

Code: MFSE 0401		Course title: Human Physiology 2	
Level: preclinical	Study year: II	Semester: IV	ECTS: 9
Status: obligatory	Total contact hours: 100		
Prerequisites:	According to the study regulations		
Lecturers: Professors and associates involved in the implementation of the course in accordance with the plan of the teaching process			
1. Overall aim	The overall aim of the Physiology course is to increase understanding of the fundamental mechanisms of how cells, organ systems function and are regulated under normal physiological conditions.		
2. Course contents	The following topics will be covered during the Modules: Module 1. Renal physiology Module 2. Blood and hemostasis Module 3. Gastrointestinal physiology Module 4. Endocrine physiology, metabolism and thermoregulation Module 5. Reproductive physiology		
3. Learning outcomes (Knowledge, skills and competences)	<p>Students will acquire knowledge necessary for understand the normal functioning of the body which is basis for further successful following of medicine program and their future independent work.</p> <p>They will be able to describe and distinguish between all organ systems, starting from molecular through cellular and organ level. Finally, all processes will be integrated at the level of the entire organism.</p> <p>Students will be able to independently solve problems which requires active participation.</p> <p>Through practical work the students will understand the task of integrating the acquired knowledge and using skills of classical physiological laboratory experiments.</p> <p><i>Through the lectures and seminars the students will gain following knowledge and competences:</i></p> <ol style="list-style-type: none">1. Learn that the urinary and renal systems play a vital role in human physiology in terms of absorption, excretion, and filtration. Acquire the knowledge on body fluids homeostasis and its composition including the role of renal system in acid base balance.2. Know physiological roles of blood system, blood clotting mechanisms, function of the immune system based on chemical communication and molecular interactions.3. Discover how the digestive system maintains mass balance and homeostasis through the process of secretion, absorption, and movement of nutrients and molecules across membranes. Understand that energy balance and metabolism are dependent upon intake, output, and the neuro-endocrine hormones mediating food intake.4. Develop a basic understanding of the endocrine system, its function on growth and metabolism, and how each hormone has stimuli that initiate its secretion and feedback signals that modulate its release. Know how the endocrine system plays a major role in communication and control of physiological processes via hormonal interactions and pathways.5. Understand that the reproductive system has one of the most complex control systems of the body, where multiple hormones interact in an ever-changing fashion in negative and positive feedback effects. <p>Through the practical laboratory work students will acquire following skills:</p> <ul style="list-style-type: none">- Blood sampling- Serum and plasma separation		

	<ul style="list-style-type: none"> - Erythrocytes sedimentation rate and hematocrit measurement - Hemoglobin measurement - Erythrocyte and leukocyte count - Blood clotting tests - Blood types analysis - Kidney function assessment - Determination of renal clearance - Neto-filtration and neto-absorbtion pressure assessment - Acid-base status assessment - Measurement of basal metabolism - Daily energy needs assessment -Calculation of daily food intake -Measurement of blood glucose -Oral glucose tolerance test -Body composition and body mass index assessment -Waist circumference measurement -Pregnancy test -Fertility tests
4. Teaching methods	<p>Lectures: 39 hours</p> <p>Seminars: 16 hours</p> <p>Laboratory practical work: 45 hours</p>
5. Method of knowledge assessment and examination	<p>Continuous knowledge and skills assessment will be carried out through Partial exam 1, Partial exam 2, Seminars and Colloquium 1, Colloquium 2 and Colloquium 3.</p> <p>Partial Exam 1 (Modules 1. and 2.) is written exam in the form of essay questions and/or Extended Response Questions (ERQs) and/or Short Answer Questions (SAQs). A student can have maximum 35 points in total. In order to pass the 1st Partial exam, student must achieve minimum 19.25 points.</p> <p>Partial Exam 2 (Modules 3, 4, and 5.) is written exam in the form of essay questions and/or ERQs and/or SAQs. A student can have maximum 30 points in total. In order to pass the 2nd Partial exam, student must achieve minimum 16.5 points.</p> <p>Colloquium 1 (Renal physiology) is written, consist of either ERQs or SAQs. A student can have maximum 10 points in total. In order to pass, the student must achieve minimum 5.5 points.</p> <p>Colloquium 2 (Physiology of blood and hemostasis) is written, consist of either ERQs or SAQs. A student can have maximum 10 points in total. In order to pass the, student must achieve minimum 5.5 points.</p> <p>Colloquium 3 (Endocrine physiology. Metabolism and thermoregulation. Reproductive physiology) is written, consist of either ERQs or SAQs. A student can have maximum 10 points in total. In order to pass the, student must achieve minimum 5.5 points.</p> <p>Seminars - The Seminars are in the form of oral presentations. During the seminars, the teacher monitors and evaluates the student's work. The student must be prepared for the seminar in advance. Activity, interest and contribution to the successful realization of the seminars are evaluated. A student can have maximum 5 points in total based on seminars activites. In order to pass the seminars, student must achieve minimum 2.75 points in total.</p> <p>Final exam The final exam consists of those parts the student did not pass during the Course. The final exam is conducted according to the previously defined criteria.</p> <p>The repeated and correction exams The repeated and correction exams are conducted according to the previously defined criteria of the final exam.</p>

