

SYLLABUS

concerning the cycle of education 2019-2025

Academic Year 2019/2020

1. BASIC INFORMATION

1.1. Basic information concerning this subject / module

Subject / Module	Anatomy
Course code / module *	A/A
Faculty of (name of the leading direction)	Faculty of Medicine, University of Rzeszow
Department Name	Department of Correct Anatomy
Field of study	Medical
Level of education	Uniform Master studies
Profile	General academic
Form of study	Stationary / non-stationary
Year and semester	1st year, 2nd semester
Type of course	Obligatory
Coordinator	Professor dr hab. n med. Stanisław Orkisz,
Asistants	Dr K. Balawender - exercises Lek. N. Leksa - exercises Lek. J. Klęba - exercises

* - According to the resolutions of the Faculty of Medicine

1.2. Forms of classes, number of hours and ECTS

Lecture	Exercise	Conversation	Laboratory	Seminar	ZP	Practical	Self-learning	Number of points ECTS
30	45	-	-	25	-	-	15	11

1.3. The form of class activities

☒ classes are in the traditional form

☒ classes are implemented using methods and techniques of distance learning

1.4. Examination Forms / module (exam, credit with grade or credit without grade)

2. REQUIREMENTS

Knowledge about the structure and functioning of the human body at the high school level.

3. OBJECTIVES, OUTCOMES, AND PROGRAM CONTENT USED IN TEACHING METHODS

3.1. Objectives of this course/module

C1	Understanding the detailed anatomical structure of the human body based on descriptive anatomy, which divides the human body into particular systems considered in sequence: bone, muscle, digestive, respiratory, urogenital, internal, vascular, nervous, common and sensory organs.
C2	Understanding correct human body structure, determines the functions of organs, systems and the organism as a whole. Dynamic development of imaging techniques of human body structures; radiology, computed tomography, magnetic resonance imaging and others that enable the visualization of structures and the interpretation of topographical relations between them, requires knowledge of normal anatomy. The student of the medical faculty, having knowledge in all the above-mentioned areas, acquires the ability to interpret the construction of the living subject to a degree that enables understanding of clinical issues and is prepared to the extent necessary to expand it in subsequent years of study and informed practical medical practice.

3.2 Outcomes for the course / module (to be completed by the coordinator)

EK (the effect of education)	The content of learning outcomes defined for the class (module)	Reference to directional effects (KEK)
EK_01	He knows anatomical appointments in Polish and English.	A.W1
EK_02	Knows the structure of the human body in the topographical aspect.	AW2
EK_03	Has detailed knowledge of the structure of the macroscopic organs of the circulatory system, respiratory system, digestive system, urinary system, genital system, sensory organs and the shell of the common body.	A.W2
EK_04	Knowledge of the structure and structural-functional correlation of the osteoarticular and muscular system.	A.W2
EK_05	Describes topographical relations between individual organs knows basic functional systems, their specialization, connections and symptoms of damage.	A.W3
EK_06	Can explain the anatomical basis of the physical examination (the site of the valves and points of their auscultation, the boundaries of the lungs and the pleura, the pupillary reflex).	A.U3
EK_07	Defines, recognizes and indicates relations between anatomical structures in the documentation of life-long imaging of structures, especially in the field of radiology and imaging diagnostics.	A.U4
EK_08	Uses in speech and writing anatomical appointment.	A.U5

3.3 Content curriculum (filled by the coordinator)

A. Lectures

Problems of the lecture

Course contents

Lecture 1

Peripheral nervous system

Reflex arc - the concept and elements of the reflex arc

Nerve plexuses - formation, branches, range of innervation

Cervical plexus, brachial, lumbar and sacral plexus

Lecture 2

Central nervous system

Divisions including embryological, topographical and clinical criteria

Meninges of the brain and spinal cord.

Vascularization and innervation of meninges

Spaces: epidural, subdural, subarachnoid - clinical significance

Subarachnoidal cisterns, circulation of cerebrospinal fluid

Lecture 3

Cerebrum. Cortex cerebri.

Division of the telencephalon; lobes, cerebral gyri and sulci. Topography of cerebral cortical centers

Commissural, association and projection fibres – their characteristics

Basal ganglia - structure, function, connections

Damage to the basal ganglia - clinical aspects

Limbic system

Lecture 4

Diencephalon and third ventricle.

Walls and recesses of third ventricle.

Division of the diencephalon

Thalamus – external and internal structure, nuclei, division, connections and function

Hypothalamus - division and function

Lecture 5

Midbrain

External structure of the midbrain: cerebral peduncles, tectum of midbrain

Internal structure: location of cranial nuclei. Substantia nigra.

Centers of extrapyramidal system

Reticular formation

Crus cerebri. Topography of nerve pathways.

"Reward system"

Lecture 6

Hindbrain. Brainstem. Metencephalon. Myelencephalon.

Pons. Pontine nuclei.

The course of pontine fibers. Rhomboid fossa.

Cerebellum, phylogenetic division. External and internal structure.

Cerebellar nuclei.

Lecture 7

Autonomic nervous system

Division of the autonomic system

Centers of the sympathetic and parasympathetic system

Autonomic ganglia.

