

**MINISTRY OF HEALTH OF UKRAINE  
ODESSA NATIONAL MEDICAL UNIVERSITY**

**Department of clinical immunology, genetics and medical biology**

**SYLLABUS OF THE EDUCATIONAL DISCIPLINE  
" MEDICAL BIOLOGY "**

<b>The scope of the academic discipline</b>	Total number of hours per discipline: 150 hours, 5 ECTS credits I - II semester. 1 year of study
<b>Days, time, place</b>	According to the approved schedule in the auditoria of clinical immunology, genetics and medical biology department, Olhivska str., 4
<b>Lecturers</b>	Shevelenkova Alla Vladimirovna: Ph.D. (Medicine), associate professor Chesnokova Marina Mikhailivna: Ph.D. (Medicine), associate professor
<b>Contact information</b>	Help by phone: Shevelenkova Alla: (097) -27-65-754 Chesnokova Marina: (048)728-54-74, (097) 256-10-33 E-mail: Shevelenkova Alla: <i>shevel2003@ukr.net</i> Chesnokova Marina: <i>marchesn2005@gmail.com</i> Face-to-face consultations: every Thursday – from 14:00 till 17:00, every Saturday – from 09:00 till 13:00. For distance online studying consultations: every Thursday – from 14:00 till 17:00, every Saturday – from 09:00 till 13:00 on the <i>Microsoft Teams, Zoom, Telegram, Viber</i> platforms

### **COMMUNICATION**

Communication with students will be carried out through face-to-face meetings. In case of transition to distance online learning, communication with students will be carried out by phone, e-mail and *Microsoft Teams, Zoom, Telegram, Viber* platforms.

### **ANNOTATION OF THE EDUCATIONAL DISCIPLINE**

*The subject of study of the discipline* are biological bases of human activity..

*Prerequisites and postrequisites of the course (the place of discipline in the educational program).*

*Prerequisites:* The study discipline "Medical Biology" is based on the subjects previously studied by students in secondary comprehensive school, such as "General Biology", "Human Biology", "Animal Biology".

*Postrequisites:* The educational discipline "Medical Biology" is integrated with the following educational disciplines: histology, cytology and embryology, biological and bioorganic chemistry, pathological physiology, microbiology, virology and immunology, medical genetics, obstetrics and gynecology, physiology, infectious diseases, pathomorphology, pediatrics.

*The aim of the discipline.* Formation of knowledge and practical skills in human biology for further assimilation by students of the block of disciplines that provide natural-scientific and professional-practical training.

*Tasks of the discipline.*

1. To explain the regularities of manifestations of vital activity of the human body at the molecular-biological, cellular and organismal levels..
2. To determine the biological essence and mechanisms of the development of diseases arising as a

result of the action of environmental factors.

3. Explain the etiology of hereditary human diseases.

4. To make preliminary conclusions about the presence of parasitic infestations of humans and to determine measures for the prevention of diseases.

*Learning outcomes for discipline:*

Upon completion of the study of the discipline "Medical biology" students must

*Know:*

- levels of living matter organization, life forms and their fundamental properties;
- structural and functional organization of the eukaryotic cell;
- molecular basis of heredity;
- cell cycle and types of cell division;
- basic patterns of heredity in mono- and dihybrid breeding and linked inheritance, inheritance of human blood groups by ABO system and Rh factor;
- inheritance of a sex and sex-linked characteristics;
- variation, its forms and manifestations;
- methods for the study of human heredity: genealogical, twins, dermatoglyphic, cytogenetic, molecular genetic, biochemical and population-statistical;
- classification of hereditary diseases, principles of prenatal diagnosis of hereditary diseases;
- forms of reproduction of organisms;
- characterization of gametogenesis, structure of sex cells;
- definition of ontogenesis and its periodization;
- basic stages of embryonic development, molecular and cellular mechanisms of differentiation;
- types of regeneration;
- types of transplantation, causes of tissue incompatibility;
- forms of symbiosis, parasitism as a biological phenomenon;
- principles of the classification of parasites and hosts;
- ways of transmission of parasitic diseases; obligatory vector-borne and facultative vector-borne diseases; notion of natural-focal diseases; structure of the natural focus;
- the basics of prophylaxis of parasitic diseases;
- causative agents of the most common protozoozosis, trematodosis, cestodiosis, nematodosis; principles of laboratory diagnosis of helminthiasis;
- arthropods - vectors and causative agents of human diseases, the concept of mechanical and specific(biological) vectors; poisonous representatives of the Arthropods;
- the concept of a population as an elementary unit of evolution, the population structure of mankind, dems, isolates;
- functional types of people's response to environmental factors ("sprinter", "stayer", "mix"); human adaptive ecotypes;
- the concept of biological rhythms, their medical significance;
- subject of ecology; types of environment, environmental factors;
- The role of man as an environmental factor. Main directions and results of anthropogenic changes of the environment; the main statements of the biosphere and the noosphere doctrine of Academician V.I. Vernadsky;
- examples of poisonous plants and animals for humans;
- regularities of phylogeny of organ systems, ontophilogenetic birth defects, examples of atavistic defects in the development of organs and organ systems of humans.

