

SYLLABUS

1. General information on the course

Full course name	Problem Based Learning
Full official name of a higher education institution	Sumy State University
Full name of a structural unit	Medical Institute. Physiology and Pathophysiology Department with Medical Biology Course
Author(s)	Obukhova Olha Anatoliivna, Harbuzova Viktoriia Yuriivna, Ivakhniuk Tetiana Vasylivna, Hrebenyk Liudmyla Ivanivna
Cycle/higher education level	The Second Level Of Higher Education, National Qualifications Framework Of Ukraine – The 7th Level, QF-LLL – The 7th Level, FQ-EHEA – The Second Cycle
Semester	During the 3rd or 4th or 5th semesters
Workload	The volume of the discipline is 5 credits. ECTS, 150 hours, of which 36 hours. is contact work with the teacher (36 hours of practical classes)
Language(s)	English

2. Place in the study programme

Relation to curriculum	Elective course available for study programme "Medicine"
Prerequisites	There are no specific pre-requisites
Additional requirements	There are no specific requirements
Restrictions	There are no specific restrictions

3. Aims of the course

The aim of the discipline is to achieve students modern knowledge based on understanding the peculiarities of the body with the principles of medical ethics, deontology and practical skills that are necessary for the doctor in the process of maintaining the health of patients; algorithms for examination of patients with various pathologies, analysis and interpretation of the results of laboratory, genetic, microbiological and instrumental research methods; determination of treatment tactics.

4. Contents

Topic 1 Principles and tasks of Problem-Based Learning (PBL).

The main areas of implementation of PBL. The role of teamwork in PBL. Anatomy of the auditory analyzer. Functions of different parts of the auditory system. Action potential: structure, physical and physiological characteristics, the mechanism of occurrence of the main phases. Hearing impairment: types, causes, mechanisms. Diagnosis of different types of hearing disorders. Rinne and Weber's experiments. Otoscopy. Audiometry. Treatment of hearing disorders. Methods of overcoming the psychological and social consequences of hearing disorders. Legal responsibility of employers to ensure noise safety. Prevention of diseases of the auditory analyzer

Topic 2 Gender determination. Genetic and phenotypic sex. Gender differentiation, factors that control it.

Changes in the body during puberty. Features of puberty. The anatomical structure of male and female genitals. Male and female sex hormones - chemical nature, synthesis, regulation of secretion, transport, mechanisms of cytoception, biological effects. Physiological features of the menstrual cycle. Formation of male and female gametes. Fertilization. Pregnancy. Contraception: principles, methods, contraindications. Social, economic, cultural reasons for the growth of adolescent pregnancy in Ukraine. Ethical and legal aspects of a doctor's activity in communication and treatment of adolescents.

Topic 3 Stages of normal development of the child. Methods of assessing the child's development.

Factors and mechanisms of formation of congenital pathology. Normal human karyotype. Causes of structural and quantitative chromosomal abnormalities. Clinical signs and karyotypes of the most common chromosomal diseases: Down syndrome, Shereshevsky-Turner, Klinefelter. Mitosis. Meiosis. Principles of the method of staining of metaphase chromosomes and FISH-method for the assessment of chromosomal abnormalities. Organization of genetic material in a diploid cell: structure of DNA, gene, chromosome. Antenatal screening programs for the diagnosis of chromosomal diseases. First aid for bleeding, burns, hypoglycemia, convulsions. Features of communication with parents with children with special needs. Prevalence of chromosomal diseases, risk factors. Social programs for children with disabilities in Ukraine. Ethical and legal norms in the treatment of children with chromosomal diseases.

Topic 4 Proteins: structure, significance, physiological functions.

Composition and functions of blood. Erythrocytes: structure, functions, erythropoiesis. Hemoglobin: structure, functions, basic forms and compounds. Forms of oxygen transport in the body. Anemia: classification, etiology, pathogenesis. Genetic blood diseases. Sickle cell anemia. Thalassemia. Structure and functions of the spleen. Peripheral circulation. Prevalence of genetic blood diseases in Ukraine.

