ANATOMY, HISTOLOGY AND EMBRYOLOGY I – II.

Department of Anatomy, Histology & Embryology

Course Director: ***Dr. Andrea D. Székely***
Dr. Sándor Katz

LEARNING OBJECTIVES

Aims of the lectures in anatomy: Presentation of the important and/or complicated chapters such
as introductory chapters, thorax, pelvis, hand, foot, skull, heart, chapters of the visceral organs, central
nervous system**, organs of special senses, topographical anatomy.**
Aims of the lectures in cell biology and histology: Presentation of the cell, basic principles in cell
biology (mitosis, cytoskeleton, cellular motility), detailed presentation of the basic tissues (epithelial,
connective, muscle and nervous). Complementing gross anatomy with a detailed presentation of the fi ne structure of organs, including the ultrastructural details together with the molecular background.
Important chapters: basic tissues, viscera, central nervous system.
Aims of the lectures in embryology: Presentation of the early development from the diff erentiation
of the germ cells to the formation of the human embryo (general embryology). Presentation of the development of the organs and functional systems parallel with the gross anatomical and histological
lectures including the frequently occurring malformations.
Aims of the practical sessions in the dissecting room: Based on the weekly programs (see separate),
students will both observe prosected cadaver specimens (bones, joints, muscles, viscera, brain) and perform dissections on parts of, or on an entire, enbalmed cadaver.
Students are supervised by the lab instructors. Bones, joints, muscles and peripheral nervous system
will be primarily taught in the dissecting room.
Discussion of the more complicated chapters of embryology is presented on small group discussions
connected to the practical sessions in the dissecting room.
Aims of the practical sessions in the histology room: Facilitate the understanding of ground (epithelial,
connective, muscle and nervous) tissues and the fi ne structure of the organs through the observation and interpretation of histological specimens.
The knowledge of the students will be checked by mid-term tests.

TOPICS OF THE LECTURES:

Lectures: first semester: 3x 45 min; second semester: 3x 45 min; third semester: 3x 45 min; fourth semester: 1x 45 min.
First semester: Gross anatomy of musculoskeletal system (i.e. bones, joints and muscles), basic cytology, general histology, general embryology, development of the skull, spine and limbs.
Second semester: Heart and vessels, lymphatic organs, viscera and body cavities; integrated gross anatomy, cytology, histology and embryology.
Third semester: Central and peripheral nervous system, organs of special senses, endocrine organs;
integrated gross anatomy, cytology, histology and embryology.
Fourth semester: Topographical anatomy of the head, neck, limbs and trunk including body cavities (thorax, abdomen, pelvis), ventral and dorsal regions, cross sectional anatomy.

PRACTICAL COURSE

6x 45 min; second semester: 6x 45 min; third semester: 4x 45 min; fourth semester: 2x 45 min;

First semester: Gross anatomy of the musculoskelatal system (i.e. bones, joints, muscles, vessels ans nerves), basic cytology, general histology, general embryology, development of the skull, spine and limbs.
Second semester: Heart and vessels, lymphatic organs, viscera, topography of body cavities; integrated gross anatomy, cytology, histology and embryology.
Third semester: Central and peripheral nervous system, organs of special senses, endocrine organs;
integrated gross anatomy, cytology, histology and embryology. Topographical anatomy of the dorsal regions of limbs and the trunk, including spinal cord. Topographical anatomy of the viscerocranium, neurocranium and the internal organs of the neck.
Fourth semester: Topographical anatomy of the ventral and dorsal regions of the body, including the limbs and body cavities (thorax, abdomen, pelvis), cross sectional anatomy.
Type of exams: oral and written.
First semester: semifinal; second semester: semifinal; third semester: semifinal;
fourth semester: final exam from the subjects of the four semesters.
ECTS credits: four semesters together: 27 (first semester: 8; second semester: 9; third semester: 7;
fourth semester: 3)

Anatomy books

LIST OF TEXTBOOKS (The list may change!)

Sobotta Atlas of Human Anatomy (Package), 15th English ed. Musculoskeletal system, internal organs, head, neck, neuroanatomy, By Waschke & Paulsen, ISBN-13: 9780702052507 2013
Gray's Anatomy for students with STUDENT CONSULT Online Access, 3rd Edition by R. Drake, A. W. Vogl, A. Mitchel Elsevier; 2014; ISBN 9780702051319
McMinn and Abrahams' Clinical Atlas of Human Anatomy with STUDENT CONSULT Online Access , 7th Edition By Abrahams, Spratt, Loukas & van Schoor ISBN-13: 9780723436973 , 2013
Netter: Atlas of Human Anatomy, Including Student Consult Interactive Ancillaries and Guides, 6th Edition, 2014.
Human Anatomy, Color Atlas and Textbook, 6th Edition by J Gosling, P Harris, J Humpherson, I Whitmore and P Willan;, ISBN 9780723438274 Elsevier, 2016.
Loukas, Benninger & Tubbs: Gray's Clinical Photographic Dissector of the Human Body, with STUDENT CONSULT Online Access, Saunders, 2012.
Stevens & Lowe's Human Histology , Elsevier, 4th edISBN 978-0-723435020, 2015.
Langmann's Medical Embryology, 13th Edition by TW Sadler, Wolters Kluwer, ISBN 9781469897806, 2014
Fitzgerald's Clinical Neuroanatomy and Neuroscience, 7th Edition, Elsevier, 2015.
Histology: A Text and Atlas: With Correlated Cell and Molecular Biology; 7th Edition by MH Ross and W Pawlina ; Wolters Kluwer 2015, ISBN 9781451187427
Thieme: Atlas of Anatomy, Head, Neck and Neuroanatomy, 2016, ISBN: 9781626231207
Thieme: Atlas of Anatomy, Internal Organs, 2016, ISBN:9781626231665
Thieme: Atlas of Anatomy, General Anatomy and Musculoskeletal System, 2014, ISBN:9781604069228

