative characteristics of gastrulation in chordates and humans.
5. Gastrulation. Definition of the concept. Biological significance of the first and second stages of gastrulation. Characteristics of different types of gastrulation.

6. Germinal leaves. Definition of the concept. Mesoderm and mesenchyme, their derivatives.
7. Germinal leaves. Definition of the concept. Ectoderm and entoderm, their derivatives.
8. Features of the development of higher vertebrates (for example, birds).
9. Axial complex of organs in vertebrates and its development.
10. Early stages of human development. Features of crushing. Morula, blastocyst and its implantation.
11. Early human embryogenesis. Formation of germinal leaves. The concept of germinal rudiments.
12. Early human embryogenesis. Formation of provisional organs (chorion, yolk and amniotic vesicles, allantois).
13. Yolk sac, amnion and allantois. Their formation and functions in human embryonic development.
14. Human embryo on the 4th week of development. Formation of neural and intestinal tubes, somites.
15. The mother-fetus system. Features of placental circulation. The structure of the umbilical cord.
16. Implantation. The placenta. Types of mammalian placentas.
17. The connection of the human embryo with the mother's body. Placenta and umbilical cord.
18. The Placenta and its formation, structure and function.
19. The concept of critical periods of human embryo development.
20. The main stages of human embryonic development. Embryonic induction as one of the regulatory mechanisms of embryogenesis.

***General histology. Tissues:***

1. Tissues. Definition of the concept. Classification. Tissue as one of the levels of organization of the living. Definition. Classification of types. The concept of determination and differentiation of tissues. The concept of a differential and a stem cell.
2. Tissue as one of the levels of organization of the living. Definition. Cellular derivatives (syncytia and symplasts, intercellular substance).
3. Tissues of the body. Definition. Physiological and reparative regeneration of different types of tissues.

***Epithelial tissue:***

1. Epithelial tissue. General characteristics. Morphofunctional and genetic classification of their types.
2. Epithelial tissue. Morphofunctional characteristics of different types of integumentary epithelium.
3. Glandular epithelium. Classification and structure of glands. Morphology of the secretory cycle. Types of glandular secretion.

***Blood and hematopoiesis:***

1. Embryonic hematopoiesis. Development of blood as a tissue. Features of yolk and hepatic hematopoiesis.
2. Postembryonic hematopoiesis. Modern scheme of hematopoiesis.
3. Hematopoiesis in the postembryonic period. The relationship of stromal and hematopoietic elements.
4. Hemogram. Leukocyte formula, its importance for the clinic. Red blood cells, structure and functional significance.
5. Hemogram and leukocyte formula. Platelets, their number, function, duration of existence.
6. Thrombocytopoiesis. Structure and function of platelets.
7. Leukocyte formula. Leukocytopoiesis in the embryonic and postembryonic periods.
8. Leukocytes. Classification, morphological and functional characteristics. Leukocyte formula and its features at different stages of ontogeny.
9. Blood leukocytes. Basophilic and eosinophilic granulocytes.
10. Leukocyte formula. Morphofunctional characteristics of monocytes. The concept of the system of mononuclear phagocytes.
11. Macrophages and lymphocytes. Their structure, histochemical characteristics and participation in immune reactions.
12. Characterization of immunocompetent cells. T- and B-lymphocytes: their development, proliferation and differentiation.

***Connective tissue:***

1. Fibrous connective tissue: its structure, types and functional significance. Formation of intercellular substance (for example, collagen synthesis).

2. Intercellular substance of connective tissue (fibers, basic substance), structure, value.
3. Intercellular substance of connective tissue. Collagen and elastic fibers. Their structure and functions.
4. Connective tissue cells. Structure, functional significance.
5. Loose fibrous connective tissue. Morphofunctional characteristics.
6. Macrophagocytes: structure and sources of development. The concept of the system of mononuclear phagocytes.
7. Dense fibrous connective tissue. Morphofunctional characteristics. The structure of dense organized fibrous connective tissue (for example, tendon).
8. Macrophagocytes: morphofunctional characteristics, their participation in natural and acquired immunity. The concept of the mononuclear phagocyte system.
9. Cellular elements of connective tissue. Macrophagocytes, plasma cells and their participation in the body's defense reactions.
10. Connective tissue with special properties (reticular, adipose, pigment, mucous). Structure and functional significance.

### ***Skeletal tissues:***

1. Cartilage tissue, their classification, structure and functions. Cartilage development, regeneration and age-related changes.
2. Bone tissue. Classification of types. Morphological and functional characteristics.
3. Reticulofibrous bone tissue. Its histogenesis, structure, regeneration and age-related changes.
4. Lamellar bone tissue. Tubular bone. Structure, development, regeneration.
5. Lamellar bone tissue. General morphofunctional characteristics. Regeneration of tubular bone, influence of separating factors.

