

Semmelweis University
Department of Anatomy, Histology and Embryology

Faculty of Dentistry
2nd year 1st semester

September 2019

ANATOMY HANDBOOK



Dr. Andrea D. Székely
Associate Professor
Course Director of the English Language Program

Dr. Gábor Gerber
Associate Professor
Deputy Head of Department
Dean of the Faculty of Dentistry



Anatomy, Histology and Embryology for ED students

TEACHING DEPARTMENT:

SEMMELWEIS UNIVERSITY

Department of Anatomy, Histology and Embryology

Budapest, Tűzoltó utca 58.

H-1094 Budapest

<http://semmelweis.hu/anatomia>

LEARNING OBJECTIVES

Aims of the lectures in Anatomy - Presentation of important and/or complicated topics such as: 1st semester - the structure of the body wall (e.g. thorax, pelvis), extremities and the cranium, 2nd semester - the morphology of internal organs including the cardiovascular, digestive and urogenital systems; 3rd semester - the composition of the central nervous system, together with the organs of special senses and topography of body regions, and the 4th semester is devoted entirely to maxillofacial topographical anatomy.

Aims of the lectures in Histology - Presentation of the cell, basic principles in cellular morphology, detailed description of the epithelial, connective, muscle and nervous tissues. During the 3 semesters, the lectures contribute to the gross anatomical description of organs with a detailed presentation of their fine structures, including ultrastructural details. Important chapters: basic tissues, viscera, central nervous system.

Aims of the lectures in Embryology - Presentation of the early development from the differentiation of the germ cells to the formation of the human embryo (basic embryology) as well as the development of the locomotor system (1st semester). In the 2nd and 3rd semesters, the embryology topics will complement the gross anatomy and histology lectures of the organs and systems, also mentioning the most frequent malformations.

For the deeper understanding of relatively difficult questions small group discussions may be organized during the practical dissection room classes.

Aims of the practical dissection classes - In the first three semesters, based on their weekly programs, the students will study the morphology of the human body using anatomical specimens (bones, joints, muscles, viscera, brain) as well as learning the basic principles of dissection, including the proper usage of tools (scalpel, forceps, scissors) under the supervision of their lab instructors. The anatomy of the locomotor system and the peripheral nervous system will be principally taught in the dissecting room.

Aims of the histology practical classes - Under supervision by the lab instructor, the students will learn the use of the light microscope and the individual viewing of histology slides will facilitate the understanding of the basic tissues (epithelial, connective, muscle and nervous) and the fine structure of the organs.

The knowledge of students will be tested by regular **mid-term examinations** and a Semester-end Dissection Test.

Lectures:

First semester: 3x 45 min; second semester: 3x 45 min;

third semester: 3x 45 min; fourth semester: 3x 45 min.

Topics:

First semester: Gross anatomy of the bones, joints and muscles, basic histology, general embryology, development of the skull, spine and limbs.

Second semester: Morphology, histology and embryology of the heart and vessels, lymphatic organs, viscera, body cavities and serous membranes. Sectional anatomy of the thorax, abdomen and pelvis. Description of the diaphragmas.

Third semester: Morphology, histology and embryology of the central and peripheral nervous systems, the organs of special senses, as well as of the endocrine organs; topographical anatomy of the extremities.

Fourth semester: Maxillofacial anatomy - organs, cavities, nervous and vascular supply of the head and neck regions, including topographical and cross sectional anatomy. Revision of the topics of the first three semesters.

Practical course:

First semester 5x 45 min; second semester: 4x 45 min;

third semester: 4x 45 min; fourth semester: 2x 45 min;

First semester: Gross anatomy of the bones, joints and muscles, basic histology, general embryology, development of the skull, spine and limbs.

Second semester: Morphology, histology and embryology of the heart and vessels, lymphatic organs, viscera, body cavities and serous membranes. Sectional anatomy of the thorax, abdomen and pelvis. Description of the diaphragmas

Third semester: Morphology, histology and embryology of the central and peripheral nervous systems, the organs of special senses, as well as of the endocrine organs; topographical anatomy of the extremities.

Fourth semester: Topographical anatomy of the head and neck. Individual revision of the subjects taught and studied during the four semesters.