Recommended textbooks:

Gray's Anatomy. The Anatomical Basis of Clinical Practice; 41st edition by S.Standring: 2015 ISBN : 9780702052309
Bräuer: Sobotta Flashcards (Muscles; Bones, Ligaments, and Joints) URBFI, 2013.
KL Moore–AF Dalley:Clinically Oriented Anatomy. 4th ed. Lippincott William and Wilkins, 1999.
RMH McMinn: Last's Anatomy, Regional and Applied. Churchill Livingstone, Edinburgh 1990. ISBN 0-443-03484-4
A.L. Kierszenbaum Histology and Cell Biology: An Introduction to Pathology 3rd Edition, Paperback with STUDENT CONSULT Online Access and E-Book ISBN: 9780323085885:, 2012
Wheater's Functional Histology, A Text and Colour Atlas, 6th Edition by B Young, G O'Dowd and P Woodford Churchill Livingstone, Edinburgh, 2013, ISBN 9780702047473
Junqueira's Basic Histology: Text and Atlas; 13th Edition by Anthony Mescher, New York, McGraw-Hill Medical, 01/03/2013 ISBN13 978007178033
The Developing Human – Clinically Oriented Embryology, 10th ed. by KL Moore, TVN Persaud and M Torchia, Saunders, 2015; ISBN 9780323313384
Regional Anatomy, by T Tömböl, Medicina 2008, ISBN 963 242 186 8
Anatomy of the Living Human. by A Csillag, Könemann, 1999.
Imaging Atlas of Human Anatomy, 4th Edition by Jamie Weir, Peter Abrahams, Jonathan D. Spratt, and Lonie Salkowski ISBN: 9780723434573 Copyright: 2011
Sectional Anatomy – Workbook, by A. Nemeskéri; István Apáthy's Foundation, 2001.
Histology Manual 1-3. by A. Nemeskéri and K. Kocsis: István Apáthy's Foundation, 2001.
Alberts,.Bray, Hopkin, Johnson, Lewis, Raff , Roberts, Walter: Essential Cell Biology, third edition Garland Science, New York and London 2010.
Neuroanatomy An Illustrated Colour Text, 4th Edition by Crossman & Neary Publication Date: 13/04/2010 ISBN-13: 9780702030864

1st year 1st semester
English Program

Anatomy: Macroscopy and clinically oriented anatomy of the parts of the musculoskeletal system, i.e. osteology, arthrology and myology, together with the vascular and nervous supply of the limbs and the trunk. Skull.
Histology: Microscopy of the ground (basic) tissues (epithelia, glandular tissues, connective and supporting tissues, types of muscle tissues. Histology of the corpuscular elements of the blood, cells of the red bone marrow.
Embryology: Basic principles of human development, introduction to the clinical embryology. General embryology, including spermatogenesis, oogenesis, fertilization, cleavage, blastulation, formation of germinal layers, body axes, molecular basis of right-left asymmetry, Hox genes, formation of the placenta, fetal membranes. Organ development including the early onset of fetal circulations. and the development of the limbs, together with the trunk and the skull. Factors inducing congenital malformations.
Credits: 8
Lectures: 2,5 hours/week **Dissection classes:**: **4** hrs/week
Histology laboratory classes: **2** hrs/week