*Be able:*

- to make temporary slides, to study micro specimens under a light microscope at low and high magnifications;
- to differentiate the components of the animal cell on microphotographs and diagrams;
- to identify (schematically) the primary protein structure, the amount of amino acids, the

molecular weight of the polypeptide based on the sequence of the nucleotides of the gene;

- to predict genotypes and phenotypes of children by the genotypes of parents;
- to calculate the probability of birth of a sick child with monogenic diseases if genotypes of parents are known:
- to exclude paternity by analyzing the blood groups of parents and the child;
- to analyze the karyotype of a person and determine the most common chromosomal diseases;
- to compose a pedigree and conduct its genealogical analysis;
- calculate the role of heredity and environment in the development of characteristics (based on the results of twins analysis);
- calculate the frequency of genes and genotypes under Hardy-Weinberg equilibrium;
- to determine the place of the biological object (agents of parasitic diseases) in the system of life;
- to diagnose on gross and micro specimens agent and vectors of parasitic diseases under study;
- to substantiate diagnostic methods and prophylaxis of human parasitic diseases, basing on the biology of the parasite.

## **DESCRIPTION OF THE EDUCATIONAL DISCIPLINE**

### *Forms and methods of teaching.*

The educational discipline "Medical biology" will be taught in the form of lectures (22 hours), practical classes (64 hours) and organization of independent work of students (64 hours).

### *Teaching methods:*

Lectures.

Practical classes: conversation, explanations, case studies, practical work.

Independent work: independent work with the textbooks from main and additional list of the literature, independent work with the data base, solving of MCQ tasks for Krok-1, independent case studies.

### *The content of the discipline. List of the topics.*

Topic 1. Introduction into the course of medical biology. Optical systems in biological research. Levels of living matter organization.

Topic 2. Morphology of the eukaryotic cell.

Topic 3. Biological membranes. Transport across the cell membrane.

Topic 4. Structural components of nucleus. Chromosomes morphology. Human karyotype.

Topic 5. Molecular basis of heredity. Gene structure in eukariotes.

Topic 6. Stages of protein synthesis. Regulation of gene expression in prokaryotes and eukaryotes.

Topic 7. Cell life cycle. Cell division. Regulation of mitotic cycle.

Topic 8. Biological peculiarities of human reproduction. Meiosis. Gametogenesis.

Fertilization.

Topic 9. Peculiarities of the prenatal period of ontogenesis and preconditions of congenital defects in humans.

Topic 10. Postnatal period of human ontogenesis.

Topic 11. Peculiarities of human genetics. Mono- and dihybrid, polyhybrid crossing.

Mendelian characters in human.

Topic 12. Multiple alleles. Genetics of blood groups.

Topic 13. Interaction of allele and non-allele genes. Pleyotropy.

Topic 14. Chromosomal theory of heredity. Genetics of sex.

Topic 15. Mutations, their forms and manifestation.

Topic 16. Methods of human heredity studying. Pedigree and twins methods of human genetics.