Clinical aspects

Lecture 8

Respiratory system.

Upper and lower respiratory tract. Larynx and trachea. Morphology of the lungs and pleura.

Inspiratory and expiratory muscles. Mechanics of breathing.

Auxiliary respiratory muscles.

Lecture 9

Digestive system.

The division of the digestive tract.

General construction; wall layers of the digestive tract.

Abdominal organs: stomach, duodenum, small and large intestine.

Peritoneum, retroperitoneal space and its contents.

Lecture 10

Large glands of the digestive tract.

Construction of the liver and bile ducts.

Pancreas, topography and structure, clinical implications.

Vascularization of the liver and pancreas.

Parotid, submandibular and sublingual glands.

Lecture 11

Urinary tract

Topography, structure and vascularization of the kidneys. Nephron.

Urinary pathways: ureter, urinary bladder, urethra.

Lecture 12

Male sex organs

The structure and function of the testis.

The epididymis, the vas deferens, the seminal vesicles

Spermatogenesis and spermiogenesis.

Descent of the testis.

External male genitalia.

Lecture 13

Internal female genitalia.

Ovary - location, construction and function.

Uterus. Fallopian tube and vagina.

Menstrual cycle, fertilization, pregnancy.

External female genitalia.

Lecture 14

Endocrine glands

Structure and function of the glands.

The hypothalamic - pituitary – gonads axis.

Neurosecretion.

Location, general structure of the pituitary, pineal gland, thyroid gland, parathyroid, adrenal glands, parts of the endocrine pancreas.

Lecture 15

Common integumentum of body. The structure and activity of the skin.

Cutis, epidermis, subcutaneous tissue, cutaneous receptors.

B. Problems of exercises

Course contents

Exercise 1: Basic knowledge about skull bone structure: composition, shape, internal structure, development. Identification of constituent bones: even and even bones, division into splanchno - and neurocranium. Development of the human skull - bones formed as a result of intramembranous and endochondral ossification. Baby and infant skull, fontanelle. Skull vault. Connections of the skull bones: synarthroses (syndesmoses, synchondroses, synostoses), diarthroses (synovial joints). Gomphosis as a special type of connection. Sutures: coronal, sagittal, lambdoidal, sphenoparietal, squamous, sphenosquamosal, parietomastoid, frontozygomatic, sphenozygomatic, median palatine, transverse palatine, frontonasal, frontomaxillary, zygomaticomaxillary . Sutural (Wormian) bone. Approximate time of ossification of the skull sutures – clinical significance. Articular joints - examples, temporomandibular joint, (elevation, depression, protraction, retraction, lateral movements (grinding movements). Differences in the structure of the skull related to age and gender. Skull base - main openings based on the skull. Skull under the influence of injuries - skull base fractures.

Exercise 2: Base of the skull –anterior, middle and posterior cranial fossa (bone forming them, holes, boundaries, contents. Openings on the base skull leading the larger vessels and the cranial nerves or their branches. Skull bones: occipital (basal part, clivus, lateral parts - and structures associated with these parts, including the pharyngeal tubercle, structures on the external and internal surface of the squama: external and internal occipital protuberances transverse, external and internal occipital crests, nuchal lines) . Grooves for sinuses: superior sagittal, transverse, sigmoid. Occipital condyles, hypoglossal canal, condylar canal, jugular notch. Parietal bone (margins, elements visible on the external and internal surface: parietal tuber. Temporal bone (petrous part (pyramid), squamous part, tympanic part = pyramid and elements related to these parts, grooves for: sigmoid sinus, superior sagittal sinus, middle meningeal artery. Zygomatic process, mandibular fossa, three pyramid surfaces, internal auditory opening, internal auditory meatus, jugular notch, carotid canal, styloid process, stylomastoid foramen, facial canal, external acoustic openings and meatus. Sphenoidal bone -body, lesser and greater wing of sphenoidal body, pterygoid process. Turkish saddle, hypophysial fossa, carotid groove, sphenoidal sinus, optic canal, foramen rotundum, foramen ovale. Frontal bone (squama, orbital part, nasal part and related structures: frontal tuber, glabella, supraorbital border, supraorbital notch, frontal notch (frontal foramen), zygomatic process, groove for superior sagittal sinus, nasal spine. Zygomatic bone: lateral, temporal and orbital surfaces of zygomatic bone. Maxilla (body, frontal, zygomatic, palatine, alveolar processes, and related components: maxillary sinus and maxillary hiatus, infraorbital margin and foramen, nasal notch and anterior nasal spine. Ethmoidal bone; cribriform plate, crista galli, ethmoidal air cells, semilunar hiatus, perpendicular plate and orbital plate of ethmoidal bone, supreme, superior, middle and inferior nasal concha, maxillary and ethmoidal processes. Palatine bone; perpendicular plate, pyramidal, orbital and sphenoidal processes of palatine bone. Horizontal plate of palatine bone, lesser palatine foramina, posterior nasal spine, nasal crest, palatine crest. Mandible: body, Ramus of mandible, coronoid and condylar processes, mandibular notch, mental protuberance, mental foramen, digastric fossa, mental spine, alveolar arch of mandible, mandibular foramen and canal, head of mandible, neck of mandible. Pneumatic bones of the skull- sinuses: frontal, ethmoidal air cells, maxillary, sphenoid.

