

**SYLLABUS OF THE EDUCATIONAL COMPONENT
MEDICAL BIOLOGY**

(title of the educational component)

Speciality: **222 “Medicine”**

Educational and professional program: **Medicine**

Component code in the educational program: **MC3**

Higher education level: **the second (master's degree)**

Form of education: **full-time**

Year of study: **1**

Semester(s): **I (Autumn), II (Spring)**

Type of educational component: **mandatory**

Academic year: **2024-2025**

Volume: **4,5 credits ECTS (135 hours)**

Training sessions: **lectures, practical classes**

Final control: **exam**

Prerequisites: **course of the subject of general education in high school**

Department/Unit: Department of Medical Biology, 4 Nauky Avenue, Building A, 2nd floor

Head of the educational component: Associate Professor Iryna P. Meshcheryakova,
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Page of the educational component in the Distance Learning System of KhNMU (Moodle):
<https://distance.knmu.edu.ua/course/view.php?id=4473>

DESCRIPTION OF THE EDUCATIONAL COMPONENT

The educational component program includes the following sections: “Molecular and Cytological Foundations of Human Vital Activity,” “Organismal Level of Life Organization. Fundamentals of Human Genetics,” and “Population-Species, Biogeocenotic, and Biospheric Levels of Life Organization,” which ensure a high level of general biological training.

Medical Biology provides a foundation for the further acquisition of knowledge and skills by students in specialized theoretical and clinical professional-practical disciplines.

PURPOSE OF THE COURSE: is to develop knowledge and practical skills in human biology for the further acquisition by students of a block of disciplines that ensure natural science and professional-practical training.

LEARNING OUTCOMES:

- To possess in-depth knowledge of the structure of professional activity. To be able to carry out professional activities that require the updating and integration of knowledge. To take responsibility for professional development and demonstrate the ability for further professional learning with a high level of autonomy.
- Understanding and knowledge of fundamental and clinical biomedical sciences at a level sufficient to solve professional tasks in the field of healthcare.
- Specialized conceptual knowledge that includes scientific achievements from the standpoint of evidence-based medicine in the field of healthcare and serves as a basis for conducting research, as well as for the critical understanding of problems in medicine and related interdisciplinary issues.
- To identify and distinguish leading clinical symptoms and syndromes.
- To search for the necessary information in professional literature, databases, and other sources; to analyze, evaluate, and apply this information.

CONTENT OF THE EDUCATIONAL COMPONENT**List of lecture topics (20 hours):**

1. Introduction to the course of Medical Biology. Structural and functional organization of the cell. Reproduction at the cellular level

2. Molecular basis of heredity. Realization of hereditary information
3. Fundamentals of human genetics. Gene interaction
4. Chromosomal theory of heredity. Genetics of sex
5. Variability in humans as a property of life and a genetic phenomenon
6. Gene disorders
7. Human chromosomal disorders. Medical genetic counseling
8. Medical and biological foundations of parasitism. Medical protozoology
9. Medical helminthology
10. Medical arachnoentomology

List of topics of practical classes (60 hours):

