



Department of Human Physiology and Pathophysiology

PHYSIOLOGY - CLASSES (44 h), Fall semester 2025/2026

No.	Topic	Tutor	Hours	Literature
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	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”)
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), chapter 47 (“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)	
5	Skeletal Muscle Electrical and mechanical events in muscle contraction. Summation of	E. Lepiarczyk, Associate Professor	4 h	• Guyton and Hall (13th Edition), the





	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.			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)	
7	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.	Skowrońska, Associate Professor Kozłowska, Associate Professor	4 h	Chapter 33, Red Blood Cells, Anemia, and Polycythemia. Hemoglobin Guyton and Hall (13 th Edition)
8	Blood 2 White blood cells: normal count, properties, lifespan, classification, variation in WBC count, functions. Erythrocyte sedimentation rate (ESR). Tests for blood typing typing, the Rh System. Buffering system	A. Kozłowska Associate Professor	4 h	Chapter 34, Leukocytes, Granulocytes, the Monocyte-Macrophage System, and Inflammation. Guyton and Hall (13 th , 14 th Edition)





	of blood.			
9	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, (13 th ,14 th Edition)
	BLOOD AND IMMUNE SYSTEM	COLLOQUIUM	(C3)	
10	Cardiovascular 1 Blood vessels. Arterial system, venous system. Hemodynamics. Pressure profile in the vasculature. Arterial pressure in the systemic circulation. Regulation of arterial pressure, estimation of blood pressure, MAP (mean arterial blood pressure), stroke volume, CO (cardiac output), cardiac index, ejection fraction. Orthostatic reaction of the artery blood pressure. Martinet test.	A. Bossowska Associate Professor	4 h	Chapter 4 Costanzo (6 th Edition)
11	Cardiovascular 2 Peripheral circulation: Arterial palpation of the radial, ulnar, brachial and carotid pulses; simultaneously registration of the ECG and pulse; investigation of the arterial blood supply to the fingers by palmar arches - anastomoses of the radial and ulnar arteries. Measurement of the pulse wave velocity. Thermoregulation: warm, cold, temperature and thermography. Measurements of the temperature, the amplitude of the finger pulse and artery blood pressure changes after provocation with warm water and after cold pressure test. Paradoxal regulation of the skin perfusion by cold provocation.	A. Bossowska, Associate Professor	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 AT THE TIME OF LECTURE AND THE PLACE IS THE SAME AS LECTURE!





UNIWERSYTET
WARMIŃSKO-MAZURSKI W OLSZTYNIE
WYDZIAŁ LEKARSKI, COLLEGIUM MEDICUM

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

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