

SYLLABUS

1. General information on the course

Full course name	Clinical Physiology
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
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	1 weeks across semester
Workload	5 ECTS, 150 hours, out of which 36 hours are working hours with the lecturer (36 hours of seminars)
Language(s)	English

2. Place in the study programme

Relation to curriculum	Elective course available for study programme "Medicine"
Prerequisites	Basic knowledge of physiology and pathophysiology
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 constructive, fundamental thinking and a system of special knowledge in the field of clinical physiology.

4. Contents

Topic 1 Introduction to clinical physiology. Methods for assessing the functional state of the organism

The subject of clinical physiology. Its connection with other disciplines. The value of clinical physiology. The concept of health and disease. Health and lifestyle. The most common diseases of our time. Methods for assessing the functional state of the organism.

Topic 2 Methods for assessing the rheological properties of blood and hemostasis system in clinical practice.

Blood functions. Functional significance of the main components of blood. Circulating blood volume. Factors influencing its value. The concept of normo-, hypo- and hypervolemia. Hematocrit. Factors that determine the hematocrit. Methods for determination of hematocrit. Blood viscosity. Factors that determine it. Requirements for blood substitutes. ESR. Definition and factor influencing the value of the indicator. Coagulogram

Topic 3 Methods for assessing the electrical and mechanical work of the heart.

Conducting system of the heart, its significance. Mechanisms of spontaneous pulse generation in a conductor system. The law of "gradient of automatism". Features of the processes of proper contraction and relaxation in myocardial cells. Methods of electrocardiogram (ECG) registration. Fundamentals of vector ECG analysis. Phase structure of the cardiac cycle. Regulation of heart activity. Methods of studying heart tones. Functional classification of blood vessels according to Folkov. Features of blood flow in arterial vessels. Arterial pulse. Blood pressure. Features of blood movement in venous vessels. Mechanisms of regulation of systemic hemodynamics

Topic 4 Study of functional tests of the cardiovascular system.

Nervous mechanisms of regulation of systemic hemodynamics. The role of baro-, chemo- and mechanoreceptors in the regulation of systemic circulation. Cardiovascular center, its characteristics. The role of reflexes in the regulation of systemic circulation. Reflexes of Zion-Ludwig, Goering-Ivanov, Bainbridge, Parin). Blood circulation when changing body position and during exercise. Functional tests of the cardiovascular system.

Topic 5 Clinical assessment of the functional state of the respiratory system

Functional characteristics of the structural elements of the external respiratory system. Biomechanics of respiration. Mechanisms of inhalation and exhalation. Mechanisms of gas exchange between alveoli and blood of pulmonary capillaries. Forms of oxygen transport by blood. Oxyhemoglobin dissociation curve. Forms of carbon dioxide transport from tissues to the lungs. Carbon dioxide binding curves. Holden effect, its significance. The concept of the respiratory center. Methods of research of its localization. Mechanisms of autonomous rhythmic activity of the respiratory center in the conditions of calm and intensified breathing.

Topic 6 Functional tests of the respiratory system

Static indicators of lung ventilation. The concept of lung volume and lung capacity. Dynamic indicators of lung ventilation. Minute breathing volume, its definition. Alveolar ventilation as an indicator of the effectiveness of external respiration mechanisms. Ventilation of anatomical and functional dead spaces. Spirography. Spirometry. Functional tests of the respiratory system.

Topic 7 Problems of clinical assessment of disorders of protein and fat metabolism

Alimentary protein deficiency. Disorders of protein biosynthesis in cells. Changes in the protein composition of the blood that can occur in conditions of pathology. Production and retention hyperazotemia. Disorders of urea formation in the liver. Disorders of phenylalanine and tyrosine metabolism. Gout. The main causes of disorders of fat metabolism in the body. Causes of disorders of digestion and absorption of lipids in the intestines. Changes in blood composition that may be a manifestation of disorders of lipid transport in the body. Classes of blood plasma lipoproteins. Classification of hyperlipoproteinemias. Pathogenetic significance of hyperlipoproteinemias. Hypolipoproteinemia. Primary and secondary obesity. Pathogenetic significance of obesity. Hyperketonemia.