1. Forms of life. Cell membranes. Transport of substances through the plasma membrane.
2. Cell morphology. Structural components of the cytoplasm and nucleus.
3. Chromosome morphology. Human karyotype.
4. Cell life cycle. Cell division. Mitosis. Meiosis. Gametogenesis.
5. Characteristics of nucleic acids.
6. Structure of prokaryotic and eukaryotic genes. Structural genes, regulatory genes, tRNA genes, rRNA genes. Organization of information flow in the cell.
7. Molecular mechanisms of variability in humans. Regulation of gene expression.
8. Lab Exam 1: Biological features of human vital activity.
9. Peculiarities of human genetics. Manifestations of the basic patterns of inheritance using Mendelian traits in humans as an example. Multiple allelism. Pleiotropy.
10. Interaction of allelic and non-allelic genes. Genetics of blood groups.
11. Linked inheritance. Genetics of sex.
12. Variability in humans as a property of life and a genetic phenomenon. Molecular diseases. Biochemical method and DNA diagnostics.
13. Chromosomal diseases. Cytogenetic method of their diagnosis.
14. Biological features of human reproduction. Medical genetic counseling. Population-statistical method.
15. Lab Exam 2: Organismal level of life organization. Fundamentals of human genetics.
16. Introduction to medical parasitology. Medical protozoology. Phylum Sarcomastigophora. Class Lobosea (true amoebae).
17. Phylum Sarcomastigophora. Class Zoomastigophora (animal flagellates).
18. Phylum Apicomplexa. Representatives of the class Sporozoa — human parasites. Phylum Ciliophora. Representatives of the class Rimostomatea — human parasites.
19. Lab Exam 3: Medico-biological foundations of parasitism. Medical protozoology.
20. Medical helminthology. Phylum Platyhelminthes. Class Trematoda — causative agents of human diseases.
21. Phylum Platyhelminthes. Class Trematoda — causative agents of human diseases.
22. Phylum Platyhelminthes. Class Cestoidea — causative agents of human diseases.
23. Phylum Nematelminthes. Class Nematoda — causative agents of human diseases.
24. Class Nematoda — causative agents of human diseases. Biohelminths.
25. Laboratory diagnostics of helminthiases.
26. Lab Exam 4: Medical helminthology.
27. Medical arachnoentomology. Phylum Arthropoda. Class Crustacea. Class Arachnida. Subclass Acarina — pathogens and vectors of human diseases.
28. Phylum Arthropoda. Class Insecta — pathogens and vectors of human diseases.
29. Biosphere as a system ensuring human existence. Human ecology.
30. Lab Exam 5: Medical arachnoentomology.

List of topics of independent work of the student (55 hours)

1. Methods of biological research.

2. Organization of matter and energy flow in the cell.
3. Cell life outside the organism. Cell cloning.
4. Gametogenesis. Fertilization in humans — restoration of the diploid chromosome set and increase of genetic diversity in offspring.
5. Stages of human embryonic development. Differentiation at the molecular-genetic, cellular, and tissue levels.
6. Periods of human postembryonic development. The concept of biofields, biological rhythms, and their medical significance.
7. Types and pathways of regeneration. Types of tissue transplantation in humans.
8. Aging as the final stage of human ontogenesis. Theories of aging.
9. The concept of biofields, biological rhythms, and their medical significance.
10. Regulation of gene function in ontogenesis.
11. Genetic maps. Methods of human chromosome mapping. Current state of human genome research.
12. Genetic hazards of environmental pollution. Concepts of antimutagens and comutagens.
13. Genetic engineering. Biotechnology. Concept of gene therapy.
14. Methods of human genetics: dermatoglyphic, immunological, and somatic cell hybridization methods.
15. Concept of microevolution. Population as the elementary unit of evolution.
16. Congenital malformations. Critical periods of development.
17. Blood flukes — causative agents of human parasitic diseases. Pathogens of metagonimiasis and nanophyctosis.
18. Guinea worm and filariae — causative agents of human diseases.
19. Mites inhabiting human dwellings and their medical significance.
20. Gnats and their components: characteristics and importance as intermediate hosts of helminths and vectors of human pathogens.
21. Structure and functions of the biosphere. Human ecology.
22. Plants and animals poisonous to humans.
23. Preparation for Lab Exams 1–5.

Independent work (IWS) is aimed at deepening and consolidating theoretical knowledge acquired during classroom learning and contributes to the formation of professional competencies. The results of independent study are subject to assessment and are included in the final knowledge evaluation.

Consultations: Online consultations are conducted according to the department schedule with prior registration via the instructor's corporate email.

Teaching Methods: oral questioning (individual and group); written assessment; test-based evaluation; creative assignments; individual tasks; project-based learning; self-assessment; presentations on assigned topics; poster presentations; and others.

EVALUATION

Current Learning Activity (CLA): The assessment of student performance is carried out in accordance with the *Instructions for the Assessment of Learning Activities of Higher Education Students at KhNMU* (https://knmu.edu.ua/doc_block_type/instrukcziyi-navchalnogo-proczesu/). The grade for a practical or final class ranges from 2 to 5 points. Submission of assignments late without a valid reason leads to a reduction in the grade proportional to the delay time from the assignment deadline. Assignments are checked within 24 hours. Grades are entered into the electronic gradebook. Unsatisfactory grades are remediated in accordance with the *Regulations on the Procedure for Remediation of Classes by KhNMU Students* (https://knmu.edu.ua/wp-content/uploads/2021/05/pol_por-vidprac-zaniat.pdf).