Type of exams: first, second and third semesters: semifinal examination, fourth semester: final exam from the subjects of the four semesters.

ECTS credits: four semesters together: 29 (first semester: 8; second semester: 8; third semester: 7; fourth semester: 6)

ED II ANNOUNCEMENTS

Evaluation is made using a five-grade scale (1-5).

Acceptance of the semester: active participation in dissection room and histology lab sessions is obligatory. Students should attend at least 75% of the scheduled hours to gain a signature proving the validity of the semester. Absences are therefore limited in **25%**. Students absent from the obligatory midterm will not earn the signature unless attending one of the retake possibilities offered.

Midterm examinations: During the semester, both practical and theoretical knowledge will regularly be evaluated. The mid-term tests may be oral or written exams. **Oral** mid-term tests include both the identification of several structures on the specimen as well as theoretical questions related to the subject.

The 2nd midterm (Microscopy of the CNS) is obligatory, students therefore are requested to sit for a retake in case they were absent from the first occasion. Two consecutive retake dates are offered (TBA).

The 1st and the 3rd tests are not obligatory therefore they cannot be postponed or retaken. Students who pass the 3rd test with a 3-4-5 will be exempted* from the practical part of the semifinal examination with the mark earned at the test.

The results of all tests will appear on the personal achievement card.

Cadaver dissection – every student is required to produce a fully dissected specimen during the 2nd, 3rd or the 4th semester to be exempted from the dissection part of the final examination. The specimen will be evaluated by a departmental jury.

Semifinal examinations are composed of the following parts:

1. **written pretest**
2. **oral examination** in Histology (identification/description of a histological specimen, including theoretical and developmental relevances)
3. **oral examination** in Morphology (unless previously exempted*) - practical and theoretical questions in Macroscopy together with developmental relevances.

N.B. – In case neither the first nor the repeated takes of a semifinal exam have been successful the exam has to be postponed to the following, exam period as a 'CV' exam (if there are possibilities left). Students may apply with the department to be exempted from passing the prerequisite.

ED II.

Subject matter of the 3rd semester

I. Central nervous system

- a) gross anatomy of brain and spinal cord, meninges
- b) nuclei and tracts of brain and spinal cord
- c) development of the brain and the spinal cord

II. Peripheral nervous system

- a) cranial nerves
- b) spinal nerves
- c) autonomic nervous system
- d) development of the peripheral nervous system

III. Organs of special senses (gross anatomy, histology and embryology)

- a) organ of vision, visual pathways
- b) organ of hearing and equilibrium, auditory pathways, vestibular system
- c) organ of smell, olfactory pathways
- d) organ of taste, gustatory pathways
- e) skin and appendages

IV. Endocrine organs (gross anatomy, histology and embryology)

V. Topographical anatomy of the limbs

Midterm test I. Topic: Gross anatomy and embryology of the central nervous system.
Date: 4th week, October 2.

Midterm test II. Topic: Microscopy of the central nervous system. (written and obligatory)
Date: 8th week, October 29.

Midterm test III. Topic: Gross anatomy and embryology of the central nervous system;
Topographical anatomy of the upper and lower limbs, spinal and cranial nerves.
Date: 14th week, December 9.

Semifinal examination

Topics: Subject matter of the semester

1) Written pretest

2) Practical examination and theoretical questions (oral examination)

Gross anatomy, microscopy and development of the brain, spinal cord, organs of special senses and endocrine glands.

3) Histology of the nervous system, organs of special senses, the endocrine system (slides).