Week	Lectures	Practical sessions	
		Dissection room	Histology laboratory
Week 1	1. The role of anatomy, histology and embryology in the medical curriculum. Terminology 2. The cell , cellular membrane, endoplasmic reticulum 3. Cell nucleus, mitochondrium, peroxysome	General introduction to practical work in the dissection room, tools and rules Upper limb Bones	Light and electron microscopical techniques, the principles of practical histology classes
Week 2.	4. Adhesion molecules, intercellular connections, epithelial cells 5. Types of epithelia. Glandular epithelium 6. The cellular framework, microtubules, IM filaments, actin microfilaments	Upper limb Bones and joints	Simple epithelia Stratified epithelia I.
Week 3.	7. Exocytosis, Golgi apparatus, , vesicular transport, sorting. Endocytosis, cellular organelles. Apoptosis 8. General arthrology and myology. Joints , muscles and movements of the shoulder and the upper girdle 9. Muscles and actions of the elbow joint	Upper limb Dissection of the muscles, vessels and nerves of the flexor side	Stratified epithelia II. Glandular epithelium
Week 4.	10. Joints, muscles and actions of the wrist and the hand 11. Connective tissue cells 12. Connective tissue fibres, types and formation. Extracellular matrix	Upper limb Dissection of the muscles, vessels and nerves of the flexor and extensor sides	Connective tissue I. Cells
Week 5.	13. The principles of cell division, differentiation. Cell cycle, mitosis, meiosis 14. Supporting tissues (cartilage, bone) 15. Ossification, bone remodelling	1. Upper limb Dissection of the muscles, vessels and nerves of the extensor side, dissection of joints **2. <u>Midterm test 1</u>** Upper limb	Connective tissue II. Fibrous elements
Week 6.	16. Components, muscles, joints and ligaments of the vertebral column. Intervertebral, atlantooccipital and atlantoaxial joints 17. Ribs, components and movements of the thorax. Abdominal muscles, rectus sheath. 18. Muscles, fasciae and movements of the neck. Back muscles, occipital muscles	Bones and muscles of the trunk. Demonstration of the muscles of the neck, back and abdomen.	Connective tissue III. Connective tissue types

Week 7.	19. Bones, joints, construction of the pelvis. 20. Muscles and actions of the hip joint 21. Muscles and actions of the knee joint	Lower limb and pelvis Dissection of joints of the lower limb	Supporting tissues Cartilage, bone
Week 8. .	22. Subinguinal hiatus. Inguinal canal. Adductor and femoral canals 23. Muscles and joints of the foot. Architecture of the foot 24. Blood. Corpuscular elements. Red bone marrow, erythropoiesis, Formation of leukocytes	Lower limb Dissection of the muscles, vessels and nerves of the dorsal side	Types of ossification
Week 9.	25. Muscle tissue 26. Gametes, fertilization, cleavage and blastulation 27. Implantation, bilaminar embryo. Fetal membranes, umbilical cord. Structure of the placenta, placentar circulation	Lower limb Dissection of the muscles, vessels and nerves of the dorsal side	Blood and red bone marrow
Week 10.	28. Molecular basis for gastrulation.Formation, differentiation and derivatives of the germinal layers. 29. Neurulation, folding of the embryo. Body axes, left-right lateralizationm asymmety. 30. Formation of the primary tissues. Homeobox genes, stem cells	Lower limb Dissection of the muscles, vessels and nerves of the ventral side	Smooth,skeletal and cardiac muscle types Revision
Week 11. Nov. 14-18.	31.Histology of vessels. 32. Bony framework of the skull. Sphenoid and ethmoid 33. Temporal bone. Internal and external skull base	Lower limb Dissection of the muscles, vessels and nerves of the ventral side	**Midterm test 2:** Epithelia, connective and supporting tissue. General embryology
Week 12.	34. Facial skeleton. Orbit, nasal cavity 35. Skull. Infratemporal and pterygopalatine fossae 36. Nervous tissue. Glial cells	Bones of the skull Internal and external skull bases	Vessels: arteries, veins, arterioles, venules, capillaries.
Week 13.	37. Temporomandibular joint, muscles of mastication; muscles of facial expression 38. Development of the skull, fontanelles. 39. Development of the limbs and the vertebral column together with the trunk	Bones of the facial skeleton, mandible. Orbit, nasal cavity, pterygopalatine fossa Temporomandibular joint	Nervous tissue
Week 14.	40. Developmental malformations 41. Clinical anatomy of the musculoskeletal system 42. Clinical anatomy of the musculoskeletal system	Muscles of mastication and facial expression	Placenta, umbilical cord Revision

Topic lists for the semifinal examination

Histology

Concept of basic tissues
Definition and classification of epithelial tissue
Simple epithelia
Stratified epithelia
Membrane specializations of epithelia
Glandular epithelia
Cells of connective tissue
Ground substance and fibres of connective tissue
Types of connective tissue
Umbilical cord and placenta
Blood and the formed elements of blood
Histology of the bone marrow, maturation of erythrocytes and platelets
Differentiation of granulocytes, lymphocytes and monocytes
Histology of cartilage
Histology of the bone tissue
Intramembranous ossification
Endochondral ossification

Growth and remodeling of bone
Smooth muscle and myoepithelial cells
Skeletal muscle tissue
Cardiac muscle tissue
Histology of the peripheral nervous system (sensory and autonomic ganglia)
Supporting cells in the peripheral nervous system
Nerve fibers, myelin sheath
Motor end-plate