6. Literature	<p>Recommended:</p> <ol style="list-style-type: none"> 1. John E. Hall, Michael E. Hall - Guyton and Hall Textbook of Medical Physiology (Guyton Physiology) 14th Edition Elsevier Saunders; 2020. <p>Additional:</p> <ol style="list-style-type: none"> 1. Boron and Boulpaep. Medical Physiology. 2nd edition, Elsevier-Saunders; 2009.
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COURSE PLAN: HUMAN PHYSIOLOGY 2

Week	Form of Instructions and materials	Number of classes
Week 1.	Lecture: The Body Fluid compartments: extracellular and intracellular fluids; interstitial fluid	2
	Lecture: Multiple functions of the kidneys in homeostasis, the nephron is the functional unit of the kidney. Glomerular filtration	2
	Practical laboratory work: Osmotic resistance of red blood cells; Hemolysis of red blood cells	3
Week 2.	Lecture: Renal Blood Flow; Determinants of GFR and renal blood flow	2
	Lecture: Urine formation by the kidneys: tubular processing of the glomerular filtrate	2
	Practical laboratory work: Renal physiology (CD presentation, A.D.A.M., Interactive Phys lab)	3
Week 3.	Lecture: Regulation of extracellular fluid osmolality and sodium concentration	2
	Seminar: Renal regulation of Potassium, Calcium, Phosphate, Magnesium;	2
	Practical laboratory work: Renal physiology (CD presentation, A.D.A.M., Interactive Phys lab); Renal clearance tests	3
Week 4.	Lecture: Integration of renal mechanisms for control of blood volume and extra-cellular fluid volume	1
	Lecture: Acid base balance	2
	Practical laboratory work: Acid base balance (CD presentation, A.D.A.M., Interactive Phys lab). Problem based learning - Acid base balance	3
Week 5.	Seminar: Micturition, Renal clearance	1
	Lecture: Physiological roles of blood, red blood cells, blood types, transfusion	2

	Practical laboratory work: <i>Colloquium 1</i>. Blood sampling; Determination of erythrocyte sedimentation rate (ESR); Hematocrit (Hct)	3
Week 6.	Lecture: Hemostasis and Blood Coagulation	2
	Lecture: Resistance of the body to infection; Leukocytes; Granulocyte; The monocyte-macrophage system. Immunity	2
	Practical laboratory work: Red blood cells count (RBC); Hemoglobin (Hb); Calculation of blood indices	3
Week 7.	Seminar: <i>Partial exam 1</i>	2
	Lecture: General principles of gastrointestinal function - motility, nervous control, and blood circulation, propulsion and mixing of food in the alimentary tract	2
	Practical laboratory work: Case report - anemia	3
Week 8.	Seminar: Secretory functions of the alimentary tract	2
	Lecture: Digestion and absorption in the gastrointestinal tract	2
	Practical laboratory work: Total leukocyte (white blood cells) count and differential leukocyte count (DLC)	3
Week 9.	Seminar: Liver, bile and pancreas physiology	2
	Lecture: Dietary balances and regulation of feeding	2
	Practical laboratory work: Determination of bleeding time, determination of clotting time; blood typing, skills repetition	3
Week 10.	Seminar: Obesity and Starvation	1
	Lecture: Coordination of body functions by chemical messengers, introduction to endocrinology	2
	Practical laboratory work: <i>Colloquium 2</i>. Salivary flow rate test	3
Week 11.	Lecture: Pituitary Hormones and Their Control by the Hypothalamus	2
	Lecture: Thyroid Metabolic Hormones	2
	Practical laboratory work: Energy expenditure. Estimation of basal metabolic rate. Basal metabolic rate and body size. Thyroid gland hormones and metabolic rate (CD Physiology interactive lab simulations. 2.0)	3
Week 12.	Lecture: Adrenocortical and adrenomedullary hormones. Stress	2
	Lecture: Insulin and glucagon	2
	Practical laboratory work: Glucose homeostasis. Determination of blood glucose level. Oral Glucose Tolerance Test (OGTT)	3

Week 13.	Lecture: Parathyroid hormone, calcitonin, calcium and phosphate metabolism, vitamin D, bone and teeth	2
	Seminar: Energetics and metabolic rate. Body temperature. Temperature regulation	2
	Practical laboratory work: Estimation of daily energy needs. Definition of principles of healthy diet. Individually daily meal plan. Body composition analysis. Body mass index. Assessment of body fat distribution. Measurement of waist and hip circumferences. Waist-to-Hip ratio;	3
Week 14.	Lecture: Female physiology before pregnancy and female hormones	2
	Seminar: Reproductive and hormonal functions of the male	1
	Practical laboratory work: Menstrual cycle - ovarian and uterine cycle. Pregnancy test. Female fertility tests. Male fertility tests	3
Week 15.	Seminar: Reproduction, pregnancy and lactation	1
	Seminar: <i>Partial exam 2.</i>	2
	Practical laboratory work: <i>Colloquium 3.</i>	3
Week 17.-18.	Final exam	
Week 19.-20.	Re-sit exam	