Academic Year 2019/2020 Faculty of Dentistry, 3rd Semester ED II. 1 – 5

Week	LECTURES <i>Monday 8.00 - 9.40 Wednesday 12.05 - 12.50</i>	DISSECTION <i>Mondays and Wednesdays 10.00 - 11.30</i>	HISTOLOGY <i>on 5 Wednesdays 10.00 - 11.30</i>
Week 1 Sept 9-13	1. Introduction to the study of the nervous system Meninges, hemispheres, the lateral ventricles 2. Gross anatomy of the diencephalon, the III. ventricle 3. Gross anatomy of the brainstem and the cerebellum The IV. ventricle	Divisions of the brain, meninges, arteries and veins of the brain, surface structures of the hemispheres, basis cerebri. Specimen demonstration: dura mater, sinuses	
Week 2. Sep 16-20	4. Blood supply to the brain, CSF circulation 5. <i>Differentiation of the neural tube, development of the spinal cord.</i> <i>Neural crest</i> 6. <i>Differentiation of the brain vesicles</i>	Lateral ventricles, third ventricle Brain stem, fourth ventricle, cerebellum	
Week 3. Sept 23-27	7. Gross anatomy of the spinal cord, spinal segments, dermatomes 8. Neuronal architecture of the spinal cord: proprioceptive and nociceptive (withdrawal) reflex arcs. 9. Neuronal architecture of the spinal cord: autonomic reflex arc. Spinal pathways	Cross sections of the brain. Specimen demonstration: spinal cord together with the membranes	
Week 4. Sept 30 - Oct 4	10. Introduction to cranial nerves. Classification of sensory, motor and autonomic nuclei 11. Microscopy of the brainstem: tracts and nuclei of the medulla oblongata 12. Microscopy of the brainstem: tracts and nuclei of the pons and midbrain. Reflex arc of mastication	Fine structure of spinal cord. Revision 1st test: Anatomy and development of the brain and the spinal cord	
Week 5. Oct 7-11	13. Cells of the CNS: neurones (axon, dendrite, synapses) and glia cells 14. Microscopy of the diencephalon 15. Microscopy of the cerebral cortex	- Dissection of limbs. Microscopy of the CNS	Nervous system I.
Week 6. Oct 14-18	16. Sensory systems, neuroanatomy of pain 17. Microscopy of the cerebellum, pathways 18. Structure and connections of the basal ganglia	Dissection of limbs. Microscopy of the CNS	
Week 7. Oct 21-25 <i>October 23 is a national holiday</i>	19. Motor pathways 20. Trigeminal nerve, ophthalmic division 21. -	- No class on Wednesday	Nervous system II.
Week 8. Oct 28 – Nov 1	22. Trigeminal nerve maxillary division 23. Trigeminal nerve, mandibular division 24. Facial and glossopharyngeal nerves	2nd midterm test: Microscopic structure of the central nervous system (written test) Dissection of limbs.	
Week 9. Nov 4-8	25. Vagus, accessory and hypoglossal nerves 26. The hypothalamo-hypophysial system. The pituitary gland 27. Endocrine organs: pineal body, thyroid, parathyroid, adrenal glands	Dissection of limbs. Demonstration of head and neck regions. Cranial nerves	
Week 10. Nov 11-15	28. The topographical anatomy of limbs 29. Skin and appendages. Mammary gland 30. Fibrous and vascular coats of the eyeball.	- Dissection of limbs. Demonstration of head and neck regions. Cranial nerves. Dissection of the eye	Endocrine organs
Week 11. Nov 18-22	31. Lens, chambers of the eye, vitreous body, accommodation 32. Inner coat of the eyeball, retina Optic nerve, visual pathway, visual cortex 33. External muscles and movements of the eye	Dissection of limbs. Demonstration of head and neck regions. Cranial nerves.	
Week 12. Nov 25-29	34. Protective and lacrimal apparatus of the eye. Development of the eye 35. External ear, auditory tube, tympanic cavity, tympanic membrane, auditory ossicles 36. Bony and membranous labyrinth	- Dissection of limbs. Demonstration of head and neck regions. Cranial nerves.	Organs of special senses I.
Week 13. Dec 2-6	37. Spiral organ of Corti. Development of the auditory and vestibular systems 38. Auditory pathway, auditory cortex 39. Vestibular system	- Demonstration of head and neck regions. Organs of special senses	Organs of special senses II. Skin and mammary gland
Week 14. Dec 9-13	40. Olfactory and gustatory systems 41. Limbic system 42. Parasympathetic and sympathetic nervous systems	3rd test: Anatomy and development of the brain and the spinal cord Topographical anatomy of the limbs, spinal nerves, cranial nerves	

RULES AND REGULATIONS IN THE DISSECTING ROOM

IT IS STRICTLY FORBIDDEN to eat, drink, smoke, to chew gums, or to use music devices or phones.