Anatomy

General osteology, classification of bones
Bones, spaces and connections of the skull, external and internal skull bases
Neurocranium, components and cavities (anterior, middle and posterior cranial fossae)
Viscerocranium, components and cavities (walls and connections of the nasal cavity, orbit, oral cavity, pterygopalatine and infratemporal fossae)
Bones of the axial and appendicular skeleton
Vertebrae, ribs, sternum
Bones of the girdles and limbs
General arthrology
Fibrous and cartilaginous joints
Components of the synovial joints
Classification of synovial joints; movements and mechanisms
Structure of the vertebral column, the gross anatomy of the muscles acting upon it
Movements and muscles of the head&neck (atlantooccipital and atlantoaxial joints)
Joints of the shoulder girdle, the gross anatomy of the muscles acting upon them
Shoulder joint, the gross anatomy of the muscles acting upon it
Elbow joint, the gross anatomy of the muscles acting upon it
Structure and movements of the radiocarpal joint, gross anatomy of the muscles acting upon it
Metacarpophalangeal and interphalangeal joints, the gross anatomy of the muscles concerned with the movements
Carpometacarpal, metacarpophalangeal and interphalangeal joints of the thumb, the gross anatomy of the muscles concerned with the movements
Hip joint and the gross anatomy of the muscles concerned with the movements
Knee joint and the gross anatomy of the muscles concerned with the movements
Ankle joint together with the gross anatomy of the muscles acting upon it
Subtalar and talocalcaneonavicular joints, the muscles acting upon them
Temporomandibular joint and the gross anatomy of the muscles acting on it
Architecture and classification of bones
Structure and actions of somatic muscles
Osteofibrous structure of the thoracic cage (bones, joints, ligaments, movements)
Muscles and movements of the thorax
Muscles of the back and nape (occipital region)
Axilla, the quadrangular and triangular spaces
Cubital fossa
Muscles and cross section of the arm
Muscles and cross section of the forearm
Osteofibrous spaces and muscle compartments of the hand, tendinous sheaths
Composition of the pelvis (bones, ligaments and membranes)
Muscles of the buttock, the posterior abdominal wall and the pelvis (external and internal muscles of the hip)
Osteofibrous compartments, muscles and cross section of the thigh
Popliteal fossa
Subinguinal hiatus, vascular and muscular compartments; adductor canal, femoral canal
Osteofibrous compartments, muscles and the cross section of the leg
Structure of the foot, arches of the foot
Osteofibrous compartments of the foot, tendinous sheaths
Muscles of mastication
Superficial muscles of the neck and the muscle triangles
Deep muscles of the neck and the laminae of the cervical fascia
Muscles of facial expression

Embryology

Spermatogenesis, spermiogenesis
Oogenesis
Fertilization, cleavage of the zygote
Blastocyst formation; the bilaminar embryonic disc
Implantation

Formation of the intraembryonic mesoderm; the notochord
Neurulation (neural tube and neural crest)
Differentiation of the intraembryonic mesoderm; formation and derivatives of the somites
Derivatives of the intermediate mesoderm
Lateral plate mesoderm and its derivatives
Folding of the embryo
Development of the primitive cardiovascular system, the fetal circulation
The structure and function of the placenta
Development of the fetal membranes (chorion and amnion) and the umbilical cord
Periods of embryonic / fetal life
Twin formation
Development of the limbs
Development of the vertebral column
Development of the skull
Development of the skeletal muscular system

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1st year 2nd semester
English Program

Anatomy: Morpholgy, topography and clinically oriented anatomy of the internal organs (i.e. cardiovascular, gastrointestinal, respiratory and the urogenital systems)
Histology: Microscopical strucure of the internal organs (cardiovascular, gastrointestinal, respiratory and the urogenital systems)
Embryology: Development of the internal organs together with their malformations
Credits: 9
Lectures: 3 hours/week
Dissection class: 6 hours /week
Histology laboratory: **2** hrs/week

Week	**Lectures**	**Practical sessions**	
		Dissection room	**Histology lab**
Week 1	1. Lymphatic tissue and cellular elements. Thymus, tonsils, MALT. 2. Lymph node, spleen (structure and circulation) 3. Muscles, triangles and fasciae of the neck	Dissection of head and neck region	Lymphatic organs: thymus, tonsils
Week 2.	4. Gastrointestinal tract. Oral cavity, morphology and histology of the tongue and salivary glands 5. Morphology, histology and development of teeth. 6. Morphology and histology of soft palate, isthmus of fauces and pharynx	Dissection of head and neck region	Lymphatic organs: lymph node, spleen
Week 3.	7. Development of the branchial apparatus, congenital malformations 8. Morphology of the nasal cavity and paranasal sinuses 9. Larynx: cartilages, joints, muscles, connective tissue skeleton and mucous membrane.	Oral cavity, tongue, salivary glands, teeth, nasal cavity, larynx	Gastrointestinal tract: lip, tongue, including the filiform, foliate, fungiform and circumvallate papillae
Week 4.	10. Development of the face, and palate, congenital malformations 11. Morphology of the trachea and the lung. Pleura 12. Histology of the respiratory tract. Development of the lungs.	Surface projections of the internal organs of the thorax, dissection of the thoracic cavity. Lungs, pleura, mediastinum	Ground section of the teeth, tooth bud. Submandibular, sublingual and parotid glands