Topic 5 Structure and functions of the digestive system

Innervation and histological structure of the intestine. Mechanisms of absorption of substances in the intestine. The role of the autonomic nervous system (ANS) in the regulation of visceral functions. Clinical effects of drugs that affect the functioning of the ANS. Signs and symptoms of malabsorption and steatorrhea. Crohn's disease. Nonspecific ulcerative colitis. Celiac disease: etiology, pathogenesis, clinical symptoms, complications. The role of a gluten-free diet in minimizing the manifestations of celiac disease. The structure of diseases of the gastrointestinal tract in childhood. Principles of examination of the abdominal cavity. Symptoms of acute abdomen.

Topic 6 Structure and functions of the spine.

Features of the structure of the cervical, thoracic and lumbar vertebrae. Curvature and types of spinal movements. Factors that determine the stability of the spine. Structure and functions of the spinal cord and nerve roots. Functions of the lymphatic system. The composition of the lymph. Clonal selection theory of immunity. The concept of "immunoglobulins", structural differences between different classes of antibodies, their functions, methods for determining serum immunoglobulins. Genetic basis of antibody diversity. Paraprotein. Bence-Jones protein. Genesis and characteristics of B-lymphocytes. Cooperative interactions of T-, B-, A-cells in the development of humoral immune response. Regulation of the immune response. The mechanism of antibody synthesis by plasma cells. Cytokine regulation of antibody synthesis. Cytokine-producing cells. Effects of cytokines at the level of the immune system and the body. Blood plasma proteins and methods of their research. Pathophysiological aspects of pain (infectious and non-infectious hypotheses). Types of back pain depending on the location. Tactics of managing a patient with back pain, methods of topical diagnosis and determining the etiology of pain. General characteristics of means and methods of diagnosis of back pain. Radiography. Functional liver tests. Proteinogram. Creatinine clearance and methods for its determination. Final test control. Discussion.

5. Intended learning outcomes of the course

After successful study of the course, the student will be able to:

LO1	Ability to act socially responsible and civic consciously in the choice of adequate methods of prevention, diagnosis, treatment of patients.
LO2	Formation of skills of interrogation and clinical examination of the patient
LO3	Ability to determine the required list of laboratory and instrumental studies and evaluate their results
LO4	Ability to establish a preliminary and clinical diagnosis of the disease, the choice of optimal treatment methods
LO5	Determining the tactics of management of persons subject to dispensary supervision.

7. Teaching and learning activities

7.1 Types of training

Topic 1. Principles and tasks of Problem-Based Learning (PBL).
pr.tr.1 "Principles and objectives of Problem-Based Learning (PBL)." (full-time course) The main areas of implementation of PBL. The role of teamwork in PBL. SSU experience in the implementation of PBL. The lesson involves students acquaintance with the basic methodological principles of pedagogical technology PBL.
pr.tr.2 "Hearing impairment" (full-time course) Anatomy of the auditory analyzer. Functions of different parts of the auditory system. Action potential: structure, physical and physiological characteristics, the mechanism of occurrence of the main phases. Hearing impairment: types, causes, mechanisms. The lesson involves the use of interactive simulation (watching educational films), teamwork on problem solving and finding an algorithm for solving them.

pr.tr.3 "Hearing impairment" (full-time course)

Diagnosis of different types of hearing disorders. Rinne and Weber's experiments. Otoscopy. Audiometry. Treatment of hearing disorders. Methods of overcoming the psychological and social consequences of hearing disorders. Legal responsibility of employers to ensure noise safety. Prevention of diseases of the auditory analyzer. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching educational films) with further discussion. In addition, when studying this topic, the conduct and interpretation of the results of Rinne and Weber tests, audiometry are forgiven. Conducting a lesson involves discussing the case, self-study, participation in the discussion, problem statement and search for an algorithm for its solution.