Bags and coats should be left in the lockers before entering the dissecting room.

The lockers will have to be locked using your padlocks.

Please, remember to keep your valuables always on you, or lock them in the lockers since the department takes no responsibility for lost items.

Everybody is supposed to behave in the dissecting room conforming to the spirit of the site. Loud speech, out-of-place jokes and any kind of behaviour, disregarding the dignity of human corpses, should strictly be avoided.

Students are expected to be prepared for the practical work.

Students should take care of the furniture and equipment of the dissecting room. Do not sit on the dissection tables or stand on the tripod stools to avoid accidents. **Fire and work safety regulations** should be maintained. The dissection room is a hazard area. **Cleanliness and order** should be kept.

Working in the dissection room involves the use of **sharp and pointed tools**, injuries should be reported to the lab instructor. The technical personnel will provide first aid when necessary.

The white lab coats should be worn while in the dissection room, but should be removed before leaving the dissection room area. The purpose of wearing the lab coats is to protect one's clothing from contacting the cadaver specimen. Furthermore we advise you to wear closed toed shoes and clothing covering the legs. In the end of the class, lab coats should be emptied and left in order on the coat hangers. The department is not responsible for valuables left in the dissecting room.

Only the members of the study group can participate in the sessions, visitors may be present only with prior permission by the lab instructor. Students can leave the sessions only with the approval of the lab instructor.