Week 5.	13. Chambers of the heart, external features. Structure of heart wall, myocardium, valves, anuli fibrosi 14. Vessels, conducting system, surface projection of the heart, pericardium. Auscultation points. Divisions of the mediastinum. 15. Structure and development of the diaphragm	Dissection of the heart	Respiratory system: larynx, trachea, lung
Week 6.	16. Development of the heart (primitive heart tube, development of atria) 17. Development of the heart (development of ventricles, malformations). Fetal circulation 18. Morphology and histology of the esophagus and the stomach.	Dissection of the heart	Heart Esophagus, cardia, fundus, pylorus of the stomach
Week 7.	19. Morphology and histology of the duodenum and the pancreas 20. Morphology and histology of the jejunum and ileum 21. Morphology and histology of the large intestine and rectum.	1.Revision 2. **Midterm test 1** Heart, great vessels, development of the heart. Morphology and development of the internal organs of the head, neck, thorax and diaphragm.	Duodenum, jejunum ileum, colon, vermiform appendix
Week 8.	22. Morphology of the liver and biliary system. Portal vein 23. Histology of the liver and biliary system 24. Development of the mid- and hindgut. Development of the liver and the pancreas	Dissection of abdominal internal organs Dissection of the visceral complex. Celiac trunk, liver, duodenum	Liver, gall bladder, pancreas
Week 9.	25. Peritoneum. Development of the serous membranes and the omental bursa. Separation of body cavities 26. Morphology and topography of the kidneys. Capsules. Urinary passages, urinary bladder 27. Histology of the urinary system	Cadaver dissection Organs supplied by the superior mesenteric artery	Urinary system: kidney, ureter, urinary bladder
Week 10.	28. Morphology and capsules of the testes. 29. Histology of the testicle. Spermatogenesis 30. Morphology and histology of the epididymis, spermatic cord, seminal vesicle and prostate	Cadaver dissection Organs supplied by the inferior mesenteric artery	**Midterm test 2**, Lymphatic organs, respiratory system, gastrointestinal tract , urinary system
Easter break			
Week 11.	31. Development of the arteries; malformations. 32. Development of the veins. 33. Morphology and histology of penis and male urethra.	Cadaver dissection Retroperitoneum, pelvic organs Dissection of the visceral complex	Male genital system: testis, epididymis, spermatic cord
Week 12.	34. Structure of pelvic floor, male perineum 35. Morphology and histology of the ovary and the uterine tube, oogenesis 36. Morphology and histology of the uterus, divisions and content of the broad ligament	Cadaver dissection Male genital system	Male genital system: Seminal vesicle, prostate, penis, glans penis.
Week 13.	37. Morphology and histology of the vagina and the external genital organs, female perineum 38. Development and malformations of the urinary system 39. Development and malformations of the genital system. Disorders of the sexual differentiation.	Cadaver dissection Female genital system	Female genital system: ovary, corpus luteum, uterine tube
Week 14.	40. Major lymphatic ducts 41. Lymphatic drainage of the head&neck, thoracic and abdominal regions 42. Clinical and radiologic anatomy of the internal organs	Revision Abdominal and pelvic organs	Female genital system: uterus (proliferation, secretion), vagina and placenta

TOPICS OF THE SEMIFINAL EXAMINATION

LYMPHATIC ORGANS

Tonsils (anatomy, histology, embryology)
Spleen (anatomy, histology, embryology)
Thymus (anatomy, histology, embryology)
Lymphatic vessels and nodes of head and neck
Lymphatic vessels and nodes of mediastinum
Lymphatic vessels and nodes of retroperitoneal space
Lymphatic vessels and nodes of pelvis
Thoracic duct and right lymphatic duct
Microscopic structure of lymphatic system (reticular cells, lymphocytes, plasma cells, antibodies, lymphatic follicles)
Microscopic anatomy of lymph nodes

CIRCULATORY SYSTEM

Shape, external features of heart
Chambers of heart
Endocardium, ostia, valves of heart
Skeleton of heart, anuli fibrosi
Structure of heart wall
Cardiac muscle, myocardium
Impulse generating and conducting system of heart
Pericardium
Position and surface projections of heart
Percussion and auscultation (area of cardiac dullness, heart sounds)
Radiology of heart
Development of heart tube
Development of atria (septum primum and secundum, foramen ovale)
Development of ventricles (interventricular septum)
Pulmonary circulation
Ascending aorta, arch of aorta and its branches
Common and external carotid artery and their branches
Maxillary artery and its branches
Subclavian artery and its branches
Thoracic aorta and its branches
Abdominal aorta and its branches
Coeliac trunk and its branches
Superior mesenteric artery and its branches
Inferior mesenteric artery and its branches
External and internal iliac artery and its branches
Internal pudendal artery and its branches
Superior vena cava and its tributaries
Inferior vena cava and its tributaries
Azygos and hemiazygos veins and their tributaries
Portal vein and its tributaries, portocaval anastomoses
Veins of face and neck
Cutaneous veins and lymphatic vessels of trunk
Microscopic structure of arterial and arteriolar wall
Microscopic structure of capillary wall
Development of aorta and branchial (pharyngeal) arch arteries
Development of great veins (caval, portal, azygos)
Fetal circulation
Microscopic structure of the wall of venules, veins and lymphatic vessels

DIGESTIVE SYSTEM

Oral cavity (divisions, boundaries)