Topic 2. Gender determination. Genetic and phenotypic sex. Gender differentiation, factors that control it.

pr.tr.4 "Gender determination. Genetic and phenotypic sex" (full-time course)

Changes in the body during puberty. Features of puberty. The anatomical structure of male and female genitals. The lesson involves teamwork of students, a virtual interactive simulation (watching movies).

pr.tr.5 "Sexual development" (full-time course)

Male and female sex hormones - chemical nature, synthesis, regulation of secretion, transport, mechanisms of cyto-reception, biological effects. Physiological features of the menstrual cycle. Formation of male and female gametes. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies) with further discussion.

pr.tr.6 "Sexual development" (full-time course)

Fertilization. Pregnancy. Contraception: principles, methods, contraindications. Social, economic, cultural reasons for the growth of adolescent pregnancy in Ukraine. Ethical and legal aspects of a doctor's activity in communication and treatment of adolescents. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching educational films) with further discussion. Drawing up a diagnostic plan, interpreting the results of laboratory tests and treatment of the underlying disease.

Topic 3. Stages of normal development of the child. Methods of assessing the child's development.

pr.tr.7 "Stages of normal development of the child. Methods of assessing the child's development" (full-time course)

Factors and mechanisms of formation of congenital pathology. Normal human karyotype. Causes of structural and quantitative chromosomal abnormalities. Clinical signs and karyotypes of the most common chromosomal diseases: Down syndrome, Shereshevsky-Turner, Klinefelter. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies) and the interpretation of genetic research (karyotype determination, preimplantation genetic screening) with further discussion.

pr.tr.8 "Chromosomal diseases" (full-time course)

Mitosis. Meiosis. Principles of the method of staining of metaphase chromosomes and FISH-method for the assessment of chromosomal abnormalities. Organization of genetic material in a diploid cell: structure of DNA, gene, chromosome. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies) and the interpretation of genetic research (karyotype determination, preimplantation genetic screening) with further discussion.

pr.tr.9 "Chromosomal diseases" (full-time course)

Antenatal screening programs for the diagnosis of chromosomal diseases. First aid for bleeding, burns, hypoglycemia, convulsions. Features of communication with parents with children with special needs. Prevalence of chromosomal diseases, risk factors. Social programs for children with disabilities in Ukraine. Ethical and legal norms in the treatment of children with chromosomal diseases. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching educational films) and the interpretation of genetic research (karyotype determination, preimplantation genetic screening) with further discussion.

Topic 4. Proteins: structure, significance, physiological functions.

pr.tr.10 "Proteins: structure, significance, physiological functions" (full-time course)

Composition and functions of blood. Erythrocytes: structure, functions, erythropoiesis. Hemoglobin: structure, functions, basic forms and compounds. Forms of oxygen transport in the body. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching movies) and the interpretation of laboratory, genetic research with further discussion.

pr.tr.11 "Anemia" (full-time course)

Anemia: classification, etiology, pathogenesis. Genetic blood diseases. Sickle cell anemia. Conducting a practical lesson involves teamwork of students in discussing the case, the results of laboratory tests, self-study, watching interactive simulations (educational films) on the topic of the lesson and their discussion.

pr.tr.12 "Genetic diseases" (full-time course)

Thalassemia. Structure and functions of the spleen. Peripheral circulation. Prevalence of genetic blood diseases in Ukraine. The study of this topic involves theoretical and practical work in the classroom, the use of virtual simulation (watching educational films) and interpretation of the results of laboratory, genetic research with further discussion.

Topic 5. Structure and functions of the digestive system

pr.tr.13 "Structure and functions of the digestive system" (full-time course)

Innervation and histological structure of the intestine. Mechanisms of absorption of substances in the intestine. The role of the autonomic nervous system (ANS) in the regulation of visceral functions. The study of this topic involves theoretical work in the classroom, the use of virtual simulation (watching educational films) and the interpretation of laboratory, instrumental research with further discussion.