### ***Muscle tissue:***

1. Muscle tissue. Sources of development. General morphofunctional characteristics. Unstriated muscle tissue. Histogenesis, structure, regeneration.

2. Muscle tissue. Sources of development, general morphofunctional characteristics. Striated muscle tissue. Structure, innervation, structural basis of contraction. Regeneration.

3. Striated skeletal muscle tissue. The concept of red and white muscle fibers. Structure of the muscle as an organ.

4. Cardiac muscle tissue. Development, microscopic and ultramicroscopic structure.

### ***Sensory organs:***

1. Sensory organs. General morphofunctional characteristics. The organ of taste. Structure, development and cytophysiology.

2. The sensory organs. General morphofunctional characteristics. The organ of smell. Structure, development and cytophysiology.

3. The eye. Embryonic development. General plan of the structure. Morphofunctional characteristics of the cornea and lens.

4. The eye. Embryonic development. Dioptric apparatus of the eye (cornea, lens, vitreous).

5. The eye. Embryonic development. Structure of the retina. Histophysiological characteristics of photoreceptor cells.

6. The eye. Embryonic development. Retina of visual, ciliary and iris parts. Histophysiological characteristics of photoreceptor cells.

7. The organ of hearing. Development, structure and histophysiology.

8. The organ of hearing. Sources of development. Structure of the external, middle and internal ear. Histophysiology of the cochlea.

9. Organ of balance and vibration. Sources of development. Structure and histophysiology.

### ***Cardiovascular system:***

1. Cardiovascular system. Morphological and functional characteristics. Classification of vessels. The relationship of hemodynamic conditions with the structure of blood vessels.

2. Arteries. Classification of types and their morphofunctional characteristics. Muscle type arteries.

3. Arteries. Classification of types and their morphofunctional characteristics. Artery of elastic and muscular-elastic types. Age-related changes.
4. Vessels of the hemomicrocirculatory system. Morphofunctional characteristics of its links.
5. Arteriolo-venular anastomoses. Classification, structure of different types of anastomoses. Their functions.
6. Blood capillaries. Structure. The main types of capillaries. The concept of histohematological barriers.
7. The vein. Classification. Development, structure, functions. Dependence of the structure on hemodynamic conditions.
8. Lymphatic vessels. Morphological and functional characteristics. Sources of development.
9. The heart. General plan of the wall structure. Myocardium. Morphofunctional characteristics of contractile and conductive cardiomyocytes.
10. The heart. Sources of development. Histogenesis. General plan of the wall structure. The endocardium.

***Organs of hematopoiesis and immune defense:***

1. The concept of the immune system and its tissue components. Classification and characterization of immunocytes and their interaction in the reactions of humoral and cellular immunity.
2. Hematopoiesis. The concept of stem and semi-stem cells of hematopoietic tissue. The modern scheme of hematopoiesis.
3. Red and yellow bone marrow. Structure and function. Characteristics of postembryonic hematopoiesis in the red bone marrow. Interaction of stromal and hematopoietic elements.
4. Organs of hematopoiesis and immune defense. Thymus gland. Structure and functional significance. Characteristics of postembryonic hematopoiesis in the thymus. The concept of age and accretionary involution of the thymus gland.

5. Organs of hematopoiesis and immune defense. Spleen. Structure and functional significance. Features of embryonic and postembryonic hematopoiesis in the spleen. T- and B-zones.

6. Organs of hematopoiesis and immune defense. Lymph nodes. Structure and functional significance of T- and B-zones of lymph nodes.

***Endocrine system:***

1. Endocrine system. Classification of endocrine glands. The concept of target cells and hormone receptors.

2. Endocrine system. Classification of endocrine glands. Characterization of single hormone-producing cells.

3. Hypothalamus. Neurosecretory nuclei of the hypothalamus, features of the structure and function of neurosecretory cells. Hypothalamoadenohypophyseal and hypothalamic-pituitary systems.

4. Development, structure, blood supply, histophysiology. Connection of the pituitary gland with the hypothalamus.

5. Development of the pituitary gland. General plan of the structure. Adenohypophysis, its blood supply, connection with the hypothalamus, functional significance.

6. Development of the pituitary gland. General plan of the structure. Neurohypophysis, its blood supply, connection with the hypothalamus, functional significance.

7. Epiphysis. Sources of development. Structure. Secretory functions.

8. The thyroid gland. Development, structure, histophysiology, functional significance. Age-related changes.

9. The pilosebaceous glands. Development, structure and functional significance. Age-related changes.

10. Adrenal glands. Sources of development. Structure, histophysiology of cortical and cerebral substance. Connection of the adrenal glands with the pituitary gland and the central nervous system. Age-related changes.

***Digestive system:***

1. The digestive tract. General plan of the wall structure. Innervation and vascularization. Morphofunctional characteristics of the lymphoid apparatus.