Floor of mouth, sulcus lateralis linguae
Types and morphology of teeth
Orientation and supporting structures of teeth
Dental arch and dental formula, blood and nerve supply of teeth
Microscopic anatomy of oral tissues (enamel, dentin, cementum, periodontal ligament, alveolar bone, gum)
Development of teeth
Microscopic anatomy of dental development
Tongue (parts, vessels, innervation)
Microscopic anatomy and development of the tongue
Salivary glands (anatomy, histology, embryology)
Isthmus of fauces
Palate, palatine muscles
Development of face, hare lip
Development of nasal cavity and paranasal sinuses
Development of palate, cleft palate
Pharynx, (shape, position, parts, muscles)
Topography of the pharynx, para and retropharyngeal spaces
Structure and development of branchial (pharyngeal) arches
Derivatives of branchial (pharyngeal) arches
Development and derivatives of branchial (pharyngeal) pouches
Branchial (pharyngeal) grooves
Esophagus (anatomy, histology, embryology)
Derivatives of foregut (pharynx, oesophagus, stomach, duodenum)
Stomach (shape, position, parts)
Peritoneal relations of stomach
Blood supply and innervation of stomach Microscopic anatomy of stomach
Microscopic anatomy of the stomach
Duodenum (shape, position, divisions, vessels)
Jejunum-ileum (shape, position, vessels)
Microscopic anatomy of small intestine
Fine structure of the intestinal villi
Rectum, anal canal (shape, position, vessels)
Microscopic anatomy of rectum and anal canal
Liver (shape, position; development)
Gall bladder and biliary passages (anatomy, histology, embryology)
Liver (peritoneal relations, vessels)
Microscopic anatomy of the liver
Circulation of liver, liver sinusoids
Microscopic anatomy of gall bladder and extrahepatic biliary tracts
Pancreas (shape, position, vessels)
Microscopic anatomy and development of the pancreas
Peritoneum omenta, mesentery, omental bursa
Rotation and derivatives of midgut, physiological umbilical hernia
Development of hindgut

RESPIRATORY SYSTEM

Nose, nasal cavity (boundaries, nasal meatus, vessels)
Paranasal sinuses (connections, vessels)
Larynx (shape, position, vessels, nerves)
Skeleton and joints of larynx
Laryngeal ligaments (fibroelastic membranes, mucous membrane)
Muscles of larynx, innervation
Microscopic structure and development of the larynx
Trachea and bronchial tree (anatomy, histology and development)
Lung (shape, parts, surfaces, hilum)
Lung (position, topography, vessels, nerves)
Surface projection of pleura and lung
Microscopic structure and development of the lung

BODY CAVITIES

Thoracic wall
Pleura, pleural cavity
Mediastinum (divisions and content)
Diaphragm
Abdominal cavity (divisions and surface projections)
Abdominal wall (muscles, fasciae)
Rectus sheath
Hernia sites
Development and separation of body cavities
Development of the diaphragm
Development of the peritoneum

UROGENITAL SYSTEM

Kidney (shape, position, hilum, sinus, capsules)
Kidney (section, vascular architecture)
Microscopic anatomy of kidney
Microscopic anatomy of juxtaglomerular apparatus
Vascular architecture of kidney
Development of kidney and ureter (pronephros, mesonephros, metanephros)
Renal pelvis and calyces
Ureter (anatomy, histology and embryology)
Urinary bladder (shape, position, muscles, vessels)
Microscopic anatomy and development of the urinary passages
Differentiation of the urogenital sinus
Female urethra (anatomy, histology and embryology)
Testis (shape, position, vessels)
Microscopic anatomy of testis, spermatogenesis
Development of testis
Epididymis, vas (ductus) deferens, spermatic cord (anatomy, histology and embryology)
Scrotum, coats of testis
Seminal vesicle (anatomy, histology and embryology)
Prostate (anatomy, histology and embryology)
Development of male genital ducts and glands
Male urethra, bulbourethral gland (anatomy, histology and embryology)
Penis (shape, position, mechanism of erection, vessels, nerves)
Microscopic anatomy of penis and male urethra
Pelvic floor, male perineum
Hernia canals (inguinal and femoral)
Development of the male external genital organs
Ovary (shape, position, vessels)
Microscopic anatomy of ovary, oogenesis
Microscopic anatomy of corpus luteum
Development of ovary
Uterine tube (shape, position, vessels; histology, embryology)
Uterus (shape, parts, wall, cavity)
Uterus (position, supporting structures, vessels)
Broad ligament (lig. latum) and its components
Microscopic anatomy of uterus, menstrual cycle
Vagina, female perineum
External female genital organs (mons pubis, labia, vestibule of vagina, greater vestibular gland, vessels)
Development of female genital tracts
Microscopic anatomy of vagina and external genitalia
Development of the female external genital organs