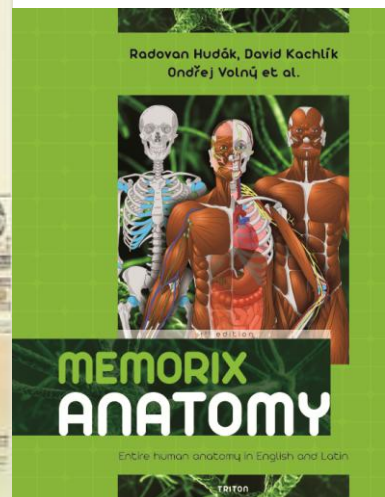
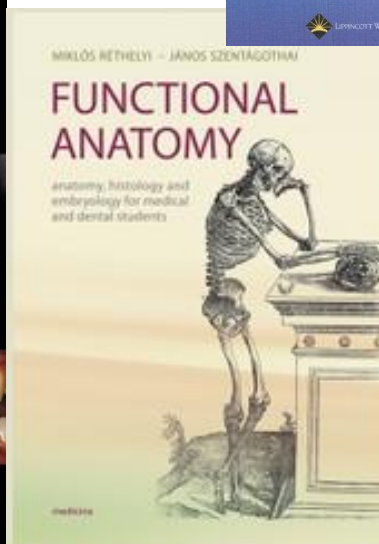
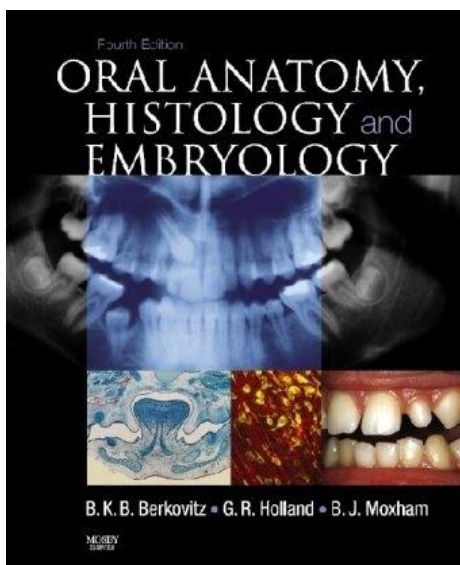
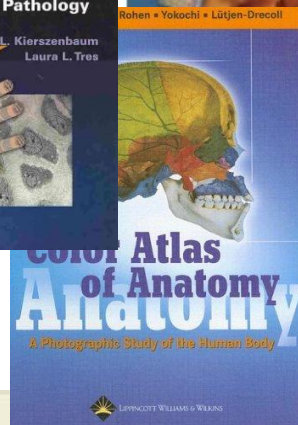
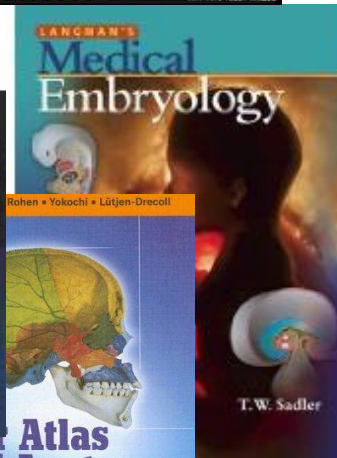
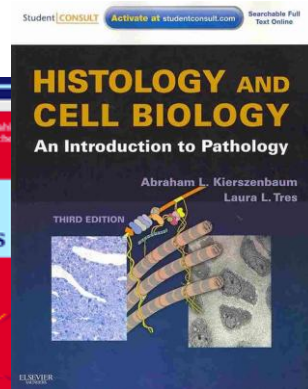
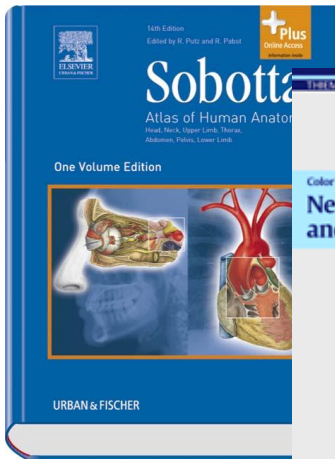
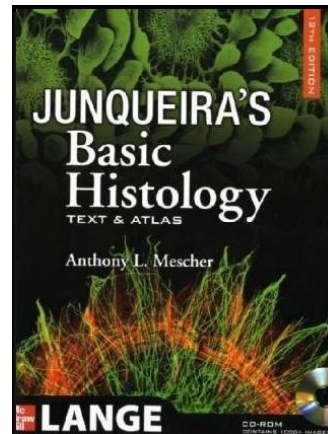
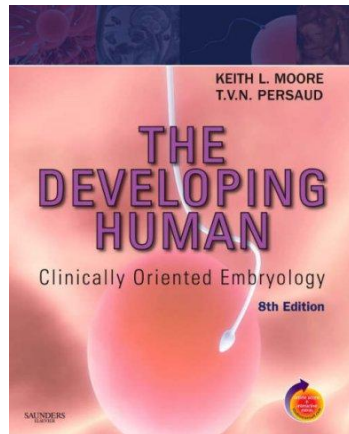
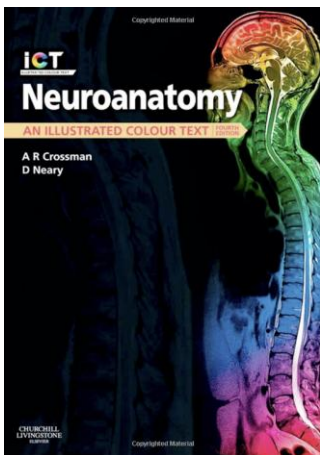
Photos of black board drawings can only be made in the presence of the lab instructor.

Specimen preparations should be wrapped and labeled. Dissection materials of other groups or individuals should not be handled. Dissected cadaver pieces should be discarded in a designated container and discarded blades have to be collected separately.

Dissecting rooms are closed between 6:00 PM to 8:00 AM and over the weekends Students may not stay in the dissecting room without the supervision of one of the assistants of the department. In the absence of an instructor, the technical personnel should ask the students to leave the dissecting room.

**SMOKING IS STRICTLY FORBIDDEN
ON THE DEPARTMENTAL PREMISES,
INCLUDING THE GARDEN AND THE YARD!**

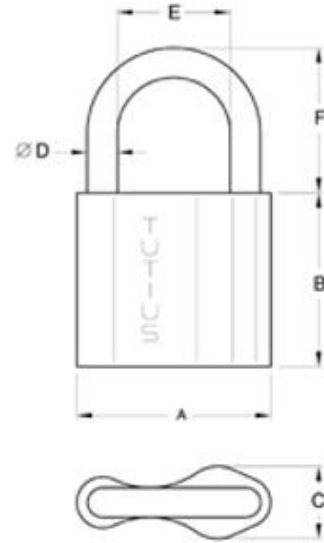
RECOMMENDED BOOKS



During dissection classes keep your belongings in the lockers and lock them with your padlock!

