UNIWERSYTET
WARMIŃSKO-MAZURSKI W OLSZTYNIE
WYDZIAŁ LEKARSKI, COLLEGIUM MEDICUM

Department of Human Physiology and Pathophysiology

PHYSIOLOGY - CLASSES (44 h), Fall semester 2026/2027

No.	Topic	Tutor	Hours	Literature
	Blood 1 Properties of blood, function and composition. Plasma proteins (origin, properties, functions). Properties of red blood cells (RBC). Hemoglobin (function, structure, types). Measurement of the oxygen-carrying capacity of RBC include: RBC count, hemoglobin concentration and packed cell volume (PCV). Determination of blood indices. Effect of isotonic, hypertonic and hypotonic solutions on RBC. RBC fragility test.	A. Skowrońska Associate Professor	4 h	Chapter 33, Red Blood Cells, Anemia, and Polycythemia. Hemoglobin Guyton and Hall • (13th Edition)
	Blood 2 White blood cells: normal count, properties, lifespan, classification, variation in WBC count, functions. Tests for blood typing typing, the Rh System. Buffering system of blood.	A. Skowrońska Associate Professor	4 h	Chapter 34, Leukocytes, Granulocytes, the Monocyte-Macrophage System, and Inflammation. Guyton and Hall • (13th, 14th Edition)
	Blood 3 Hemostasis: platelets, structures, normal count and variations, functions, activators and inhibitors of platelets. Stages of hemostasis. Coagulation mechanism. Anticlotting mechanism in the body. Clotting and bleeding time tests. Anticoagulants. Procoagulants. Tests for blood clotting. Fibrinolysis. Factors involved in coagulation.	A. Skowrońska Associate Professor	4 h	Chapter 37, Hemostasis and Blood Coagulation. Guyton and Hall, • (13th,14th Edition)
	BLOOD AND IMMUNE SYSTEM	**COLLOQUIUM**	**(C3)**	**SKOWROŃSKA A.**

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1	**Neurophysiology 1** Electrical signals in neurons. Action potentials along an axon. Electrical properties of neurons: resting membrane potentials and action potentials of neurons; relative and absolute refractory periods; (simulation programs).	E. Lepiarczyk, Associate Professor A. Bossowska, Associate Professor	4 h	• Guyton and Hall (13th Edition), the whole chapter 5 („Membrane potentials and Action Potentials") • Guyton and Hall, chapter 45 ("Central nervous system synapses, Some special characteristics of synaptic transmission")
2	**Neurophysiology 2** Study of spinal reflexes. Monosynaptic and polysynaptic somatic motor reflexes: flexion reflexes; crossed extensor reflexes; myotatic reflexes – the patellar tendon (knee jerk) reflex. Examination of reaction times to visual, auditory and tactile stimuli.	E. Lepiarczyk, Associate Professor	4 h	• Guyton and Hall (13th Edition), the whole chapter 54 ("Motor Functions of the Spinal Cord; the cord reflexes") • Guyton and Hall chapter 58, starting from "Thoughts, consciousness, and memory"
3	**Neurophysiology 3** Sensory physiology the eye and vision: calculation of the visual field by automated perimetry exam; subjective and objective methods of the eye investigation; ophthalmoscopy; measurements of the visual acuity, contrast sensitivity and colors vision; binocular vision, stereoscopic depth perception, central and peripheral vision; the retinal and cortical mechanisms of the visual illusions. Assessment of papillary reflexes. The Stroop test. Principles of electroencephalography.	E. Lepiarczyk, Associate Professor	4 h	• Guyton and Hall (13th Edition), chapter 49 ("the Eye: I. optics of vision"), chapter 50 ("the Eye: II. Receptor and Neural Function of the Retina"), chapter 51 (the Eye: III. Central Neurophysiology of vision) • Guyton and Hall, chapter 60 (starting from "Brain waves")