2. The oral cavity. Features of the structure of the mucous membrane of various organs of the oral cavity.

3. Oral cavity. General characteristics of the mucous membrane. The lip and cheek. Development, structure, functions.
4. Hard and soft palate. Development. General structure. Morphological features of the mucous membrane on different surfaces.
6. The tongue. Development. General plan of the structure. Features of the structure of the mucous membrane on different surfaces.
7. Large salivary glands. Their classification, development. Parotid salivary gland, structure, functions.
8. Large salivary glands. General characteristics. Submandibular and hyoid salivary glands.
9. The teeth. General plan of the structure. Dentin. Development, structure, functions. The concept of transparent dentin and interglobular spaces.
10. Teeth. General plan of the structure. Enamel. Structure, functions, development.
11. Teeth. General plan of the structure. Enamel. Structure, functions, development.
12. Teeth. Pulp and periodontium. Structure, function, development.
13. Development of the tooth. Teething and change of teeth.
14. The digestive tract. General plan of the wall structure. Pharynx and esophagus. Its structure and functions.
14. Stomach. General morphofunctional characteristics. Sources of development. Features of the structure of different departments. Innervation and vascularization. Regeneration. Age-related changes.
15. Glands of the stomach. Their morphofunctional features in different parts of the organ.
16. Small intestine. Development. Morphofunctional characteristics. Histophysiology of the crypt-villus system.
17. Colon. General morphofunctional characteristics. Sources of development. Structure, regeneration, age-related changes.
18. Digestive canal. General plan of the structure. Morphofunctional characteristics of the endocrine apparatus.
19. Wormlike process. General morphofunctional characteristics. 20. Liver. General morphofunctional characteristics. The structure of hepatocytes, perisinusoidal adipocytes and the wall of sinusoids.

21. Liver. General morphofunctional characteristics. Sources of development. Structure of the classical hepatic lobe. The concept of portal lobe and acinus. Regeneration. Age-related changes.
22. Pancreas. Development. General plan of the structure. Histophysiology, regeneration, age-related changes.
23. Pancreas. Development, general plan of structure. Exocrine part, its structure and functions.

### **List of practical tasks and papers for the exam:**

#### **Microscopic preparations:**

1. Mitosis.
2. The Golgi Apparatus
3. Amphibian blood
4. Human blood
5. Adipose tissue
6. Loose fibrous connective tissue
7. Tendon
8. Hyaline cartilage
9. Elastic cartilage
10. Transverse section of the tubular bone
11. Development of bone in place of cartilage
12. Bone development at the site of mesenchyme
13. The mesothelium
14. Cubic and cylindrical epithelium
15. Smooth muscle tissue
16. Striated cardiac muscle tissue
17. Nerve cell tigroid
18. Myelinated nerve cells
19. Transverse section of the nerve trunk
20. Lymph node
21. The spleen
22. The tonsil
23. Red bone marrow

#### **Macroscopic preparations:**

1. Pituitary gland
2. The thyroid gland
3. Thymus
4. Adrenal glands
5. Leaf-like papillae of the tongue
6. Filiform papillae of the tongue

7. The esophagus
8. The bottom of the stomach
9. Small intestine
10. The large intestine
11. Parotid salivary gland
12. Hyoid salivary gland
13. The liver
14. The pancreas
15. The skin of the human finger
16. Skin with hair
17. Trachea
18. Lungs
19. Kidneys
20. Ureter
21. Bladder
22. Testicle
23. Appendages of the testicle
24. Ovary
25. Uterus
26. The mammary gland
27. Human placenta
28. The cortex of the cerebral hemispheres
29. The cerebellar cortex
30. Transverse section of the spinal cord
31. Sensory ganglion
32. Cornea
33. The back wall of the eye
34. The organ of Corti

## **7. Recommended literature**

1. Eroschenko, V.P. Atlas of Histology with Functional Correlations / V. P. Eroschenko. — thirteenth edition. — Philadelphia : Wolters Kluwer, 2017. 617 p.
2. Kierszenbaum A.L., Tres L.L. Histology and Cell Biology. – Elsevier, Philadelphia, 2012. – 701p.
3. Melnyk, N.O. Histology, cytology and embryology : підручник / N. O. Melnyk. — К. : Book-plus, 2017. — 416 p.
4. Melnyk, N.O. Histology, cytology and embryology (short course) / N. O. Melnyk. — К. : Book-plus, 2018. — 312 c.
5. Ross, M.H. Histology : a Text and Atlas with Correlated Cell and Molecular Biology / M. H. Ross, W. Pawlina. — 7-th ed. — Philadelphia : Wolters Kluwer, 2016. — 984 p.

**Information resources:**

[http: // histologyatlas.wisc.edu](http://histologyatlas.wisc.edu)

[http: // www.meddean.luc.edu](http://www.meddean.luc.edu)

[http: // www.morphology.dp.ua](http://www.morphology.dp.ua)

<http://histologyatlas.wisc.edu/>

<http://www.histologyguide.com/>

<https://www.cytoindia.com>