Topic 17. Cytogenetic method of human genetics. Chromosomal disorders.  
 Topic 18. Biochemical method. DNA-diagnostics. Single gene disorders. Population-statistics method of human genetics. Medical-genetic counseling.  
 Topic 19. Summary class on content sections 1 - 4.  
 Topic 20. Protozoa. Sarcodina. Dysentery amoeba and other amoeba species. Infusoria. Balantidium.  
 Topic 21. Flagellates (Zoomastigophora). Lamblia, Trichomonas, Leishmania, Trypanosoma.  
 Topic 22. Apycomplexa. Malaria parasites. Toxoplasma.  
 Topic 23. Flat worms. Flukes – agents of the human diseases.  
 Topic 24. Tapeworms. Pork tapeworm and beef tapeworm..  
 Topic 25. Dwarf tapeworm, echinococcus, alveococcus, broad tapeworm. Topic 26. Nematodes. Ascaris, pinworm, whipworm.  
 Topic 27. Ancylostoma, necator, trichina worm, strongiloid, Guinea worm, filarial worms.  
 Topic 28. Arthropodes. Arachnoidea. Spiders, ticks.  
 Topic 29. Insects as agents and vectors of human diseases.  
 Topic 30. Summary class on content sections 5 - 7.  
 Topic 31. Biosphere as human environment. Human ecology. Adaptation to environment.  
 Stress.

*List of recommended materials:*

*Main:*

1. Medical biology. Yu. I. Bazhora, R. Ye. Bulyk, M.M. Chesnokova, A. V. Shevelenkova, O.O. Smetyuk, Yu. V. Lomakina. - Vinnytsya: Nova Knyha – 2019. – 448 pp.

*Additional:*

1. Before we are born : Essentials of embryology and birth defects / Keith L. Moore, T. V. N. Persaud, Mark G. Torchia. – 9th ed. – Elsevier, 2016. – 348 pp.
2. Campbell biology / Lisa Urry, Michael Cain, Steven Wasserman, Peter Minorsky, Jane Reece. – 11th restructured ed. – Hoboken : Pearson Higher Education, 2016.- 560 pp.
3. Chiodini P. L. Atlas of Medical Helminthology and Protozoology 4th ed. – Churchill Livingstone, 2003. – 87 pp.
4. Emery's Elements of medical genetics. 15th ed. / Peter Turnpenny, Sian Ellard. – Elsevier, 2017. – 400 pp.
5. Essential Cell Biology by Bruce Alberts [et al] 4<sup>th</sup> edition – 2014 – 864 pp.
6. Human parasitology / Bruton J. Bogitsh, Clint E. Carter. – 4th ed. – Elsevier, 2013. – 430 pp.
7. T. W. Salder. Langman's medical embryology – 14th ed. – Wolter Kluwer Health, 2018. – 423 pp.
8. Lynn B. Jorde, John C. Carey, Michael J. Bamshad. Medical genetics. 5th ed. Elsevier, 2016. 356 pp.
9. Markell and Voge's Medical parasitology / David. T. John, William A. Petri. – 9th ed. – Elsevier, 2017. – 463 pp.
10. Vogel and Motulsky's human genetics. Problems and approaches / M. R. Speicher, S. E. Antonarakis, F. G. Motulsky. 4th addition. – Springer, 2010. – 981 pp.
11. Young Ian. D. Medical genetics. – 2nd ed. – Oxford university press, 2010. – 304 pp.

*Information resources:*

1. Testing Center - the base of licensing test tasks "Krok" - 1: <http://testcentr.org.ua/>
2. OMIM (Online Mendelian Inheritance in Man) – An Online Catalog of Human Genes and Genetic Disorders <http://omim.org/>
3. The tech interactive: <https://genetics.thetech.org/genetics-news>

4. Phys.org internet news portal provides the latest news on science. <https://phys.org/biology-news/>
5. Sci-News.com provides the latest science news from around the world, covering breaking news in astronomy and astrophysics, archaeology, paleontology, medicine, biology, physics, genetics & more <http://www.sci-news.com/news/biology>
6. Link to the most thought-provoking, well researched online items in the world of science and technology <https://scitechdaily.com/news/biology/>
7. Web atlas of medical parasitology <http://www.atlas.or.kr/about/index.html>

## EVALUATION

*Forms and methods of current control:* current control is carried out on the basis of control of theoretical knowledge, practical skills and abilities: oral survey, testing, assessment of the performance of practical work, solving situational tasks, assessment of activity in class. The current educational activity of the applicant in practical classes is evaluated on a 4-point (traditional) scale.