Exercise 3: Nasal cavity. Nasal cartilages: lateral, greater alar, lesser alar, accessory, septal, vomeronasal. Nasal cavity: nasal openings (nostrils), choanae, nasal septum, nasal vestibule, superior, middle and inferior nasal concha, cavernous plexus of conchae

(Kiesselbach plexus), superior, middle and inferior nasal meatus, nasopharyngeal meatus, membranous and cartilaginous part of nasal septum, bony part of nasal septum, vomeronasal organ. Respiratory and olfactory region of nasal mucosa, ethmoidal bulla, semilunar hiatus. Paranasal sinuses: frontal, maxillary, sphenoidal, ethmoidal air cells. Ostium of paranasal sinuses to the nasal cavity. Oral cavity; lips, philtrum, cheek, buccal fat pad, frenulum of lips, parotid papilla. Bones forming the hard palate, soft palate, the muscles of the palate and their innervation. Gingiva. Small glands of the oral cavity. Major salivary glands: sublingual, submandibular, parotid glands. Teeth: crown, neck, root of tooth, enamel, dentine, periodontium, cementum. Deciduous (milk) teeth, permanent teeth: incisor teeth, canine teeth, premolar teeth, molar teeth, wisdom teeth. Tongue: body, root, dorsum. Median groove of tongue, foramen caecum, thyroglossal duct. Lingual tonsil; lingual follicles. Papillae of tongue: filiform, conical, fungiform, vallate, foliate, taste buds. Internal muscles of tongue: superior longitudinal, inferior longitudinal, transverse, vertical. External muscles of tongue: genioglossus, hyoglossus, styloglossus. Vascularization and innervation of the tongue. Taste route. Receptors- taste buds. First neuron – neurons in geniculate ganglion (VII), glossopharyngeal ganglion and ganglion of vagus nerve (IX and X), solitary tract. The second neuron - the nucleus of the solitary tract, from there to the opposite thalamus. Third neuron - cells of accessory arcuate nucleus in ventral postero-medial nucleus. End of the taste road: postcentral gyrus (frontoparietal operculum). Salivary glands: parotid, submandibular, sublingual - composition of saliva and meaning. Pharynx: Throat - division into : nasopharynx, oropharynx and laryngopharynx. Boundaries, structure of pharyngeal wall. Muscles: constrictors-outer circular layer (superior, middle, inferior constrictors), inner longitudinal layer (stylopharyngeus, salpingopharyngeus, palatopharyngeus). Innervation of pharynx. Retropharyngeal space – clinical significance. Vascularization of the head: arteries and veins of the head and neck.

Exercise 4: Meninges of the brain and spinal cord. The hard tire and its folds and reflections: falx cerebri, tentorium cerebelli, falx cerebelli, sellar diaphragm, trigeminal cave, epidural space, subdural space. Clinical significance of the above structures. Dura mater sinuses: superior sagittal, inferior sagittal, transverse, occipital, confluence of sinuses, sigmoid, basilar plexus, straight, inferior petrosal, superior petrosal, cavernous, intercavernous, sphenoparietal. Dura mater vascularization and innervation. Arachnoid: subarachnoid space, cerebrospinal fluid, arachnoid granulations, arachnoid trabeculae. Subarachnoid cisterns: posteriori cerebellomedullary (cisterna magna), lateral cerebellomedullary, cisterna of lateral fossa, chiasmatic, interpeduncular, ambient pontocerebellar. Perivascular space (Virchow-Robin). Pia mater. Tela choroidea of third and fourth ventricle, choroid plexus of lateral, third and fourth ventricles. Meninges of spinal cord. Telencephalon; lobes, gyri, sulci. The boundaries of the lobes, the ability to indicate the gyri of a given lobe. Construction of gray and white matter. Functional centers in the cerebral cortex: limbic system, hippocampus formation and functions assigned to them.

Exercise 5: Amygdaloid body (amygdala): basolateral part and corticomedial part. Basal nuclei: corpus striatum, caudate nucleus, lentiform nucleus, claustrum. Neostriatum: caudate nucleus + putamen. Paleostriatum: globus pallidus with lentiform nucleus. Internal structure of hemispheres - white substance. Association, commissural and projecting neurofibers. Internal, external and extreme capsule. Corpus callosum: splenium, trunk (body), genu, and rostrum corpus callosum. Fornix: crus, body, tenia, column and commissure of fornix., Septum pellucidum: cavity and lamina of septum. Cerebrospinal fluid - composition and function. The formation of cerebrospinal fluid in the choroid plexus of all ventricles. Absorption of cerebrospinal fluid. The walls of lateral and third ventricles. Diencephalon-division: thalamencephalon (epithalamus, thalamus, metathalamus), subthalamus, hypothalamus. Pineal gland and its product-melatonin. Habenula, habenular trigone, habenular commissure, posteriori (epithalamic) commissure, pretectal area. Thalamus: dorsal thalamus, interthalamic adhesion, anterior tubercle, internal and external medullary laminae, medullary stria,