<p>Topic 8 Problems of clinical assessment of carbohydrate metabolism disorders</p> <p>Regulation of carbohydrate metabolism. Causes of disorders of carbohydrate metabolism. Clinical signs of hypoglycemia. Hypoglycemic coma. Hyperglycemia. Diabetes. Comparative characteristics of type I and II diabetes mellitus. Complications are typical of diabetes. Basic pathogenetic principles of diabetes treatment.</p>
<p>Topic 9 Problems of clinical assessment of water-electrolyte and acid-base balance disorders.</p> <p>Positive and negative water balance. Regulation of water-salt metabolism. Functional effects of aldosterone. Renin-angiotensin system. Functions of atrial natriuretic hormone (atriopectin). Functional effects of vasopressin (antidiuretic hormone). Extracellular dehydration. Isoosmolar, hypoosmolar and hyperosmolar dehydration. Anhydremia syndrome. Intracellular dehydration. Extracellular hyperhydria. Isoosmolar, hypoosmolar and hyperosmolar hyperhydria. Edema. Protective-compensatory reactions that occur in hyponatremia and hypernatremia. Protective-compensatory reactions that occur in hypokalemia and hyperkalemia. Causes and main manifestations of disorders of magnesium metabolism in the body. Mechanisms of acid-base regulation. Buffer systems. The main forms of disorders of the acid-base state. Indicators used to characterize acid-base disorders. Gas acidosis. Non-gaseous acidosis. Correction of gaseous and non-gaseous acidosis. Gas alkalosis. Non-gaseous alkalosis. Correction of gaseous and non-gaseous alkalosis. Relationship between acid-base disorders and electrolyte metabolism disorders.</p>
<p>Topic 10 Final lesson</p>

5. Intended learning outcomes of the course

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

LO2	To evaluate information about the diagnosis in a health care setting, using knowledge about the person, his organs and systems, based on the results of laboratory and instrumental studies.
LO3	To be able to identify and record the leading clinical symptom or syndrome by making an informed decision, using preliminary history and physical examination of the patient, knowledge of the person, his organs and systems, adhering to the relevant ethical and legal norms. Assign laboratory and / or instrumental examination of the patient.

7. Teaching and learning activities

7.1 Types of training

<p>Topic 1. Introduction to clinical physiology. Methods for assessing the functional state of the organism</p>
<p>pr.tr.1 "Introduction to clinical physiology. Methods for assessing the functional state of the organism" (full-time course)</p> <p>The subject of clinical physiology. Its connection with other disciplines. The value of clinical physiology. The concept of health and disease. Health and lifestyle. The most common diseases of our time. Methods for assessing the functional state of the organism.</p>

Topic 2. Methods for assessing the rheological properties of blood and hemostasis system in clinical practice.

pr.tr.2 "Methods for assessing the rheological properties of blood system in clinical practice." (full-time course)

Blood functions. Functional significance of the main components of blood. Circulating blood volume. Factors influencing its value. The concept of normo-, hypo- and hypervolemia. Hematocrit. Factors that determine the hematocrit. Methods for determination of hematocrit. Blood viscosity. Factors that determine it. Requirements for blood substitutes. SHOE. Definition and factor influencing the value of the indicator. Coagulogram.

pr.tr.3 "Evaluation of the hemostasis system" (full-time course)

The concept of the hemostasis system. The structure of the hemostasis system. Mechanisms of hemostasis. Stages of vascular-platelet hemostasis. Phases of coagulation hemostasis. Anticoagulant system. Fibrinolysis.