2nd year 1st semester
English Program

Anatomy: Morphology, topography and clinically oriented anatomy of the central and peripheral nervous systems (CNS, PNS), organs of special senses, endocrine organs; integrated gross anatomy, cytology, histology and embryology
Histology: Microscopical structure of the CNS and PNS (cerebum, cerebellum, brain stem, spinal cord, ganglia) organs of special senses (apple of eye, inner ear), endocrine glands (pineal, pituitary, thyroid, suprarenal glands) skin and appendages, mammary gland.
Embryology: Development of the central and peripheral nervous system, development of the organs of senses, together with their malformations
Credits: 7
Lectures: 3 hours/week
Dissection class: 4 hours /week

Histology laboratory: **12** hrs/semester

Week	Lectures	Dissection room	Histology lab
Week 1	1. Introduction to the study of the nervous system Meninges, hemispheres, the lateral ventricles 2. Differentiation of the neural tube, development of the spinal cord. Neural crest. Craniocaudal and dorsoventral differentiation, malformations 3. Differentiation of the brain vesicles. Gross anatomy of the diencephalon, the III. 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	4. Macroscopy and development of the brain stem and cerebellum, IV. ventricle 5. Development and derivatives of the placode ectoderm and the neural crest 6. Blood supply to the brain, CSF circulation	Lateral ventricles, third ventricle Brain stem, fourth ventricle, cerebellum	-
Week 3	7. Gross anatomy and blood supply of the spinal cord, spinal segment. Dermatomes. 8. Microscopical structure of the spinal cord, Rexed zones. Spinal reflexes, receptors and effectors, proprioceptive reflex arc. 9. Nociceptive (withdrawal) and autonomic reflex arcs. Spinal pathways, injuries, symptoms	Cross sections of the brain. Specimen demonstration: spinal cord together with the membranes	-
Week 4	10. Cells of the CNS: neurons, glia cells. Axon, dendrite, synapses, synaptic transmission, 11. Microscopy of the cerebral cortex. Cortical fields, Brodmann areas 12. Sensory systems	1. Revision 2. **Midterm test 1**: Anatomy and development of the brain and the spinal cord	-
Week 5	13. Motor systems and tracts, pyramidal tract 14. Structure and connections of the basal ganglia. Motor pathways arising from the brain stem 15. Microscopy of the cerebellum, pathways. Functional considerations	Dissecion of the back muscles, suboccipital trigone.	Nervous system I. Peripheral nerve, motor end plate, spinal cord, brainstem

Week 6	16. Diencephalon, thalamic nuclei 17. Introduction to cranial nerves. Classification of sensory, motor and autonomic nuclei 18. Reticular formation, monoaminergic systems	'In situ' dissection of the spinal cord. Demonstration of the spinal ganglia, spinal nerves, membranes.	Nervous system II. Cerebellar and cerebral cortices Pineal body
Week 7	19. Microscopy of the brainstem 20. Trigeminal nerve, trigeminal neuralgia 21. Cranial nerves 3, 4, 6, 7. Central and peripheral paresis	'In situ' brain dissection, Demonstration of the membranes, ventricles, thalamus, brain stem, cranial nerve exits.	-
Week 8	22. Glossopharyngeal, vagus, accessory and hypoglossal nerves 23. Sympathetic nervous systems 24. Parasympathetic nervous systems. Autonomic innervation and reflexes of pelvic organs	Cranial nerves 5, 7 and 9. Dissection of the superficial and deep regions of the head (frontal, infraorbital, buccal, infratemporal, parotideomassetericregions and the parapharyngeal space)	-
Week 9	25. Fibrous and vascular coats of the eyeball. Lens, chambers of the eye, vitreous body, accommodation 26. Inner coat of the eyeball, retina. Morphological basis for colour vision. 27. Optic nerve, visual pathway, visual cortex, disorders. Visual reflexes	Cranial nerves 10, 11 and 12 Dissection of the submandibular, carotid, median cervical regions	-
Week 10	28. Extraocular muscles and eye movements, conjugated eye movements, strabism. 3D vision 29. Protective and lacrimal apparatus of the eye. Development of the eye. Malformations. 30. Skin and appendages. Mammary gland	1. **Midterm test 2**. (written) Microscopy of CNS, cranial nerves 2. Dissection of the eye (coats and muscles, chambers, optic nerve)	-
Week 11	31. The organ of hearing in general. External ear, auditory tube, tympanic cavity, tympanic membrane, auditory ossicles 32. Bony and membranous labyrinth. Vestibular system 33. Spiral organ of Corti. Auditory pathway, auditory cortex	Dissection of orbit, extraocular muscles	Organs of special senses I. Eyeball, retina, lacrimal gland
Week 12	34. Development of the auditory and vestibular system. Clinical relevances 35. Olfactory and gustatory systems 36. Limbic system	Dissection and demonstration Tympanic cavity, inner ear, temporal bone	Organs of special senses II. Organ of Corti, palm skin, scalp skin, mammary gland
Week 13	37. The hypothalamo-hypophysial system. The pituitary gland 38. Endocrine organs: pineal body, thyroid, parathyroid, adrenal glands 39. Patient demonstration	Midterm test 3: Organs of special senses, head and neck regions	Endocrine organs Pituitary, thyroid, parathyroid, suprarenal glands, Endocrine cells in the testicle, ovary, corpus luteum and pancreas
Week 14	40. Drugs of abuse, opiates, endogenous cannabinoids and receptor mediated actions in the CNS 41. Research in the field of neuroscience 42. Research in the field of neuroscience	Revisions Brain in situ, cranial nerves	Revision