pulvinar. Reticular nucleus of thalamus. Anterior nuclei: anterodorsal, anteromedial, anteroventral. Intralaminar nuclei: centromedian, paracentral, parafascicular. Ventral nuclei; ventrolateral nucleus. Dorsal nuclei. Subthalamic nucleus, zona incerta. Lateral geniculate body (LGB - visual pathway), medial geniculate body (MGB – acoustic pathway). Hypothalamus - division: supraoptic, tuberal, mammillary regions. Preoptic n., supraoptic n., paraventricular n., anterior hypothalamic n., tuberal nuclei, ventromedial and dorsomedial nn, dorsal, posterior n., periventricular n., arcuate n., mammillary bodies, posterior hypothalamic n. Medial forebrain bundle (MFB), mammillothalamic fasciculus (Vicus d'Azyr). Function of hypothalamus. Hypophysis (Pituitary gland): division-adenohypophysis; pars distalis and intermedia, neurohypophysis; infundibulum and neural lobe of neurohypophysis. Influence of the hypothalamus on the pituitary gland. Hormones of the anterior pituitary gland. Third ventricle.

Test 1

Exercise 6: External brainstem structure. Cerebral peduncle: cerebral crus, tegmentum of midbrain, interpeduncular fossa, posterior perforated substance. Cerebral crus: corticospinal, corticonuclear, corticopontine, corticopontine, parietotemporo-pontine fibers. Substantia nigra, periaqueductal grey. Mesencephalic nuclei: oculomotor nerve (III), trochlear nerve (IV), mesencephalic tract of the trigeminal n. Red nucleus. Tectum: tectal lamina, inferior and superior colliculus of tectal lamina, brachium of inferior and superior colliculus. Tegmentum: trigone of lemniscus, aqueduct of midbrain (of Sylvius). Tegmentum-white matter: medial longitudinal fasciculus (MLF), decussations of tegmentum, decussation of superior cerebellar peduncles. Lemniscus: lateral, medial, spinal, trigeminal. The fourth ventricle: superior and inferior medullary velum, area postrema, choroid plexus of fourth ventricle, obex, median and lateral apertures of fourth ventricle. Rhomboid fossa: median sulcus, median eminence, facial colliculus, locus ceruleus, vestibular area, medullary stria, trigone of hypoglossal nerve, trigone of vagus nerve. Location of cranial nerves nuclei in the brainstem.

Exercise 7: Cerebellum; two lateral hemispheres, vermis. Position of cerebellum: behind pons and medulla oblongata, separated by the cavity of fourth ventricle. Morphological division into lobes: anterior lobe (rostral), posterior (caudal) lobe, flocculo-nodular lobe, divided by primary and posterolateral fissures. Surface highly convoluted forming arbor vitae (oriented transversely folds or folia). Tonsil of the cerebellum. Morphological and clinical division into longitudinal zones: vermis, intermediate (paravermis) and lateral zone. Peduncles connected to brainstem: superior – with midbrain, middle – with pons and inferior – with medulla oblongata. The cerebellar cortex: molecular, Purkinje cell and granular layers. Division into lobules. Afferent fibers: climbing and mossy fibers. Cerebellar nuclei: fastigial, globosus, emboliform and dentate. Functional aspects of the cerebellum morphological structures. Function of archicerebellum, paleocerebellum and neocerebellum. Cerebellar lesions: ataxia, ataxia, atony, asthenia, adiadochokinesia. Reticular formation, functions: motor, sensory, visceral, associated with consciousness, sense of existence, wakefulness.

Exercise 8: Medulla oblongata; external structure. Pyramid and pyramidal decussation. Anterior median fissure, anterolateral sulcus, posterolateral sulcus. Olive of medulla oblongata. Cuneate fasciculus, fasciculus gracilis, posterior median sulcus. Spinal cord-external structure: cervical and lumbosacral enlargements, medullary conus, filum terminale. Terminal ventricle (lumbar cistern), clinical aspects: lumbar puncture. Gray matter ventral, lateral and dorsal horn. Anterior, lateral and posterior funiculus of spinal cord. Cross-section of spinal cord: laminae of Rexed. Nuclei of spinal cord. Central canal and intermediate gray matter. White matter: ascending and descending roads on

spinal crosssection- detailed localisation. Clinical syndromes: spinal shock, Brown-Sequard syndrome, syringomyelia. Cortico-spinal and cortico-nuclear roads: paralysis flaccida. Spinothalamic roads of protopathic feeling / touch, pain, temperature/. Road of deep sensation: gracile and cuneate fasciculus. Spinal cord meninges, epidural, subdural and subarachnoid spaces. Vascularization of spinal cord.