<p>pr.tr.14 "Indigestion" (full-time course)</p> <p>Clinical effects of drugs that affect the functioning of the ANS. Signs and symptoms of malabsorption and steatorrhea. Crohn's disease. Nonspecific ulcerative colitis. Celiac disease: etiology, pathogenesis, clinical symptoms, complications. The study of this topic involves theoretical work in the classroom, the use of virtual simulation (watching educational films) and the interpretation of laboratory, immunological studies with further discussion.</p>
<p>pr.tr.15 "Indigestion" (full-time course)</p> <p>The role of a gluten-free diet in minimizing the manifestations of celiac disease. The structure of diseases of the gastrointestinal tract in childhood. Principles of examination of the abdominal cavity. Symptoms of acute abdomen. The study of this topic involves theoretical work in the classroom, the use of virtual simulation (watching movies) and the interpretation of laboratory, immunological studies with further discussion; development of patient management algorithm.</p>
<p>Topic 6. Structure and functions of the spine.</p>
<p>pr.tr.16 "Structure and functions of the spine" (full-time course)</p> <p>Features of the structure of the cervical, thoracic and lumbar vertebrae. Curvature and types of spinal movements. Factors that determine the stability of the spine. Conducting a practical lesson involves discussion, self-study, teamwork on solving problematic issues of the case, a virtual simulation (watching educational films).</p>
<p>pr.tr.17 "Functioning of the immune system" (full-time course)</p> <p>Structure and functions of the spinal cord and nerve roots. Functions of the lymphatic system. The composition of the lymph. Clonal selection theory of immunity. The concept of "immunoglobulins", structural differences between different classes of antibodies, their functions, methods for determining serum immunoglobulins. The lesson involves a discussion of the case, discussion, self-study, the use of virtual simulation - watching educational films, interpretation of the immunogram with their subsequent discussion.</p>
<p>pr.tr.18 "Management of patients with pain syndrome" (full-time course)</p> <p>Genetic basis of antibody diversity. Paraprotein. Bence-Jones protein. Genesis and characteristics of B-lymphocytes. Cooperative interactions of T-, B-, A-cells in the development of humoral immune response. Regulation of the immune response. The mechanism of antibody synthesis by plasma cells. Cytokine regulation of antibody synthesis. Cytokine-producing cells. Effects of cytokines at the level of the immune system and the body. Blood plasma proteins and methods of their research. Pathophysiological aspects of pain (infectious and non-infectious hypotheses). Types of back pain depending on the location. Tactics of managing a patient with back pain, methods of topical diagnosis and determining the etiology of pain. General characteristics of means and methods of diagnosis of back pain. Radiography. Functional liver tests. Proteinogram. Creatinine clearance and methods for its determination. Conducting a practical lesson involves teamwork to discuss the case and the results of laboratory tests, radiographs, the use of virtual simulation - watching educational films with their subsequent discussion. The lesson involves conducting a final test control of the material within the topics of the discipline with a discussion of the results.</p>

7.2 Learning activities

LA1	Preparation for practical classes
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LA2	Solving clinical cases
LA3	Work with textbooks and relevant information sources
LA4	Participation in discussion (group and pair)
LA5	Interpretation of results of laboratory, molecular genetic and other researches, work with diagnostic catalogs
LA6	Self-study
LA7	Watching educational films
LA8	E-learning in systems (Zoom, Google Meet, MIX.sumdu.edu.ua)
LA9	Preparation for the final control
LA10	Individual research project (preparation of multimedia presentations)

8. Teaching methods

Course involves learning through:

TM1	Problem Based Learning (PBL)
TM2	Team-based learning (TBL).
TM3	Research-based learning (RBL).
TM4	Practical training
TM5	Brain storm
TM6	Work with an expert on a specific clinical issue
TM7	Demonstration method
TM8	Edutainment
TM9	Educational discussion / debate

Practical classes in the discipline include consideration of practical structured cases (Problem-Based Learning) that give students the opportunity to apply theoretical knowledge through practical examples using practical demonstrations and illustrations: the ability to determine methods for diagnosing diseases with further interpretation of the results; etiotropic therapy, specific and nonspecific prophylaxis of diseases. Classes are held in small groups (no more than 8 students). Consideration of each case consists of 3 parts with the introduction of edutainment technologies. Analysis of specific situations involves the search for optimal solutions for solving a practice-oriented problem: understanding the main pathophysiological, biochemical and immunological processes against the background of various pathologies of the human body; connection with the onset of symptoms of diseases. Self-study is facilitated by preparation for practical exercises.