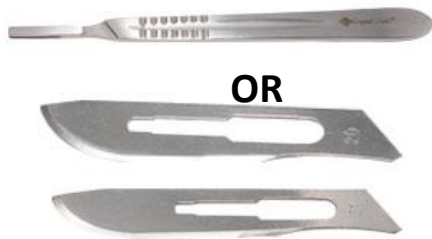
PADLOCK SIZE: 6 mm

Please, remember to keep your valuables always on you, or lock them in the lockers since the department takes no responsibility for lost items.



DISSECTION ROOM TOOLS

SCALPEL



OR



A PAIR OF ANATOMICAL FORCEPS



RUBBER GLOVES



PROTECTIVE CLOTHING (LABCOAT)

GOGGLES



TOPICS OF THE SEMIFINAL EXAM

Dissection room

Histology exam

Description of a histological specimen

Other relevant topics

Endocrine organs

Gross and microscopical anatomy of the pituitary gland; development of the posterior lobe

Blood supply, histology and development of the anterior and intermediate lobes of the pituitary gland

Gross and microscopical anatomy of the pineal gland

Gross and microscopical anatomy and the development of the thyroid gland

Gross and microscopical anatomy and the development of the parathyroid gland

Gross and microscopical anatomy and the development of the suprarenal gland

Histology of the Langerhans islets

Endocrine cells and function of the male and female gonads

Microscopical structure of the eyeball

Histology of the lacrimal gland

Microscopical structure of the cochlea

Microscopical structure of the skin (scalp and palm)

Histology of the mammary gland (lactating and non-lactating)

Macroscopical structure of the CNS

Gross anatomy of hemispheres

Cranial dura mater and its sinuses

Arachnoid and pia mater. Subarachnoid cisterns. Cerebrospinal fluid

Arteries, circle of Willis and veins of the brain

Gross anatomy of the lateral ventricles

Gross anatomy of the third ventricle

Gross anatomy of the fourth ventricle

Gross anatomy of the large commissural pathways

Gross anatomy of the internal capsule

Gross and microscopic anatomy of basal nuclei

Gross and microscopic anatomy of thalamus

Anatomy, blood supply and development of the diencephalon

Gross and microscopic anatomy of midbrain

Gross and microscopic anatomy of pons

Gross and microscopic anatomy of medulla oblongata

Gross and microscopic anatomy of cerebellum

Cranial nerve exits

Gross anatomy of spinal cord. Spinal segment. Spinal nerve.

Blood supply and meninges of the spinal cord

Microscopical structure and development of the central nervous system

Development and primary differentiation of the neural tube
Development of the spinal cord; neurohistogenesis
Differentiation of the prosencephalon vesicle; development of the hemispheres and the lateral ventricle
Differentiation of the diencephalon vesicle, development of the third ventricle
Differentiation of the mesencephalon and rhombencephalon vesicles, development of the fourth ventricle
Roots, branches and components of the spinal nerves; spinal segment
Fine structure (microscopy) of the spinal cord
Neurons and function of the spinal proprioceptive (stretch) reflex
Neurons and function of the spinal flexion (withdrawal) reflex
Neurons and functions of the visceral reflexes
Microscopical anatomy of the medulla
Microscopical anatomy of the pons
Microscopical anatomy of the midbrain
Nuclei of the cranial nerves
Microscopical anatomy of the cerebellum
Afferent and efferent cerebellar connections
Microscopical anatomy of thalamus, divisions, connections and transmitters
Hypothalamus, hypothalamo-hypophyseal systems
Microscopical anatomy of the basal ganglia, divisions, connections and transmitters
Histology of the cerebral cortex; cortical fields
Internal capsule, divisions
Tracts of the protopathic sensibility (anterolateral system)
Tracts of the epicritic sensibility (posterior funiculus/medial lemniscus)
Corticospinal tract (pyramidal tract)
Extrapyramidal system
Limbic system (nuclei and tracts)