Criteria for current assessment in the practical class:

«5»	The student is fluent in the material, takes an active part in the discussion and case studies, confidently demonstrates practical skills during performing and interpreting of practical work on the topic of the lesson, expresses his opinion on the topic of the lesson.
«4»	The student is well versed in the material, participates in the discussion and case studies, demonstrates practical skills while performing practical work with some mistakes, expresses his opinion on the topic of the lesson.
«3»	The student does not have enough knowledge on theoretical material, insecurely participates in the discussion and case studies, performs practical work with significant errors.
«2»	The student does not have knowledge on theoretical material, does not participate in the discussion and case studies, does not demonstrate practical skills during the practical work on the topic of the lesson.

### *Evaluation of independent work.*

Independent work of students, which is included in the topic of the lesson along with the auditory work, is evaluated during current control of the topic on the proper lesson. Mastering of themes which are placed out only on independent work is checked during the exam.

Only those applicants who have fulfilled the requirements of the training program in the discipline, have no academic debt, their average score for the current educational activity in the discipline is at least 3.00, and they have passed the test control according to the tests "Krock - 1" are admitted to the final control in the form of an exam. » at least 90% (50 tasks). Test control is carried out in the Educational and production complex of innovative technologies of learning, informatization and internal monitoring of the quality of education of the University at the last lesson

### *Forms and methods of final control.*

The method of final control in the form of an exam is unified and involves the use of standardized forms. The number of questions submitted to the exam corresponds to the amount of credits assigned to the study of the academic discipline.

The ticket form is standardized and consists of structural elements (components): theoretical questions and practical tasks (situational tasks, case tasks, descriptions, etc.).

Theoretical questions are short, simple, understandable, clear and transparent, a complete answer to one theoretical question lasts no more than 5 minutes. Practical tasks are clearly and clearly formulated, a complete answer to one practical question lasts no more than 5 minutes. The timing of the exam is standard - no more than 30 minutes.

For each ticket, a check list (answer standard) is drawn up, which provides full correlation with the ticket, contains a similar number of structural elements (components), has answer standards, which are mandatory for providing complete answers to the questions.

During the exam, the applicant receives a ticket, and the examiners use a check sheet for the corresponding ticket with reference answers and determine which mandatory components of the answer were named or not named by the applicant.

The overall grade for the exam is calculated as the arithmetic average of all grades obtained for answers to theoretical questions and practical tasks on a traditional four-point scale, rounded to two decimal places.

The exam is held in the Educational and production complex of innovative technologies of learning, informatization and internal monitoring of the quality of education of the University during the examination sessions at the end of the semester (autumn and spring) according to the schedule.

*Distribution of points obtained by applicants of higher education*

The obtained average score for the academic discipline for applicants who have successfully mastered the work program of the academic discipline is converted from a traditional four-point scale to points on a 200-point scale, as shown in the table:

**Conversion table of a traditional assessment into a multi-point scale**

National grade for the discipline	Multipoint 200-point scale
«5»	185-200
«4»	151-184
«3»	120-150

A multi-point scale (200-point scale) characterizes the actual success of each applicant in learning the educational component. The conversion of the traditional grade (average score for the academic discipline) into a 200-point grade is performed by the information and technical department of the University.

According to the obtained points on a 200-point scale, the achievements of the applicants are evaluated according to the ECTS rating scale. Further ranking according to the ECTS rating scale allows you to evaluate the achievements of students from the educational component who are studying in the same course of the same specialty, according to the points they received.

The ECTS scale is a relative-comparative rating, which establishes the applicant's belonging to the group of better or worse among the reference group of fellow students (faculty, specialty). An "A" grade on the ECTS scale cannot be equal to an "excellent" grade, a "B" grade to a "good" grade, etc. When converting from a multi-point scale, the limits of grades "A", "B", "C", "D", "E" according to the ECTS scale do not coincide with the limits of grades "5", "4", "3" according to the traditional scale. Acquirers who have received grades of "FX" and "F" ("2") are not included in the list of ranked acquirers. The grade "FX" is awarded to students who have obtained the minimum number of points for the current learning activity, but who have not passed the final examination. A grade of "F" is assigned to students who have attended all classes in the discipline, but have not achieved a grade point average (3.00) for the current academic activity and are not admitted to the final examination.