During the preparation and solution of practice-oriented structured cases, students will develop self-study skills; fast synthesis and analytical thinking; skills and ability to use different models of behavior are acquired even in the same situations; deeply understand their own interests and the interests of interested parties, taking into account their rights and obligations as a member of society and the rights of the patient; quickly and clearly prioritize, calculate the time; make informed

logical choices when alternatives are available; adapt quickly to new challenges and circumstances; be stress-resistant to stress; be able to achieve the set goal; teamwork: to highlight and fulfill your role in teamwork.

9. Methods and criteria for assessment

9.1. Assessment criteria

Definition	National scale	Rating scale
Outstanding performance without errors	5 (Excellent)	$170 \leq RD \leq 200$
Above the average standard but with minor errors	4 (Good)	$140 \leq RD < 169$
Fair but with significant shortcomings	3 (Satisfactory)	$120 \leq RD < 139$
Fail – some more work required before the credit can be awarded	2 (Fail)	$0 \leq RD < 119$

9.2 Formative assessment

FA1	Peer assessment
FA2	Solving practical cases
FA3	Teacher's instructions in the process of solving practical cases

9.3 Summative assessment

SA1	Execution of a practical case (preparation, presentation, defense)
SA2	Final control: Differential credit (according to the regulations)

Form of assessment:

3 semester		200 scores
SA1. Execution of a practical case (preparation, presentation, defense)		120
	6x20	120
SA2. Final control: Differential credit (according to the regulations)		80
		80
4 semester		200 scores
SA1. Execution of a practical case (preparation, presentation, defense)		120
	6x20	120
SA2. Final control: Differential credit (according to the regulations)		80
		80
5 semester		200 scores
SA1. Execution of a practical case (preparation, presentation, defense)		120
	6x20	120
SA2. Final control: Differential credit (according to the regulations)		80

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Form of assessment (special cases):

3 semester		200 scores
SA1. Execution of a practical case (preparation, presentation, defense)		120
	In case of quarantine restrictions, the practical case is performed remotely using the platforms MIX.sumdu.edu.ua, Zoom, Google meet (6x20)	120
SA2. Final control: Differential credit (according to the regulations)		80
	In case of quarantine restrictions, the differential test is carried out remotely using the platforms MIX.sumdu.edu.ua, Zoom, Google meet	80
4 semester		200 scores
SA1. Execution of a practical case (preparation, presentation, defense)		120
	In case of quarantine restrictions, the practical case is performed remotely using the platforms MIX.sumdu.edu.ua, Zoom, Google meet (6x20)	120
SA2. Final control: Differential credit (according to the regulations)		80
	In case of quarantine restrictions, the differential test is carried out remotely using the platforms MIX.sumdu.edu.ua, Zoom, Google meet	80
5 semester		200 scores
SA1. Execution of a practical case (preparation, presentation, defense)		120
	In case of quarantine restrictions, the practical case is performed remotely using the platforms MIX.sumdu.edu.ua, Zoom, Google meet (6x20)	120
SA2. Final control: Differential credit (according to the regulations)		80
	In case of quarantine restrictions, the differential test is carried out remotely using the platforms MIX.sumdu.edu.ua, Zoom, Google meet	80

When mastering the materials of the student's discipline, a maximum of 5 points is assigned for each practical lesson (the grade is set in the traditional 4-point grading system). At the end of the academic year, the arithmetic mean of student performance is calculated. The maximum number of points that a student can get in practical classes during the academic year is 120. The number of student points is calculated by the formula 120 multiplied by the arithmetic mean and divided by 5. The form of the final module control - differential credit. The student is admitted to the differential credit provided that the requirements of the curriculum are met and if he has scored at least 72 points for the current academic activity, which corresponds to the average score for the current mark "3". The final module control is carried out according to the schedule at the last practical lesson of the semester (the maximum number of points that a student can score during the assembly is 80), includes control and evaluation of theoretical and practical training within all topics of the

discipline. The final module control is carried out in the form of testing, with a score of "5" corresponds to 80 points, "4" - 64 points, "3" - 48 points, "2" - 0 points. In case of unsatisfactory result for the final module control, the student has the right to retake the test. Students who fail to take the test without good reason are considered to have received an unsatisfactory grade. The student's refusal to perform the final module test is certified as an unsatisfactory answer. Incentive points are added to the assessment of the discipline for the implementation of an individual research project (defense of student research work 12 points, presentation at the conference 5 points, poster presentation at the conference 4 points, abstracts 3 points). The total score in the discipline may not exceed 200 points.