Gross anatomy and development of the peripheral nervous system

Development, fate and differentiation of the cells in the neural crest
Development of the peripheral nervous system
Nuclei and branches of the IIIrd, IVth and VIth cranial nerves
Nuclei of the trigeminal nerve; course and fiber composition of the branches of the ophthalmic (V/1) nerve
Course and fiber composition of the branches of the maxillary nerve (V/2)
Course and fiber composition of the branches of the mandibular nerve (V/3)
Nuclei, course and fiber composition of the branches of the facial nerve (VII)
Nuclei, course and fiber composition of the branches of the glossopharyngeal nerve (IX)
Nuclei, course and fiber composition of the branches of the vagus nerve (X)
Nuclei, course and fiber composition of the branches of the accessory (XI) and hypoglossal nerves (XII)
Cervical plexus and its branches
Brachial plexus and its branches (including the short branches to the neck and shoulder girdle)
Lumbar plexus and its branches

Sacral plexus and its branches
General organization of the autonomic nervous system
The sympathetic trunk
Cranial part of the parasympathetic nervous system
Sacral part of the parasympathetic nervous system

Gross anatomy, histology and embryology of the organs of special senses

Gross anatomy and microscopic structure of the fibrous coat of the eye ball (cornea, sclera)

Gross anatomy and microscopic structure of the vascular coat of the eye ball
(choroid, ciliary body, iris)

Gross anatomy, microscopic structure and development of the nervous coat of
the eye ball (retina)

Neurons of the visual pathways; localization and microscopic structure of the visual cortex

Gross anatomy, microscopic structure and development of the lens, accommodation

Gross anatomy and content of the chambers of the eye, circulation of the aqueous humor;
gross anatomy of the vitreous body

Gross anatomy and function of the external ocular muscles.

Visual reflexes

Gross anatomy, microscopic structure of the eye lids; conjunctiva, Tenon's capsule and
periorbit

Gross anatomy, microscopic structure and development of the lacrimal apparatus

Gross anatomy and development of the external ear and the tympanic membrane

Gross anatomy and development of the tympanic cavity and the auditory tube

Gross anatomy and development of the auditory ossicles; joints, muscles, and the mucous
membrane of the tympanic cavity

Sensory innervation and blood supply of the tympanic cavity

Internal acoustic meatus

Gross anatomy of the bony labyrinth

Gross anatomy and development of the labyrinth

Morphology, development and divisions of the vestibular apparatus

Receptors and neuronal connections of the vestibular system

Gross anatomy, microscopic structure and development of the cochlear duct and
the organ of Corti

Neurons of the auditory pathways

Organ and pathways of olfaction

Organ and pathways of taste

Gross anatomy and microscopic structure of the fibrous coat of the eye ball (cornea, sclera)

Gross anatomy and microscopic structure of the vascular coat of the eye ball
(choroid, ciliary body, iris)

Gross anatomy, microscopic structure and development of the nervous coat of
the eye ball (retina)

Neurons of the visual pathways; localization and microscopic structure of the visual cortex

Gross anatomy, microscopic structure and development of the lens, accommodation

Gross anatomy and content of the chambers of the eye, circulation of the aqueous humor;
gross anatomy of the vitreous body

Gross anatomy and function of the external ocular muscles.

Visual reflexes

Gross anatomy, microscopic structure of the eye lids; conjunctiva, Tenon's capsule and periorbit

Gross anatomy, microscopic structure and development of the lacrimal apparatus

Gross anatomy and development of the external ear and the tympanic membrane

Gross anatomy and development of the tympanic cavity and the auditory tube

Gross anatomy and development of the auditory ossicles; joints, muscles, and the mucous membrane of the tympanic cavity

Sensory innervation and blood supply of the tympanic cavity

Internal acoustic meatus

Gross anatomy of the bony labyrinth

Gross anatomy and development of the labyrinth

Morphology, development and divisions of the vestibular apparatus

Receptors and neuronal connections of the vestibular system

Gross anatomy, microscopic structure and development of the cochlear duct and the organ of Corti

Neurons of the auditory pathways

Organ and pathways of olfaction

Organ and pathways of taste