Exercise 9: Spinal nerve: roots, trunk, branches. Anterior roots: projections of motor cells of the anterior horn and autonomic (intermediomedial, intermediolateral n.) lateral horn. Posterior roots, dorsal root ganglion. Trunk of spinal nerve: branches (ventral, dorsal, meningeal, white communicating branch – preganglionic, gray communicating branch – postganglionic). Gray matter of spinal cord on cross section. Posterior gray column – lamina I; posteromarginal nucleus (Lissauer's marginal layer), lamina II – substantia gelatinosa of Rolando, lamina III and IV – nucleus proprius, Lamina V – neck of dorsal horn (mechanical and visceral nociceptors), lamina VI – base of dorsal horn. Lateral gray column – lamina VII – intermediolateral and intermediomedial nuclei, lamina X – gray matter surrounding the central canal. Anterior gray column – lamina VIII – motor interneurons, lamina IX – lateral (in limb regions) and medial neurons and spinal accessory nuclei at cervical level, Onuf's nucleus in the sacral region. Spinal nucleus of the accessory nerve (XI) in the cervical part. Posterior cord (funiculus posterior): gracile fascicle of Goll, cuneate fascicle of Burdach- spino-bulbar tract, septomarginal fasciculus, interfascicular fasciculus. Lateral funiculus: lateral corticospinal (pyramidal) tract, rubrospinal tract, lateral corticospinal tract posterior spinocerebellar tract, anterior spinocerebellar tract. Anterior funiculus: sulcomarginal fasciculus, tracts: anterior cortico-spinal (pyramidal) vestibulospinal, reticulospinal, anterior spino-thalamic, pontoreticulospinal, tectospinal.

Exercise 10: Cerebral arterial vascularization: internal carotid system and vertebrobasilar system. Common carotid artery-division: internal carotid artery, external carotid artery. Internal carotid artery (ICA): cervical part-from the carotid bifurcation to the petrous part temporal bone. Petrous part-carotid canal in the pyramid temporal bone. (external carotid foramen, carotid canal, internal carotid foramen in the middle cranial fossa. Branches in this part: caroticotympanic a., pterygoid branch of ICA. Cavernous part-in the cavernous sinus. Branches cavernous part: tentorial, meningeal, branch to trigeminal ganglion, cavernous sinus branch, inferior hypophysial artery. Cerebral part- to the chiasmatic cistern: division on ACA and MCA. Branches: superior hypophysial artery, clival branch, ophthalmic artery, anterior choroidal artery (AChA), anterior cerebral artery (ACA), middle cerebral artery (MCA). Segments of ACA and MCA, central and cortical branches. Extent of vascularization ACA and MCA. Vertebral artery: prevertebral part, cervical part-branches: spinal radicular branches, muscular branches, atlantic (suboccipital) part, intracranial part: branches: meningeal branches, anterior spinal artery, posterior inferior cerebellar artery (PICA), choroidal branch to fourth ventricle, tonsillar branch, posterior spinal artery, basilar artery. Basilar artery-branches: anterior inferior cerebellar artery (AICA), labyrinthine artery, pontine arteries, superior cerebellar artery (SCA), posterior cerebellar artery (PCA). Cerebral arterial circle (of Willis). Clinical aspects of cerebral vascularization: aneurysms, haemorrhagic and ischemic strokes, arteriovenous malformations, epidural hematoma, subdural and subarachnoid haemorrhage. Spinal vascularization: anterior and posterior spinal arteries. Outflow of venous blood from the brain. Superficial and deep cerebral veins. Dural sinuses. Veins of vertebral column: anterior/posterior external vertebral venous plexus, anterior/posterior internal venous plexus.

Test 2

Exercise 11: Superior centers of the autonomic system (limbic system, amygdala, hypothalamus, locus coeruleus, reticular formation and others). Functional division of the autonomic system. The sympathetic part. Medulla oblongata: vasomotor, respiratory, swallowing, vomiting centers. Sympathetic trunk, sympathetic nerves: ganglions along the arteries, cardiac nerves, visceral nerves. Plexuses: pulmonary, cardiac, superior mesenteric, intermesenteric, inferior mesenteric. Superior cervical ganglion. Stellate ganglion. Greater thoracic splanchnic, lesser thoracic splanchnic, least thoracic splanchnic nerves. The parasympathetic part of the autonomic nervous system. Ciliary ganglion. Pterygopalatine ganglion. Submandibular ganglion: fibers from superior salivatory nucleus (n.VII) through tympanic chorda. Otic ganglion: the fibers from the dorsal nucleus n. IX (inferior salivary nucleus) - through the tympanic nerve, lesser petrosal nerve to the parotid gland. Nerve X - the dorsal nucleus n. X; field of supply - cardiac, bronchial, fundus, pancreatic glands. The sacral region - intermediomedial nucleus, at the level of neuromers S2-S4. Pelvic visceral nerves (nervi erigentes). Intestinal part of the autonomic system. - Intramuscular plexus (plexus myentericus seu Auerbachii), submucosal plexus (plexus submucosus seu Meissneri).