10. Learning resources

10.1 Material and technical support

MTS1	Multimedia, video and sound reproduction, projection equipment (video cameras, projectors, screens, smart boards, etc.)
MTS2	Information and communication systems
MTS3	Current models (devices, medical equipment, etc.) of the medical institute, including the Center for collective use of scientific equipment of the medical institute and the university clinic of SSU
MTS4	Models and dummies (organisms and individual organs, technical installations, etc.)
MTS5	Library funds, archives of results of laboratory, genetic, immunological and instrumental research methods
MTS6	Software (to support distance learning, Internet polls), integrated information system (SSU web system, e-learning information system)

10.2 Information and methodical support

Essential Reading	
1	Guyton & Hall Textbook of Medical Physiology, 14th edition. Philadelphia: Elsevier, 2020.
2	Clinical Anatomy and Operative Surgery: textbook / O. M. Slobodian, V. Yu. Yershov, H. Ya. Kostyuk, V. I. Pivtorak ; ed. V.Yu. Yershov. - K. : Medicine Publishing, 2018.
3	Herring, N. & Paterson, D.J. Levick's Introduction to Cardiovascular Physiology, 6th edition. Boca Raton: CRC Press, 2018.
4	Biological chemistry/ Yu. I. Gubskiy. - 3-nd. ed. - Vinnitsa : Nova Knyha, 2020.
5	Medical microbiology and immunology: textbook / M. Z. Tymkiv, O. P. Korniychuk, S. Y. Pavliy et al. - Vinnytsia : Nova Knyha, 2019.
Supplemental Reading	
1	Clinical Psychology : Second edition / Graham Davey, Nick Lake and Adrian Whittington. - New York, 2015. https://dl.uswr.ac.ir/bitstream/Hannan/140735/1/9781848722224.pdf

2	Robbins Basic Pathology / V. Kumar, A. K. Abbas, J. C. Aster. - 10-th ed. - Philadelphia : Saunders Elsevier, 2018.
3	Guyton & Hall Textbook of Medical Physiology, 13th edition. - Philadelphia: Elsevier, 2016.
4	Crash Course in Pathophysiology. Questions & Answers / O. Ataman. — Vinnytsia : Nova knyha, 2019.
5	General and clinical pathophysiology [textbook] / A. V. Kubyshkin, A. I. Gozhenko, V. F. Sagach et al. ; edited by A. V. Kubyshkin, A. I. Gozhenko. - 3rd ed. - Vinnytsia : Nova Knyha, 2017.
6	Atlas of Anatomy of the Peripheral Nerves: The Nerves of the Limbs – Student Edition / edited by Philippe Rigoard. - 1st ed. 2017. - Cham : Springer International Publishing, 2017. - XXVIII, 322 p. 237 illus., 235 illus. in color.
7	Biochemistry: Free For All / K. Ahern, I. Rajagopal, T. Tan. - Oregon State University, 2018.
8	USMLE Step 1: Biochemistry and Medical Genetics: Lecture Notes / Editors S. Turco, R. Lane, R.M. Harden. - New York : Kaplan, 2019.
9	The association of apai-polymorphism of vitamin D receptor gene (VDR) with development of generalized parodontitis in Ukrainian population / I. G. Fomenko, V. Y. Harbuzova, O.A. Obukhova, O.A., et al // Wiadomosci lekarskie. – 2019. – 72(7), p. 1253-1257.
Web-based and electronic resources	
1	https://teachmephysiology.com/
2	https://pubmed.ncbi.nlm.nih.gov/
3	Osmosis Study Video https://www.osmosis.org/
4	Lecturio course «Medical Courses» https://www.lecturio.com/medical