According to the points got on a 200-point scale, students are evaluated on a rating scale ECTS. Students enrolled in one course (one specialty) based on the number of points scored in the discipline are ranked on a scale according to ECTS system by the following way:

*Conversion of the traditional grade from the discipline and the sum of points on the ECTS scale*

ECTS Point	Statistics indicator
«A»	The best 10 % of the students
«B»	Next 25 % students
«C»	Next 30 % students

«D»	Next 25 % students
«E»	The last 10 % students

*Possibility and conditions of obtaining additional (bonus) points: not provided.*

## **INDEPENDENT WORK OF A STUDENT**

Independent work involves preparation for each practical lesson, preparation for the final test control, preparation for the exam, and independent study of topics that are not part of the classroom lesson plan.

List of topics for self-study.

Topic 1. Aging as a final stage of ontogenesis. Theories of aging.

Topic 2. Genetic danger of environmental pollution. The concept of antimutagens and commutagens.

Topic 3. Methods of human genetics: dermatoglyphic, immunological, somatic cell hybridization.

Topic 4. Using the formula of the Hardy-Weinberg equilibrium for detection of genetic structure of human population.

Topic 5. Blood flukes – causative agents of human diseases. Causative agents of metagonimosis, nanophyetosis.

Topic 6. Guinea worm and filaria – causative agents of human diseases

Topic 7. Principles and characteristics of basic laboratory methods for diagnosing helminthiasis.

Topic 8. Midges: characteristics and importance as intermediate hosts of helminthes and vectors of human diseases.

Topic 9. Plants and animals poisonous to humans

## **COURSE POLICY**

*Deadlines and Rework Policy:*

- Absences of classes for non-respectable reasons are worked out according to the schedule of the teacher on duty.

- Absences due to valid reasons are processed according to an individual schedule with the permission of the dean's office.

- Unsatisfactory assessment from the final practical lesson is rewritten on the days of consultations and exercises; in the case of distance learning - in the terms determined and agreed with the teacher.

- The rewriting of an unsatisfactory grade from the final test control is carried out according to a schedule agreed with the Educational and Production Complex of Innovative Technologies of Learning, Informatization and Continuous Education of the Odessa National Medical University

- Retaking the exam is carried out according to the schedule agreed with the dean.

*Academic Integrity Policy:*

Applicants must observe academic integrity, namely:

- independent performance of all types of work, tasks, forms of control provided for by the work program of this educational discipline;

- references to sources of information in the case of using ideas, developments, statements, information;

- compliance with the legislation on copyright and related rights;

- provision of reliable information about the results of one's own educational (scientific) activity, used research methods and sources of information.

Unacceptable in educational activities for participants of the educational process are:

- using family or official ties to obtain a positive or higher grade during any form of control of learning outcomes or academic performance;
- use of prohibited additional materials or technical means (cheat sheets, notes, micro-earphones, telephones, smartphones etc.) during control measures;
- passing procedures for control of training results by fake persons

For violation of academic integrity, students may be held to the following academic responsibility:

- a decrease in the results of assessment of control work, assessment in class, credit, etc.;
- retaking the assessment (control work, credit, etc.);
- appointment of additional control measures (additional individual tasks, control works, tests, etc.);
- conducting an additional inspection of other works authored by the violator.

*Attendance and lateness Policy:*

Attending all types of classroom classes (lectures, practical classes) is mandatory.

Uniform: a medical gown that completely covers the outer clothing, or medical pajamas, a cap, a mask, and a change of shoes.

Equipment: notebook, pen, methodological instructions, album.

State of health: applicants suffering from acute infectious diseases, including respiratory diseases, are not allowed to attend classes.

A student who is late for class can attend it, but if the teacher has put "ab" in the journal, he must complete it in the general order.

*Use of mobile devices:*

Mobile devices may be used by students with the permission of the teacher if they are needed for the assignment.

*Behavior in the audience:*

The behavior of applicants and teachers in the classrooms must be working and calm, strictly comply with the rules established by the Regulations on academic integrity and ethics of academic relations at Odessa National Medical University, in accordance with the Code of Academic Ethics and University Community Relations of Odessa National Medical University, Regulations on Prevention and detection of academic plagiarism in research and educational work of students of higher education, scientists and teachers of Odessa National Medical University