Exercise 12: Facial nerve (CN VII) - motor part, intermediate n. - parasympathetic and sensory. The larger part innervates: stapedius, stylohyoid, posterior digastric belly, facial expressions m. and buccinator, platysma and occipitalis. The smaller part-parasympathetic: lacrimal gland, submandibular and sublingual gland, mucous membrane glands of nose, sinuses, hard and soft palate. Parasympathetic fibers - the superior salivatory nucleus: greater petrosal n. (lacrimal gland and nasal glands) and chorda tympani (submandibular and sublingual glands). CN V. Special feeling: taste of two-thirds of the tongue, hard and soft palate, cell bodies: geniculate ganglion in the tympanic cavity. Clinical aspects related to the course of the nerves V and VII. Glossopharyngeal nerve (CN IX), superior and inferior ganglion of glossopharyngeal nerve, tympanic n. Innervation: one striated muscle - stylopharyngeus, parasympathetic fibers through the otic ganglion to the parotid gland and the posterior part of the tongue, feeling from the carotid sinus and a carotid body - through the branch of the carotid artery sinus. the sensation of taste from the posterior 1/3 of the tongue through the inferior ganglion, the general feeling from the back 1/3 of the tongue, the ear's skin, internal area of tympanic membrane, pharyngeal tonsils, pharynx through the upper or lower ganglion of the nerve IX. The course of the nerve IX. Plexus tympanicus: from the tympanic nerve, caroticotympanic nerves, from internal carotid internal plexus. Vagus nerve (CN X) - range of innervation: skeletal muscles of the pharynx, soft palate (except tensor veli palatini - V3), larynx - with exception stylopharyngeus (IX), one tongue muscle (palatoglossus). Pharyngeal plexus: arises from gg. IX, X and sympathetic fibers. Parasympathetic innervation: smooth muscles and glands of thoracic (including thyroid, parathyroid glands) and abdomen. Conduct visceral sensation from the viscera of the thorax and abdomen, from receptors in the aortic arch wall, from aortic bodies near the aortic arch, general feeling from the meninx of posterior cranial fossa, part of tympanic membrane, pharynx, larynx. The course of the vagus nerve, superior laryngeal nerve, laryngeal recurrent nerve, inferior laryngeal nerve (motor for all larynx muscles with exception of the cricothyroid m.). Trigeminal nerve (CN V), trigeminal (Gasser, semilunar) ganglion. Ophthalmic n. V1 - superior orbital fissure, maxillary n. V2 - foramen rotundum, mandibular n. V3 - foramen ovale. Innervation: motor- muscles of mastication, m. tensor tympani, m. tensor veli palatini, mylohyoid m., anterior venter of digastric muscle, sensory: conjunctiva, eyeball, mucosa of sinuses, nasal and oral cavity, partially tympanic membrane, meninges of anterior and middle cranial fossa. Branches of ophthalmic nerve: lacrimal, frontal: (peripheral, supraorbital, nerve to the frontal sinus), nasociliary n.: long and short ciliary nn, supraorbital n., supratrochlear n. anterior and posterior ethmoidal nn. tentorial (meningeal branch. Branches of maxillary n.: zygomatic: (zygomaticotemporal, zygomaticofacial),

infraborbital: (superior alveolar nerves, superior dental plexus), pterygopalatine ganglion: nasopalatine n., branches to nasal septum, to maxillary sinus, pharyngeal nerve, greater palatine n. Mandibular nerve - V3: buccal, masseteric n., otic ganglion, auriculotemporal n., to external acoustic meatus, lingual, inferior alveolar n., medial pterygoid, to tensor veli palatini, to tensor tympani, masseteric, deep temporal nn, to lateral pterygoid m., to mylohyoid m, to anterior venter digastric m. Accessory n. (NXI) - nuclei in the spinal cord, range of supply. Hypoglossal n. (XII) -range of innervation. Triangle of hypoglossal n. at the bottom of the fourth ventricle.

Exercise 13: Eyeball. Fibrous layer of eyeball: sclera, cornea. Sclera: pectinate ligament, scleral venous sinus, episcleral layer, substantia propria of sclera, lamina fusca of sclera, lamina cribrosa. Cornea: conjunctival ring, corneoscleral junction, anterior epithelium of cornea, anterior limiting lamina, substantia propria, posterior limiting lamina, posterior epithelium of cornea. Ciliary body: corona ciliaris, ciliary folds, ciliary muscle; fibres of ciliary muscle-longitudinal, circular, radial. Iris: pupillary and ciliary margin of iris, greater and lesser ring of iris, iridial folds, pupil, sphincter and dilator pupillae muscles, pigmented epithelium, spaces of iridocorneal angle, greater and lesser arterial circles of iris, pupillary membrane. Retina: pars optica, pigmented part, nervous part. Ora serrata of retina, pars ciliaris, pars iridica retinae. Optic disc, macula lutea, fovea centralis, retinal blood vessels. Vessels of retina. Eyeball-chambers: anterior, iridocorneal angle, posterior, vitreous, aqueous humor. Lens-layers, epithelium, capsule of lens, ciliary zonule, suspensory ligaments of ciliary zonule. Cataract. Production, absorption and circulation of eye fluid. Glaucoma. Eye as an optical device. Optical defects of the eyes. The concept of diopter, the refractive power of lenses, lens defects. astigmatism, spherical and chromatic aberration. The formation of the optic nerve. Retinal photoreceptors. Motor, autonomic and sensory innervation of the eye (CNIII, IV, VI). Oculomotor n. supplies four of the six outer muscles of the eye, levator palpebrae superioris, sphincter pupillae and ciliary muscle. Trochlear n. (CN IV) supplies superior oblique m. abducens n. (CNVI) - lateral rectus muscle.