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4	**Neurophysiology 4** Sensory physiology continue: hearing, sound transmission through the ear, (the Rinne and the Weber tests); the ear: equilibrium, the vestibular apparatus (the vestibulo -spinal reflex); Chemoreception smell and taste: (distribution of taste buds), touch receptors in skin; a receptive fields, two-point discrimination).	E. Lepiarczyk, Associate Professor	4 h	• Guyton and Hall (13th Edition), chapter47 ("Somatic sensations: general organization, the tactile and position senses"), chapter 53 ("The chemical senses – Taste and smell") • chapter 52 ("The sense of hearing"), chapter 55, pages 674-679 – from "Vestibular apparatus"
	NEUROPHYSIOLOGY	**COLLOQUIUM**	**(C1)**	**LEPIARCZYK E.**
5	**Skeletal Muscle** Electrical and mechanical events in muscle contraction. Summation of contractions. Incomplete and complete tetanus contractions of muscles. Isotonic, isometric contractions. The relationship between load and velocity (speed) of contraction. Muscular single twitch response as a function of the stimulation activity. Mechanisms of muscular fatigue.	E. Lepiarczyk, Associate Professor	4 h	• Guyton and Hall (13th Edition), the whole chapter 6 ("Contraction of Skeletal Muscle") and chapter 7 ("Excitation of Skeletal Muscle: Neuromuscular Transmission and Excitation – Contraction Coupling")
6	**Smooth Muscles** Electromyography. Structure and function of the contractile system in smooth muscles. Types of smooth muscle - single-unit and multi-unit smooth muscles. Regulation of contraction by calcium ions. Neuromuscular junctions of smooth muscle. Membrane potentials and action potentials in smooth muscle. Nervous and hormonal control of smooth muscle contraction (simulation programs).	A. Bossowska, Associate Professor	4 h	**Chapter 8** (the whole chapter) - Excitation and Contraction of Smooth Muscle **(Guyton and Hall - 14th Edition)**
	MUSCLE AND AUTONOMIC NERVOUS SYSTEM	**COLLOQUIUM**	**(C2)**	**LEPIARCZYK E.**

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10	**Cardiovascular 1** Heart. The myocardium. Conduction pathways, pacemaker cells of the myocardium. The sequence of myocardial activation. Stages of the cardiac action potential. The cardiac conduction system. The cardiac cycle, the five phases of the cardiac cycle, mechanical and electrical phenomena occurring during a single cycle. The SimHeart experimental simulation programme: heart rate under the influence of the sympathetic and parasympathetic nervous systems, hormones and other substances. Case studies related to the topic of the lecture.	A. Bossowska Associate Professor	4 h	Chapter 4 Costanzo (6th Edition)
11	**Cardiovascular 2** Electrocardiography and heart sounds: auscultation, normal heart sounds recorded using a stethoscope and a cardiac microphone. Understanding the ECG, the physical principles of electrocardiography, ECG leads, normal clinical features of the ECG. The mean electrical axis of the heart. Normal sinus rhythm. A basic approach to ECG analysis. Respiratory sinus arrhythmia. Case studies related to the topic of the lecture.	B. Kordas MVD	4 h	**Chapter 16** – Structure of the microcirculation and capillary system; flow of blood in the capillaries—vasomotion; exchange of water, nutrients, and other substances between the blood and interstitial fluid; interstitium and interstitial fluid; fluid filtration across capillaries **(Guyton and Hall - 14th Edition)** **Chapter 17** - Local and Humoral Control of Tissue Blood Flow (the whole chapter - **Guyton and Hall - 14th Edition**)

THE COLLOQUIUM IS SCHEDULE WILL BE DISCUSSED DURING THE FIRST CLASS

Guyton and Hall "**Medical Physiology**" 13th Edition or 14th Edition 2020, Elsevier

Linda S. Costanzo "**Physiology"**, (6th Edition) 2018 or 2022 Wolters Kluwer Health

Guyton & Hall" **Physiology Review"** 2021 Elsevier, Health Sciences Division

Olsztyn, 01.10.2026.

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