Topic 3. Methods for assessing the electrical and mechanical work of the heart.

pr.tr.4 "Methods for assessing the electrical and mechanical work of the heart" (full-time course)

Conducting system of the heart, its significance. Mechanisms of spontaneous pulse generation in a conductor system. The law of "gradient of automatism". Features of the processes of proper contraction and relaxation in myocardial cells. Electrocardiogram (ECG) recording methods. Fundamentals of vector ECG analysis. Phase structure of the cardiac cycle. Regulation of heart activity. Methods of studying heart tones. Functional classification of blood vessels according to Folkov. Features of blood flow in arterial vessels. Arterial pulse. Blood pressure. Features of blood movement in venous vessels. Mechanisms of regulation of systemic hemodynamics.

pr.tr.5 "Features of blood circulation in arterial and venous vessels" (full-time course)

Functional classification of blood vessels according to Folkov. Features of blood flow in arterial vessels. Arterial pulse. Blood pressure. Features of blood flow in venous vessels. Mechanisms of regulation of systemic hemodynamics.

Topic 4. Study of functional tests of the cardiovascular system.

pr.tr.6 "Regulation of systemic hemodynamics and local blood circulation" (full-time course)

Nervous mechanisms of regulation of systemic hemodynamics. The role of baro-, chemo- and mechanoreceptors in the regulation of systemic circulation. Cardiovascular center, its characteristics. The role of reflexes in the regulation of systemic circulation. Reflexes of Zion-Ludwig, Goering-Ivanov, Bainbridge, Parin).

pr.tr.7 "Investigation of functional tests of the cardiovascular system" (full-time course)

Blood circulation when changing body position and during exercise. Functional tests of the cardiovascular system.

Topic 5. Clinical assessment of the functional state of the respiratory system

pr.tr.8 "Structural and functional features of the respiratory system. Regulation of respiration" (full-time course)

Functional characteristics of the structural elements of the external respiratory system. Biomechanics of respiration. Mechanisms of inhalation and exhalation. The concept of the respiratory center. Methods of research of its localization. Mechanisms of autonomous rhythmic activity of the respiratory center in conditions of calm and intensive breathing.

pr.tr.9 "Gas exchange in the lungs. Transport of gases by blood" (full-time course)

Mechanisms of gas exchange between alveoli and blood of pulmonary capillaries. Forms of oxygen transport by blood. Oxyhemoglobin dissociation curve. Forms of carbon dioxide transport from tissues to the lungs. Carbon dioxide binding curves. Holden effect, its significance.

Topic 6. Functional tests of the respiratory system

pr.tr.10 "Research of indicators of pulmonary ventilation by methods of spirometry and spirometry" (full-time course)

Static indicators of lung ventilation. The concept of lung volume and lung capacity. Dynamic indicators of lung ventilation. Minute breathing volume, its definition. Alveolar ventilation as an indicator of the effectiveness of external respiration mechanisms. Ventilation of anatomical and functional dead spaces. Spirometry. Spirometry.

pr.tr.11 "Functional tests of the respiratory system" (full-time course)

Carrying out of tests of Christie, Votchak, Stange-Gench, tests with physical activity. Assessment of the respiratory system.

Topic 7. Problems of clinical assessment of disorders of protein and fat metabolism

pr.tr.12 "Problems of clinical evaluation of protein metabolism disorders" (full-time course)

Alimentary protein deficiency. Disorders of protein biosynthesis in cells. Changes in the protein composition of the blood that can occur in conditions of pathology. Production and retention hyperazotemia. Disorders of urea formation in the liver. Disorders of phenylalanine and tyrosine metabolism. Gout.

pr.tr.13 "Problems of clinical assessment of disorders of fat metabolism" (full-time course)

The main causes of disorders of fat metabolism in the body. Causes of disorders of digestion and absorption of lipids in the intestines. Changes in blood composition that may be a manifestation of disorders of lipid transport in the body. Classes of blood plasma lipoproteins. Classification of hyperlipoproteinemias. Pathogenetic significance of hyperlipoproteinemias. Hypolipoproteinemia. Primary and secondary obesity. Pathogenetic significance of obesity. Hyperketonemia.