Exercise 14: Vestibulocochlear organ. Division: external, middle and internal ear. Structure of the external ear: auricle - its structural parts, external acoustic pore, cartilaginous external acoustic meatus. Middle ear: tympanic cavity, tympanic membrane (eardrum), auditory ossicles-stapes, incus, malleus and their connections, walls of tympanic cavity. Innervation external and middle - clinical consequences. Internal ear: membranous labyrinth, osseous labyrinth, internal acoustic meatus. Vestibular labyrinth: Hearing receptor - Corti's organ. Endolymph and perilymph. The mechanism of hearing - the way of hearing. The mechanism of registration of head movements in space. Vestibular labyrinth: endolymphatic duct, utriculosaccular duct, utricle, semicircular ducts (anterior, posterior, lateral), ampullary crest, neuroepithelium, ductus reuniens, maculae, statoconia, saccule. Cochlear labyrinth: perilymphatic space, scala vestibule, scala tympani, cochlear aqueduct, cochlear duct, spiral organ (Corti's), tectorial membrane, spiral ganglion of cochlea. Osseous labyrinth: vestibule, osseous semicircular canals, cochlea. Hearing. The first neuron – bipolar cells in cochlear spiral ganglion. Second neuron – ventral and dorsal cochlear nuclei. Third neuron – nuclei of the lateral lemniscus, trapezoid body nucleus, olive nuclei, nuclei of inferior colliculus. Fourth neuron – medial geniculate body. Their axons – acoustic radiation runs through internal capsule to transverse temporal gyri (Heschl's, i). Lemniscus lateralis- fibers of acoustic route crossing in pons and diencephalon. Vestibular pathway: first neuron – vestibular ganglion in internal acoustic meatus. Second neuron – vestibular nuclei of brainstem. Third neuron - pathway to the thalamus. Cortical center in parietal lobe.

Exercise 15: Cervical plexus: abdominal branches nn. C1-C4 core. Skin branches of the cervical plexus (lesser occipital n., greater auricular n., transverse cervical n., supraclavicular nn). Short motor fibers to prevertebral mm, lateral group cervical mm, straight muscles of the neck. Ansa

cervicalis. Phrenic nerve. Posterior rami of cervical plexus: suboccipital n., greater occipital n., third occipital n. Brachial plexus (C5-Th1). Three trunks: superior (C5-C6), middle (C7), inferior (C8-Th1). Divisions: anterior and posterior part. Cords: posterior cord - formed by posterior part all trunks, lateral cord – by anterior part of superior trunk and medial part of inferior trunk, medial cord – by anterior part inferior trunk. Branches of the supraclavicular part of plexus: dorsal scapular n., suprascapular n., subclavius n., long thoracic n., anterior pectoral nerves, lateral and medial pectoral nerves, subscapular n., thoracodorsal n., rami to scalene mm., longus colli m. Branches from the subclavian plexus: musculocutaneous n., median n., ulnar n., medial cutaneous n. of arm, medial cutaneous n. of forearm, radial n., axillary n. Topography plexus branches and area of innervation. Innervation of thoracic wall. Intercostal nerves: branches- muscular, cutaneous lateral and anterior, pleural, peritoneal. Lumbosacral plexus. Lumbar plexus-anterior branches of L1-L4: short muscular branches (to quadratus lumborum, psoas major, psoas minor, intertransversari lateral mm). Long branches: iliohypogastric, ilioinguinal, genitofemoral, lateral femoral cutaneous, obturator, femoral nerves. The course and extent of innervation. Sacral plexus (L5-Co), topography, branches. Short branches: n. to piriformis, obturator internus muscle, to gemellus superior and inferior muscles. Long branches: superior gluteal n., inferior gluteal n., posterior femoral cutaneous n., sciatic n., pudendal n., coccygeal n. Feeling and its type: A) special (smell, taste, eyesight, hearing, vestibular stimuli - linear and angular displacement of the head in space, B) general feeling: 1) deep (from proprioceptors in muscles, tendons, ligaments), 2) superficial (pain-other than visceral, heat, cold, pruritus, some sexual sensations, touch, pressure, vibration), 3) visceral pain including thoracic and abdominal parenchyma, vessel walls and other information necessary for unconscious autonomic reaction-concerning secretions, pH, osmolarity, oxygen saturation.

Test 3

C. Seminars

Course contents

Skull - general structure.

Detailed skull construction.

Oral cavity. Nose and nasal cavity. Paranasal sinuses. The hard and soft palate . Pharynx.

Central nervous system.

Internal structure of the cerebral hemispheres.

Brainstem (midbrain, pons, medulla oblongata).

Test 1

Cerebellum. Reticular formation.

Spinal cord. The ways of any movements.

Spinal nerve. Autonomic nervous system.

Vascularization of the brain and spinal cord.

Test 2

Autonomic nervous system.

Nerves of the skull.

Sensory organs. Eyeball - structures.

Organ of hearing - structure.

The peripheral nervous system. Plexuses, ganglions, nerves, receptors.

Test 3

3.4 TEACHING METHODS

Communicative methods.

Lecture: lectures with multimedia presentation, providing students with in-depth scientific knowledge in the field of anatomy, solving research problems.

Seminars / seminars: discussion, preparation of a research problem and research methodology based on scientific publications, searching and collecting literature data on the basis of scientific publications, work with databases, development of experimental results, statistical analysis, formulation and analysis of applications, participation in writing a scientific publication and preparing a congress message.