TOPICS OF THE SEMIFINAL EXAMINATION

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)

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 (strech) 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 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

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, accomodation
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, Tennon'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
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
Internal acoustic meatus
Organ and pathways of olfaction
Organ and pathways of taste

2nd year 2nd semester
English Program

Anatomy, Histology and Embryology: Topographical anatomy of the head, neck, limbs and trunk including body cavities (thorax, abdomen, pelvis), ventral and dorsal regions, cross

sectional anatomy. Intagrated approach including developmental and histological relevances.
Credits: 3
Lectures: 1 hours/week
Dissection class: 2 hours /week

Week	**Lectures**	**Dissection room**
Week 1	Topographical anatomy of the lower limb, gait mechanism	Ventral regions of the limbs (*prosections*) Lower limb (bones, joints, muscles, vessels, nerves)
Week 2	Topographical anatomy of the upper limb, axillary fossa	Ventral regions of the limbs (*prosections*) Upper limb (bones, joints, muscles, vessels, nerves)
Week 3	Topographical and surface anatomy of the thorax, clinical relevance. Regional lymph nodes, with special reference to the mamma.	Ventral regions of the thorax, mammary region (*prosections*) Topography and sectional anatomy. Mediastinum. Heart, valves, pericardium, lung, pleura.
Week 4	Topographical and sectional anatomy of the thorax. Topography of pleura and pericardiac punctures.	Muscles and skeletal elements of the thorax. Diaphragm (*prosections*). Abdominal surface projections. Topography of intraperitoneal organs.
Week 5	Topographical and surface anatomy of the abdomen. Projection of internal organs, peritoneal relations	Abdominal wall, rectus sheath, hernia canals (*prosections*). Retroperitoneum. Urinary system. Cross sections of the abdominal cavity.
Week 6	Topography and sectional anatomy of the abdomen and the retroperitoneum. Arterious and venous anastomotic systems	Topography of the lesser pelvis. Syntopy and blood supply of the rectum. Portocaval anastomoses. Ventral regios of limbs (*prosections*)
Week 7	Topographical and sectional anatomy of the male pelvis and perineum.	**Midterm test 1. Ventral regional anatomy of** the trunk and the limbs. Body cavities, internal organs (except for the head&neck and the superficial perineal structures.
Week 8	Topographical and sectional anatomy of the female pelvis and perineum.	Dorsal regions of limbs and the trunk (*prosections)* Nape and nuchal region, spinal cord 'in situ', gluteal region.
Week 9	Topographical and sectional anatomy of the head. Spaces and content of the neurocranium.	Dorsal regions of limbs and the trunk (*prosections)* Topographical and sectional anatomy of the male pelvis and perineum.
Week 10	Topographical anatomy of the viscerocranium. External carotid artery, trigeminal nerve.	Dorsal regions of limbs and the trunk (*prosections)* Topographical and sectional anatomy of the female pelvis and perineum.
Week 11	Topography of cervical fasciae and spaces, sectional anatomy of the neck. Clinical relevances.	**Midterm test 2. Dorsal regions** Topography of the nuchal regions, trunk, limbs and perineum.
Week 12	Histological revision of ground tissues. Histology of vessels and lymphatic organs including cell biological relevances.	Topographical anatomy of the brain and spinal cord. Cranial nerves. Dural topography. Skull base, orbit, organs of special senses.

Week 13	Histology of the respiratory system and the gastrointestinal tract including cell biological relevances.	Topographcal anatomy of the nasal cavity&paranasal sinuses, , oral cavity, muscles of facial expression and mastication, TMJ. Oral diaphragm, para- and retropharyngeal spaces. Muscles, fasciae, viscera and cross section sof the head&neck region.
Week 14	Histology of the urinary and genital systems including cell biological relevances.	Prosected specimen demonstration of the final examination. Cross sections, placenta, fetus.

TOPICS OF THE FINAL EXAMINATION

See above at the semifinal examinations.

Furthermore

Regional anatomy

Topographical anatomy of the lower limb, gait mechanism
Topographical anatomy of the upper limb, axillary fossa
Topographical and surface anatomy of the thorax, clinical relevance. Regional lymph nodes, with special reference to the mamma.
Topographical and sectional anatomy of the thorax. Topography of pleura and pericardiac punctures.
Topographical and surface anatomy of the abdomen. Projection of internal organs, peritoneal relations
Topography and sectional anatomy of the abdomen and the retroperitoneum. Arterious and venous anastomotic systems
Topographical and sectional anatomy of the male pelvis and perineum.
Topographical and sectional anatomy of the female pelvis and perineum.
Topographical and sectional anatomy of the head. Spaces and content of the neurocranium.
Topographical anatomy of the viscerocranium. External carotid artery, trigeminal nerve.
Topography of cervical fasciae and spaces, sectional anatomy of the neck.
Clinical relevances.
Topographical anatomy of the nape and nuchal region.