Topic 8. Problems of clinical assessment of carbohydrate metabolism disorders

pr.tr.14 "Clinical assessment of carbohydrate metabolism disorders" (full-time course)

Problems of clinical evaluation of carbohydrate metabolism disorders." (day) Regulation of carbohydrate metabolism. Causes of disorders of carbohydrate metabolism. Clinical signs of hypoglycemia. Hypoglycemic coma. Hyperglycemia.

pr.tr.15 "Diabetes mellitus" (full-time course) Diabetes mellitus. Comparative characteristics of type I and II diabetes mellitus. Complications are typical of diabetes. Basic pathogenetic principles of diabetes treatment.
Topic 9. Problems of clinical assessment of water-electrolyte and acid-base balance disorders.
pr.tr.16 "Clinical assessment of water-electrolyte and acid-base balance disorders" (full-time course) Positive and negative water balance. Regulation of water-salt metabolism. Functional effects of aldosterone. Renin-angiotensin system. Functions of atrial natriuretic hormone (atriopeptin). Functional effects of vasopressin (antidiuretic hormone). Extracellular dehydration. Isoosmolar, hypoosmolar and hyperosmolar dehydration. Anhydremia syndrome. Intracellular dehydration. Extracellular hyperhydria. Isoosmolar, hypoosmolar and hyperosmolar hyperhydria. Edema. Protective-compensatory reactions that occur in hyponatremia and hypernatremia. Protective-compensatory reactions that occur in hypokalemia and hyperkalemia. Causes and main manifestations of disorders of magnesium metabolism in the body.
pr.tr.17 "Problems of clinical assessment of acid-base imbalances" (full-time course) Mechanisms of acid-base regulation. Buffer systems. The main forms of disorders of the acid-base state. Indicators used to characterize acid-base disorders. Gas acidosis. Non-gaseous acidosis. Correction of gaseous and non-gaseous acidosis. Gas alkalosis. Non-gaseous alkalosis. Correction of gaseous and non-gaseous alkalosis. Relationship between acid-base disorders and electrolyte metabolism disorders.
Topic 10. Final lesson
pr.tr.10 "Final lesson" (full-time course) Conclusion of results for the subject

7.2 Learning activities

LA1	Preparation for practical classes
LA2	E-learning in systems (MIX.sumdu.edu.ua, Google Meet, Zoom)
LA3	Preparation and participation in discussions for classes 7,8,9.
LA4	Preparation for current and final control
LA5	Laboratory research based on the results of studying topics 2, 4, 6, reporting
LA6	Individual research project (preparation of multimedia presentations)
LA7	Self-learning
LA8	Work with textbooks and relevant information sources

8. Teaching methods

Course involves learning through:

TM1	Practical training
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TM2	Case-based learning (CBL).
TM3	Team-based learning (TBL).
TM4	Research-based learning (RBL).
TM5	Educational discussion / debate

Practical classes in the discipline include consideration of information about the patient's diagnosis, using knowledge about the relationship between the functioning of the human body and the results of laboratory and instrumental studies. Students are given the opportunity to identify and record the leading clinical symptom or syndrome by making an informed decision, using preliminary history and physical examination of the patient, knowledge about the person, his organs and systems. Be able to reasonably prescribe laboratory and / or instrumental examination of the patient and assess changes in physiological parameters of the organism.