Observation-based methods: demonstration, multimedia presentation.

Methods based on the practical activity of students: practical classes in the dissecting room.

Methods of intra-articular imaging of anatomical structures: X-ray, CT, NMR
Teaching aids: a virtual anatomical table, anatomical models, boards, didactic films.

4 METHODS AND EVALUATION CRITERIA

4.1 Methods of verification of learning outcomes

Symbol of effect	Methods of assessment of learning outcomes (Eg.: tests, oral exams, written exams, project reports, observations during classes)	Form of classes
EK_01	Observation during classes	Prosective exercises, seminars
EK_02	Colloquium, exam	Exercises, lectures
EK_03	Colloquium, practical exam, test exam	Exercises, seminars,
EK_04	Observation during classes, colloquium, test exam	Lectures, exercises, seminars
EK_05	Colloquium, exam	exercises, seminars
EK_06	Observation during the course of the prosector classes, colloquium, exam	Lectures, exercises, seminars
EK_07	Colloquium, practical exam	exercises,
EK_08	Observation during the course of the prosector classes, practical exam, test exam	Prosective exercises, seminars

4.2 Conditions for completing the course (evaluation criteria)

The condition of passing the course is to achieve all the results of the training, in particular, to lectures - written test (MCQ test), verified learning outcomes: EK_02, EK_03, EK_04, EK_06, Exercises - credit with an assessment including: - attendance - activity on exercises

- grades from partial tests
- observation of the student's work and attitudes. Verified learning outcomes EK_01- EK_08, seminars - credit including:
- attendance
- student activity

Verified learning outcomes EK_01, EK_03, EK_04, EK_05, EK_08,

Exercises and seminars

1. systematic, full participation in the exercises
2. colloquia during the year with the assessment from the next sections of the anatomy in a topographical view.
3. test with single-choice and / or open problem questions

Knowledge assessment, verified learning outcomes:

Written test

- 5.0 - has knowledge of each of the contents of education at the level of 92% -100%
- 4.5 - has knowledge of each of the content of education at the level of 84% -92%
- 4.0 - has knowledge of each of the content of education at the level of 76% -84%
- 3.5 - has knowledge of each of the content of education at the level of 68% -76%
- 3.0 - has knowledge of each of the content of education at the level of 60% -68%
- 2.0 - has knowledge of each of the contents of education below 60%

Assessment of skills, verified learning outcomes:

- 5.0 - the student actively participates in classes, recognizes and is able to correctly name individual anatomical units on phantoms and in the human body; can relate knowledge of the detailed human anatomy, especially in the area of the musculoskeletal system and the nervous system with the function and tasks of individual organs.
- 4.5 - the student actively participates in the classes, with little help from the teacher he recognizes and is able to properly name individual anatomical units on phantoms and in the human body; can relate knowledge of the detailed human anatomy, especially in the area of the musculoskeletal system and the nervous system with the function and tasks of individual organs.
- 4.0 - the student actively participates in classes, with minor corrections of the teacher, commits minor mistakes, recognizes and is able to properly name individual anatomical units on phantoms and in the human body; can relate knowledge of the detailed human anatomy, especially in the area of the musculoskeletal system and the nervous system with the function and tasks of individual organs.
- 3.5 - the student participates in activities with corrections and teacher's instructions recognizes and is able to properly name individual anatomical units on phantoms and in the human body; can relate knowledge of the detailed human anatomy, especially in the area of the musculoskeletal system and the nervous system with the function and tasks of individual organs.
- 3.0 - the student participates in classes, with numerous corrections and instructions from the teacher, but commits minor mistakes and recognizes and correctly names individual anatomical units on phantoms and in the human body; can relate knowledge of the detailed human anatomy, especially in the area of the musculoskeletal system and the nervous system with the function and tasks of individual organs.
- 2.0 - the student passively participates in classes, commits blatant errors in the diagnosis and proper naming of anatomical units, and can not link knowledge of the detailed human anatomical structure with the function and tasks of individual organs.

Knowledge evaluation, verified learning outcomes: EK_01-EK_05

Assessment of skills, verified learning outcomes: EK_06-EK_08

5. TOTAL STUDENT WORKLOAD REQUIRED TO ACHIEVE THE DESIRED RESULT IN HOURS AND ECTS CREDITS

Activity	Hours / student work
Hours of classes according to plan with the teacher /e-learning	100
Preparation for classes	85
Participation in the consultations	2
Preparation for tests	90
Participation in colloquia	6
SUM OF HOURS	283
TOTAL NUMBER OF ECTS	11

6. TRAINING PRACTICES IN THE SUBJECT / MODUL

Number of hours	---
Rules and forms of apprenticeship	---

7. LITERATURE

Obligatory sources: 1. Gray's Anatomy for Students. R.L. Drake, A.W. Vogl, W.M. Mitchell 2. Basic Clinical Neuroscience. P.A.Young, P.H. Young, D. Tolbert 3. Atlas of Human Anatomy. Frank H. Netter
Additional sources for self-studying: 1. Clinically Oriented Anatomy. K.I.Moore, A.F. Dalley