Individual Assignments (IA)

Individual student assignments (hereinafter – ISA) are not a mandatory component of the course. However, at the student’s discretion, they may be completed and are assessed in ECTS points (up to 10), which are added to the total points earned for current learning activity. The list of approved individual assignments has been determined by the department (including participation with reports in student conferences, profile-related Olympiads, preparation of analytical reviews with presentations checked for plagiarism) along with the corresponding points for completion. These points may be added as bonus points (not exceeding 10).

Final Exam: Eligibility to take the exam requires no outstanding academic debts. The exam is graded on a scale from 50 to 80 points.

Course Grade (CG): The final grade for the educational component includes points from overall learning activity (OLA), points for individual assignments (IA), and the exam grade. The total course grade ranges from 120 to 200 points.

Appeals: Appeals regarding the results of the final assessment are conducted in accordance with the procedure established at KhNMU

(https://knmu.edu.ua/wpcontent/uploads/2021/05/polog_apel_kontrol.pdf).

POLICIES OF THE EDUCATIONAL COMPONENT

Course Recommendations: Students are encouraged to actively participate in all forms of class activities, dedicate 1–2 hours daily to independent work and preparation for classes, ask questions during sessions, attend consultations, submit assignments on time, and complete all forms of assessment.

Attendance: Attendance at lectures and practical classes is mandatory. The required attire for in-person sessions is a white medical coat. When visiting clinical base departments, students must wear a surgical suit, cap, medical mask, and changeable footwear. Students arriving more than 5 minutes late may be denied entry to the class. Missed classes must be made up in accordance with the *Regulations on the Procedure for Making Up Classes by Students at KhNMU* (https://knmu.edu.ua/wp-content/uploads/2021/05/pol_por-vidprac-zaniat.pdf).

Academic Integrity: KhNMU maintains a zero-tolerance policy toward academic dishonesty. Any violations of academic integrity are subject to accountability in accordance with the procedures established at KhNMU (https://knmu.edu.ua/wp-content/uploads/2021/05/polog_ad-1.pdf).

Use of Electronic Devices and Artificial Intelligence Tools: Use of electronic devices and AI tools is permitted only with the teacher’s approval.

Policy for Students with Special Educational Needs: Students with special educational needs should contact the teacher to develop an individualized educational trajectory.

Teacher Response Time: 24 hours

Technical Requirements for the Course:

- Access to a computer, laptop, tablet, or smartphone.
- A corporate Google account with a personal photo.
- Skills in using Google Workspace (Google Meet, Docs, Sheets, Slides, Forms) and Moodle.

Technical Support:

- ASM: ev.shevtsov@knmu.edu.ua
- Google: tehotdelknmu@gmail.com
- Moodle: al.korol@knmu.edu.ua

RECOMMENDED SOURCES

1. Medical Genetics. 6th ed. / L.B. Jorde, J.C. Carey, M.J. Bamshard. — Philadelphia: Elsevier, 2019. — 352 p.
2. Molecular Cell Biology. 9th ed. / H. Lodish, A. Berk, Kaiser C.A. et al. — New York: W.H. Freeman & Co. Ltd, 2021. — 1264 p.
3. Medical Parasitology: textbook for the students of medical universities / L.Digol, V. Myasoyedov, O. Khromenkova. – Kharkiv: 2020. – 114 p.

4. Human parasitology. 5th ed. / B. Bogitsh, C. Carter, T. Oeltmann. — Academic Press: London, 2019. — 422 p.
5. First Aid For The USMLE Step 1 2019: a student-to-student guide. 29th ed. / T. Le, V. Bhushan, M. Sochat et al. — New York: McGraw Hill Education, 2019. — 792 p.

Head of Department of Medical Biology

Iryna MESHCHERIAKOVA