The study of the discipline develops the ability of students of abstract thinking, analysis and synthesis; ability to learn, master modern knowledge and apply them in practical situations, the ability to use information and communication technologies; creativity

9. Methods and criteria for assessment

9.1. Assessment criteria

ECTS	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	Computer testing
FA2	Individual oral interview, interview, oral comments of the teacher
FA3	Checking and evaluating the performance of practical work
FA4	Control of practical actions (skills)
FA5	Protection of presentations and reports
FA6	Solving clinical cases

9.3 Summative assessment

SA1	Evaluation of written works, surveys, solving a clinical case
SA2	Protection of the presentation
SA3	Final control: differentiated test (according to the regulations)

Form of assessment:

7 semester		200 scores
SA1. Evaluation of written works, surveys, solving a clinical case		90
		90
SA2. Protection of the presentation		30
		30
SA3. Final control: differentiated test (according to the regulations)		80
	Solving situational problems	30
	Computer testing	50
8 semester		200 scores
SA1. Evaluation of written works, surveys, solving a clinical case		90
		90
SA2. Protection of the presentation		30
		30
SA3. Final control: differentiated test (according to the regulations)		80
	Solving situational problems	30
	Computer testing	50

Form of assessment (special cases):

7 semester		200 scores
SA1. Evaluation of written works, surveys, solving a clinical case		90
	In case of quarantine restrictions, evaluation of written works, surveys, clinical case solving are carried out remotely using the platform Mix.sumdu.edu.ua, Zoom, Google meet.	90
SA2. Protection of the presentation		30
	In the case of quarantine restrictions, the presentation security is evaluated remotely using Zoom, Google meet.	30
SA3. Final control: differentiated test (according to the regulations)		80
	In case of quarantine restrictions, the solution of situational problems and computer evaluation of written works, surveys, solving a clinical case are conducted remotely using the platform Mix.sumdu.edu.ua, Zoom, Google meet.	80
8 semester		200 scores
SA1. Evaluation of written works, surveys, solving a clinical case		90
	In case of quarantine restrictions, evaluation of written works, surveys, clinical case solving are carried out remotely using the platform Mix.sumdu.edu.ua, Zoom, Google meet.	90
SA2. Protection of the presentation		30

	In the case of quarantine restrictions, the presentation security is evaluated remotely using Zoom, Google meet.	30
SA3. Final control: differentiated test (according to the regulations)		80
	In case of quarantine restrictions, the solution of situational problems and computer evaluation of written works, surveys, solving a clinical case are conducted remotely using the platform Mix.sumdu.edu.ua, Zoom, Google meet.	80

In special situations, work during the semester can be performed remotely. Computer testing

10. Learning resources

10.1 Material and technical support

MTS1	Computers, computer systems and networks
MTS2	Multimedia, video and sound reproduction, projection equipment (video cameras, projectors, screens, smart boards, etc.)
MTS3	Stimulation center (electrocardiographs, spirometers, phonendoscopes and blood pressure monitors)
MTS4	Library funds

10.2 Information and methodical support

Essential Reading	
1	Textbook of medical physiology Arthur C. Guyton, John E. Hall.—16th ed., 2020. – 1116 p. ; cm
2	Hole's Human Anatomy & Physiology 15th Edition. By David N. Shier, Jackie L. Butler and Ricki Lewis 2018
Supplemental Reading	
1	Helen McGuinness Anatomy & Physiology, Fifth Edition Paperback – 26 Oct. 2018
2	Garbuzova V. Yu. The general and cellular basis of medical physiology / V. Yu. Garbuzova, O.A. Obukhova // Суми: Вид-во СумДУ. – 2013. – 132 с.
3	Association analysis between HOTAIR rs1899663 single nucleotide polymorphism and clear cell renal cell carcinoma development in ukrainian population / A.D. Volkohon, A.V. Kolnoguz, Ya.D. Chumachenko, V.Yu. Harbuzova, N.L. Tsyndrenko // Wiadomo
4	Fomenko, I.G., Harbuzova, V.Y., Obukhova, O.A., Pohmura, V.V., Plakhtiienko, I.A., Piven. The association of apai-polymorphism of vitamin D receptor gene (VDR) with development of generalized parodontitis in Ukrainian population // Wiadomosci lekarskie. – 2019. – 72(7), p. 1253–1257.
Web-based and electronic resources	
1	Anatomy and Physiology – Open Textbook - BC Open Textbooks https://opentextbc.ca/anatomyandphysiology/

